Atlantic States Marine Fisheries Commission
1050 N. Highland Street, Suite 200A-N
Arlington, VA 22201

Robert E. Beal, Executive Director

Maine Department of Marine Resources
State House Station 21
Augusta, ME 04333

Patrick Keliher, Commissioner

MEMORANDUM

October 19, 2016

TO: Commissioners; Proxies; American Lobster Management Board; Atlantic Coastal Cooperative Statistics Program (ACCSP) Coordinating Council; Atlantic Herring Section; Atlantic Menhaden Management Board; Atlantic Striped Bass Management Board; Coastal Sharks Management Board; Executive Committee; Horseshoe Crab Management Board; ISFMP Policy Board; Law Enforcement Committee; Shad and River Herring Management Board; Spiny Dogfish Management Board; South Atlantic State/Federal Fisheries Management Board; Summer Flounder, Scup, and Black Sea Bass Management Board; Tautog Management Board

FROM: Robert E. Beal REB
Executive Director

RE: **75th Annual Meeting of the Atlantic States Marine Fisheries Commission**
October 23-27, 2016

The Atlantic States Marine Fisheries Commission's 75th Annual Meeting will be held October 23-27, 2016 at the Harborside Hotel in Bar Harbor, Maine. The reserved hotel room block is now closed. Please call Cindy Robertson at the Commission if you need assistance with lodging.

Board/Section meeting proceedings will be broadcast daily via webinar at https://attendee.gotowebinar.com/register/6632926318150310403 beginning at 8:30 a.m. on October 24th, continuing daily until the conclusion of the meeting (expected to be 4:00 p.m.) on October 27th. The webinar will allow registrants to listen to the proceedings of the Commission's management boards/sections during the 75th Annual Meeting, October 24-27, 2016. Registrants will also be able to view presentations and motions as they occur. For a detailed agenda and meeting materials, go to http://www.asmfc.org/home/2016-Annual-Meeting. No comments or questions will be accepted via the webinar. Should technical difficulties arise during the streaming of the broadcast, the boards/sections will continue their deliberations without interruption. We will attempt to resume the broadcast as soon as possible. Board/Section summaries, presentations, and audio files will be available at http://www.asmfc.org/home/2016-Annual-Meeting the week of October 30th.

Maine DMR has arranged for a boat tour around the local area islands and Mt Desert shoreline on one of the Bar Harbor Whale Watch vessels. The tour will last about an hour, and there will be a cash-bar on board. Information about where to meet will be available at the registration desk at the Annual Meeting.

The following pages contain the Final Agenda. Be advised the schedule is subject to change; the order in which the agenda items are listed is subject to change, and other agenda items or meetings may be added as necessary.

I look forward to seeing you all in Bar Harbor.

Enclosures: Annual Meeting Agenda
TA #16-067

Public Comment Guidelines

With the intent of developing policies in the Commission's procedures for public participation that result in a fair opportunity for public input, the ISFMP Policy Board has approved the following guidelines for use at management board meetings:

For issues that are not on the agenda, management boards will continue to provide opportunity to the public to bring matters of concern to the board's attention at the start of each board meeting. Board chairs will use a speaker sign-up list in deciding how to allocate the available time on the agenda (typically 10 minutes) to the number of people who want to speak.

For topics that are on the agenda, but have not gone out for public comment, board chairs will provide limited opportunity for comment, taking into account the time allotted on the agenda for the topic. Chairs will have flexibility in deciding how to allocate comment opportunities; this could include hearing one comment in favor and one in opposition until the chair is satisfied further comment will not provide additional insight to the board.

For agenda action items that have already gone out for public comment, it is the Policy Board's intent to end the occasional practice of allowing extensive and lengthy public comments. Currently, board chairs have the discretion to decide what public comment to allow in these circumstances.

In addition, the following timeline has been established for the **submission of written comment for issues for which the Commission has *NOT* established a specific public comment period** (i.e., in response to proposed management action).

1. Comments received 3 weeks prior to the start of a meeting week will be included in the briefing materials.
2. Comments received by **5:00 PM on the Tuesday, October 18, 2016** will be distributed electronically to Commissioners/Board members prior to the meeting and a limited number of copies will be provided at the meeting.
3. Following the Tuesday, **October 18, 2016 5:00 PM** deadline, the commenter will be responsible for distributing the information to the management board prior to the board meeting or providing enough copies for the management board consideration at the meeting (a minimum of 50 copies).

The submitted comments must clearly indicate the commenter's expectation from the ASMFC staff regarding distribution. As with other public comment, it will be accepted via mail, fax, and email.

Preliminary Agenda

The agenda is subject to change. The agenda reflects the current estimate of time required for scheduled Board meetings. The Commission may adjust this agenda in accordance with the actual duration of Board meetings. Interested parties should anticipate Boards starting earlier or later than indicated herein.

<u>Sunday, October 23, 2016</u>

2:00 – 6:00 p.m. **Registration**

6:30 – 8:30 p.m. **Welcome Reception**

<u>**Monday October 24, 2016**</u>

7:00 a.m. – Noon **Registration**

8:30 a.m. – Noon **75th Annual Meeting Plenary Session – *Honoring our Past, Celebrating the Present and Envisioning the Future***

1. Welcome/Kick-off, ASMFC Chair Doug Grout, Chief of Marine Fisheries, New Hampshire Fish and Game
2. Plenary Overview, ASMFC Executive Director Bob Beal
3. ASMFC History
   - Honoring the Past (1941-1991), Phil Coates, former Massachusetts Division of Marine Fisheries Director and ASMFC Commissioner (1979-2000)
   - Celebrating the Present (1992- 2016), Susan Shipman, former Georgia Coastal Resources Division Director and ASMFC Commissioner (1994-2008)
4. ASMFC Highlights – Interactive Session
5. Morning Session Wrap-up and Overview of Things to Come, Bob Beal
6. Break
7. Envisioning the Future
   - Introduction, Patrick Keliher, Commissioner, Maine Department of Marine Resources
   - Observations on the Current and Future State of the Ocean and Marine Resources, Guest Speaker Dr. Robert Steneck, Maine School of Marine Sciences
   - Panel Discussion on Adapting to Future Challenges

Panelists: Jack Dunnigan, Former ASMFC Executive Director and Assistant Administrator for Oceans and Coastal Services; Gordon Colvin, former Director of Marine Resources, New York State Department of Environmental Conservation and ASMFC Commissioner (1982-2007); Robert Boyles, Jr., Deputy for Marine Resources, South Carolina Department of Natural Resources; Patrick Keliher; Jason McNamee, Chief, Marine Resources Division, Rhode Island Division of Fish and Wildlife; and Kathy Knowlton, Fisheries Statistics Unit Leader, Georgia Coastal Resources Division

8. Plenary Wrap-up and Adjournment, Bob Beal

1:00 – 5:00 p.m. **Law Enforcement Committee**
(A portion of this meeting is a closed session for Committee members and authorized personnel only)
Members: Anthony, Blanchard, Burton, Cloutier, Cornish, Donovan, Eastman, Frampton, Furlong, Gordon, Green, Hettenbach, Hogan, Huss, Kersey, King, Lynn, Messeck, Moran, Overturf, Schlaht, Snellbaker
Chair: Eastman
Staff: Robson

1. Call to Order/Roll Call of the Law Enforcement Committee (LEC) Representatives *(M. Eastman)*
2. Approval of Agenda and Minutes from May 2016
3. Public Comment
4. Discussion of Emerging ISFMP Issues
5. Review and Discussion of 2017 Action Plan Items
6. Interstate Violator Compacts and Application to Marine Fisheries
7. Review Proposed Jonah Crab Claw Harvest Regulations
8. Review Warrant and Search Provisions Among LEC Jurisdictions
9. Review and Discussion of Ongoing Enforcement Activities *(Closed Session)*
10. Other Business/Recess

1:00 – 1:30 p.m. **Spiny Dogfish Management Board**
Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina
Other Members: NMFS, USFWS
Chair: Borden
Other Participants: Moran, Newlin
Staff: Appelman

1. Welcome/Call to Order *(D. Borden)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from February 2016
3. Public Comment
4. Review and Set Spiny Dogfish Fishery Specifications for 2017/2018 Season **Final Action**
   - Review Mid-Atlantic Fishery Management Council 2016-2018 Specifications Recommendation *(M. Appelman)*

5. Consider 2016 Spiny Dogfish Fishery Management Plan Review and State Compliance *(M. Appelman)* **Action**
6. Other Business/Adjourn

1:45 – 2:45 p.m. **Coastal Sharks Management Board**

Member States: Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Other Members: NMFS, USFWS
Chair: Nowalsky
Other Participants: Belcher, Frampton
Staff: Harp

1. Welcome/Call to Order (*A. Nowalsky)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Updates from NOAA Fisheries Highly Migratory Species (HMS) Division (*K. Brewster-Geisz*)
   - Review Proposed Rule for HMS Amendment 5b (Dusky Sharks) and 2016 Stock Assessment Results
   - Review Draft Environmental Assessment for Amendment 10 to the 2006 Consolidated HMS Fishery Management Plan: Essential Fish Habitat
   - Review Proposed Review Proposed Rule for Blacknose Possession Limits for Federally-permitted Vessels
   - Review Proposed Rule for the 2017 Atlantic Shark Commercial Fishing Season
5. Set 2017 Coastal Sharks Fishery Specifications *(A. Harp)* **Final Action**
6. Other Business/Adjourn

2:00 – 5:00 p.m. **Registration**

2:00 – 3:00 p.m. **Welcome Tea for Spouses/Guests**

3:00 – 5:00 p.m. **Atlantic Striped Bass Management Board**

Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, North Carolina
Other Members: NMFS, DC, PRFC, USFWS
Chair: Gilmore
Other Participants: Blanchard, Lengyel, Nelson
Staff: Appelman

1. Welcome/Call to Order *(J. Gilmore)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016

3. Public Comment
4. Technical Committee Report *(N. Lengyel)*
    - Performance Evaluation of Addendum IV Regulatory Measures
5. Review the 2016 Atlantic Striped Bass Stock Assessment Update *(G. Nelson)*
6. Consider Approval of the Advisory Panel Request to Submit Comment to the Mid-Atlantic Fishery Management Council on its Draft Squid Capacity Amendment *(J. Gilmore)* **Possible Action**
7. Other Business/Adjourn

<u>Tuesday October 25, 2016</u>

7:30 a.m. – Noon **Registration**

8:00 – 10:00 a.m. **Executive Committee**
Breakfast to be served ***(A portion of this meeting may be a closed session for Commissioners and Committee members only)***
Members: Abbott, Blazer, Boyles, Bull, Chanda, Clark, Davis, Estes, Gilmore, Grout, Keliher, McNamee, Miller, Pierce, Shiels, Simpson, Woodward
Chair: Grout
Staff: Leach

1. Welcome/Call to Order *(D. Grout)*
2. Board Consent
    - Approval of Agenda
    - Approval of Meeting Summary from August 2016
3. Public Comment
4. Consider Approval of FY16 Audit *(L. Leach)* **Action**
5. Review Conservation Equivalency Guidance Document *(T. Kerns)* **Action**
6. Review ASMFC Standard Meeting Practices Document *(R. Beal)* **Action**
7. Awards Committee Report *(S. Woodward)*
8. Review Performance Appraisal/Merit Increase Protocol *(R. Beal)*
9. Review Resolution Regarding Revision of Retirement Plan *(L. Leach)* **Action**
10. Discuss Revision of Action Plan to Include ACCSP Goal *(R. Beal)*
11. Discuss Health Benefits for Retired ASMFC Employees *(R. Beal)*
12. Other Business/Adjourn

8:00 a.m. – Noon **Law Enforcement Committee (continued)**

1. Social (Open to Commissioners and Staff)
2. Update on Future Safe Harbor Issues and Input (Other Emerging Issues)
3. Update on Aerial Enforcement Subcommittee Discussions
4. Federal/State Agency Reports
5. Lobster Enforcement Subcommittee Report and Discussion
6. Review Law Enforcement Committee Comments and Recommendations to ASMFC Boards
7. Review Out-of-State Shipment/Sale Tracking for Enforcement Needs
8. Review Updated ISFMP Issues
9. Other Business/Adjourn

10:15 a.m. – 12:15 p.m. **South Atlantic State/Federal Fisheries Management Board**

Member States: New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Other Members: PRFC, DC, NMFS, USFWS, SAFMC
Other Participants: Lynn, McDonough, Murphy, Rickabaugh
Chair: Estes
Staff: Kerns

1. Welcome/Call to Order *(J. Estes)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Consider Draft Cobia FMP Public Information Document for Public Comment *(L. Daniel)* **Action**
5. Red Drum Working Group Report *(J. Kipp)*
   - Presentation of Follow Up Tasks to the Red Drum Assessment
6. Progress Report on the Spot and Atlantic Croaker Benchmark Stock Assessments *(J. Kipp)*
7. Consider 2016 Fishery Management Plan Reviews and State Compliance *(A. Hirrlinger)* **Action**
   - Black Drum
   - Spanish Mackerel
   - Spotted Seatrout
8. Review and Populate Advisory Panel Membership (*T. Berger*) **Action**
9. SEAMAP Funding Update *(S. Madsen)*
10. Other Business/Adjourn

1:15 – 3:15 p.m. **Tautog Management Board**

Member States: Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia
Other Participants: McNamee, Snellbaker
Chair: Nowalsky
Staff: Harp

1. Welcome/Call to Order (*A. Nowalsky)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Review 2016 Stock Assessment Update *(J. McNamee)*
5. Provide Plan Development Team Guidance on Draft Amendment 1 *(A. Harp, A. Nowalsky)*
6. Update on Tautog Tagging Trial *(A. Harp)*
7. Other Business/Adjourn

2:30 – 5:00 p.m. **Registration**

3:30 – 4:30 p.m. **Summer Flounder, Scup, and Black Sea Bass Management Board**

Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina
Other Members: NMFS, PRFC, USFWS
Other Participants: Wojcik, Snellbaker
Chair: Luisi
Staff: Rootes-Murdy

1. Welcome/Call to Order *(M. Luisi)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from February 2016
3. Public Comment
4. Review Marine Recreational Information Program Wave 4 Harvest Estimates for Summer Flounder, Scup, and Black Sea Bass (if available) *(K. Rootes-Murdy)*
5. Consider Management Approaches for 2017 Summer Flounder and Black Sea Bass Recreational Fisheries **Possible Action**
   - Summer Flounder Working Group Report *(K. Rootes-Murdy)*
6. Update on Stock Assessment Progress for Black Sea Bass *(K. Rootes-Murdy)*
7. Consider 2016 Fishery Management Plan Reviews and State Compliance *(K. Rootes-Murdy)* **Action**
   - Summer Flounder
   - Scup
   - Black Sea Bass
8. Other Business/Adjourn

4:45 – 5:30 p.m. **Shad and River Herring Management Board**

Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Other Members: DC, PRFC, USFWS, NMFS
Other Participants: Chase, Furlong
Chair: Goldsborough
Staff: Harp

1. Welcome/Call to Order *(B. Goldsborough)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from May 2016
3. Public Comment
4. Consider Approval of the Nemasket River, Massachusetts Sustainable Fishery Management Plan for River Herring *(B. Chase)* **Final Action**
   - Review Technical Committee Memo on the Nemasket River Sustainable Fishery Management Plan
5. Discuss the Timetable for the Five-Year Update of Shad and River Herring Sustainable Fishery Management Plans *(A. Harp)*

6. Review Mid-Atlantic Fishery Management Council Decision on Potential Management of Shad and River Herring *(B. Goldsborough)*
7. Other Business/Adjourn

6:30 – 9:00 p.m. **Annual Dinner**

Wednesday October 26, 2016

8:00 – 10:00 a.m. **Horseshoe Crab Management Board**
Member States: Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Other Members: PRFC, NMFS, USFWS
Other Participants: Breese, Doctor, Messeck
Chair: Gilmore
Staff: Rootes-Murdy

1. Welcome/Call to Order *(J. Gilmore)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Consider Comments from the Adaptive Resource Management (ARM) Subcommittee on Draft Addendum VIII *(K. Rootes-Murdy)* **Possible Action**
   - ARM Subcommittee Report *(K. Anstead)*
5. Horseshoe Crab Technical Committees Report *(S. Doctor)* **Possible Action**
   - Shorebird and Horseshoe Crab Survey Reports Summary
   - ARM Framework Harvest Output for 2017
   - Recommendations on Bait Trials
6. Set 2017 Delaware Bay Horseshoe Crab Fishery Specifications *(K. Rootes-Murdy)* **Final Action**
7. Consider 2016 Horseshoe Crab Fishery Management Plan Review and State Compliance *(K. Rootes-Murdy)* **Action**
8. Other Business/Adjourn

10:15 – 11:15 a.m. **Atlantic Coastal Cooperative Statistics Program (ACCSP) Coordinating Council**
Members: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, PRFC, Virginia, North Carolina, South Carolina, Georgia, Florida, ASMFC, NOAA Fisheries, NEFSC, GARFO, SEFSC, SERO, USFWS, NEFMC, MAFMC, SAFMC
Chair: R. Boyles, Jr.
Staff: Cahall

1. Welcome/Introductions *(R. Boyles, Jr.)*

2. Council Consent
   - Approval of Agenda
   - Approval of Minutes from August 2016
3. Public Comment
4. ACCSP Status Report *(M. Cahall)*
   - Program Updates
   - Committee Updates
5. Presentation of the Universe of Electronic Reporting Efforts on the Atlantic Coast *(M. Cahall)*
6. Consider Recommendations of FY2017 Submitted Proposals *(P. Campfield, J. Morgan)* **Action**
7. Consider Addendum to Memorandum of Understanding to Reflect Governance Change *(R. Boyles, Jr.)* **Action**
8. Other Business/Adjourn

11:30 a.m. – 12:30 p.m. **Business Session**
Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Chair: Grout
Staff: Beal

1. Welcome/Introductions *(D. Grout)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Election of Commission Chair and Vice-chair (*R. Beal*) **Action**
5. Review and Consider Approval of the 2017 ASMFC Action Plan **Action**
6. Other Business/Adjourn

12:30 – 1:45 p.m. **Captain David H. Hart Award Luncheon**

2:00 – 5:00 p.m. **Atlantic Menhaden Management Board**
Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Other Members: NMFS, PRFC, USFWS
Other Participants: Kaelin, McNamee, Kersey
Chair: Ballou
Staff: Ware

1. Welcome/Call to Order *(R. Ballou)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Review Timeline of Menhaden Activities through 2019 *(M. Ware)*

5. Set 2017 Atlantic Menhaden Fishery Specifications **Final Action**
   - Review Stock Projections and Recent Juvenile Abundance Indices Trends *(J. McNamee)*
   - Consider Postponed Motion to Set the 2017 Total Allowable Catch (TAC)
     - *Motion to set the 2017 Coastal TAC for the Atlantic Menhaden Fishery at 225,456 metric tons (20% Increase)*
6. Consider Draft Amendment 3 Public Information Document for Public Comment **Action**
   - Overview of Public Information Document *(M. Ware)*
   - Advisory Panel Report *(J. Kaelin)*
7. Technical Committee Report *(J. McNamee)*
   - Review of "The Fate of an Atlantic Menhaden Year Class"
8. Biological Ecological Reference Points Working Group Progress Report *(S. Madsen)*
9. Review and Populate Advisory Panel Membership *(T. Berger)* **Action**
10. Other Business/Adjourn

<u>Thursday October 27, 2016</u>

8:00 – 10:30 a.m. **Interstate Fisheries Management Program (ISFMP) Policy Board**
Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida
Other Members: DC, NMFS, PRFC, USFWS
Chair: Grout
Staff: Kerns

1. Welcome/Call to Order *(D. Grout)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Executive Committee Report *(D. Grout)*
5. Review Revisions to the Conservation Equivalency Guidance Document *(T. Kerns)* **Final Action**
6. Update on the Climate Change Working Group *(T. Kerns)*
7. Discuss Risk and Uncertainty Policy Workgroup White Paper *(J. McNamee)*
8. Habitat Committee Report *(T. Kerns)* **Action**
   - Review and Consider the Sciaenid Habitat Source Document
   - Review State Reports on Climate Change Initiatives
   - Review the Draft Letter to BOEM regarding Seismic Testing
9. Atlantic Coastal Fish Habitat Partnership Report (*P. Campfield)*
10. Law Enforcement Committee Report *(M. Robson)*
11. Review Non-Compliance Findings, If Necessary **Possible Action**
12. Other Business/Adjourn

10:45 a.m. – 12:15 p.m. **Atlantic Herring Section**

Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey
Chair: White
Other Participants: Eastman, Kaelin, Zobel
Staff: Harp

1. Welcome/Call to Order *(R. White)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from February 2016
3. Public Comment
4. Elect Vice-chair **Action**
5. Review and Discuss White Paper on Fishery Performance and Alternative Management Tools *(A. Harp, R. White)* **Possible Action**
6. Set 2017 Atlantic Herring Specifications for Area 1A **Final Action**
7. Other Business/Adjourn

12:30 – 4:00 p.m. **American Lobster Management Board *(Lunch to be provided)***

Member States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia
Other Members: NMFS
Chair: Borden
Other Participants: Cornish, Reardon
Staff: Ware

1. Welcome/Call to Order *(D. Borden)*
2. Board Consent
   - Approval of Agenda
   - Approval of Proceedings from August 2016
3. Public Comment
4. Consider American Lobster Draft Addendum XXV for Public Comment *(M. Ware)* **Action**
5. Discuss Trap Caps Included in Addenda XXI and XXII *(M. Ware)*
6. American Lobster Reporting Work Group Report *(M. Ware)* **Possible Action**
7. Consider Jonah Crab Draft Addendum II for Public Comment **Action**
   - Jonah Crab Working Group Report *(M. Ware)*
8. Consider 2016 American Lobster Fishery Management Plan Review and State Compliance *(M. Ware)* **Action**
9. Update on the Atlantic Marine Monument Designation *(M. Ware)*
10. Update on New England Fishery Management Council Deep-Sea Coral Amendment *(M. Ware)*
11. Other Business/Adjourn

Atlantic States Marine Fisheries Commission

75th Annual Meeting Plenary Session
Honoring the Past, Celebrating the Present and Envisioning the Future

October 24, 2016
8:30 AM – Noon

1. Welcome/Kick-off, ASMFC Chair Doug Grout, Chief of Marine Fisheries, New Hampshire Fish and Game — 8:30 a.m.

2. Plenary Overview, ASMFC Executive Director Bob Beal — 8:45 a.m.

3. ASMFC History — 8:50 a.m.
    - Honoring the Past (1941-1991), Phil Coates, former Massachusetts Division of Marine Fisheries Director and ASMFC Commissioner (1979-2000)
    - Celebrating the Present (1992- 2016), Susan Shipman, former Georgia Coastal Resources Division Director and ASMFC Commissioner (1994-2008)

4. ASMFC Highlights – Interactive Session — 9:30 a.m.

5. Morning Session Wrap-up and Overview of Things to Come, Bob Beal — 9:50 a.m.

6. Break — 9:55 a.m.

7. Envisioning the Future
    - Introduction, Patrick Keliher, Commissioner, Maine Department of Marine Resources — 10:05 a.m.
    - Observations on the Current and Future State of the Ocean and Marine Resources, Guest Speaker Dr. Robert Steneck, Maine School of Marine Sciences — 10:10 a.m.
    - Panel Discussion on Adapting to Future Challenges — 10:40 a.m.

    Panelists: Jack Dunnigan, Former ASMFC Executive Director and Assistant Administrator for Oceans and Coastal Services; Gordon Colvin, former Director of Marine Resources, New York State Department of Environmental Conservation and ASMFC Commissioner (1982-2007); Robert Boyles, Jr., Deputy for Marine Resources, South Carolina Department of Natural Resources; Patrick Keliher; Jason McNamee, Chief, Marine Resources Division, Rhode Island Division of Fish and Wildlife; and Kathy Knowlton, Fisheries Statistics Unit Leader, Georgia Coastal Resources Division

8. Plenary Wrap-up & Adjournment, Bob Beal — 11:55 a.m.

Atlantic States Marine Fisheries Commission

Spiny Dogfish Management Board

October 24, 2016
1:00 – 1:30 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order (*D. Borden)*	1:00 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from February 2016	1:00 p.m.
3.	Public Comment	1:05 p.m.
4.	Review and Set Fishery Specifications for the 2017-2018 Season **Final Action** • Review Mid-Atlantic Fishery Management Council 2016-2018 Specifications Recommendation *(M. Appelman)*	1:15 p.m.
5.	Consider 2016 Fishery Management Plan Review and State Compliance (*M. Appelman)* **Action**	1:25 p.m.
6.	Other Business/Adjourn	1:30 p.m.

The meeting will be held at the Harborside Hotel; 55 West Street; Bar Harbor, Maine; 207.288.5033

Vision: Sustainably Managing Atlantic Coastal Fisheries

MEETING OVERVIEW

Spiny Dogfish Management Board
October 24, 2016
1:00 – 1:30 p.m.
Bar Harbor, Maine

Chair: David Borden (RI) Assumed Chairmanship: 10/15	Vice Chair: Rob O'Reilly	Law Enforcement Committee Representative: Moran
Spiny Dogfish Technical Committee Chair: Scott Newlin	Spiny Dogfish Advisory Panel Chair: VACANT	Previous Board Meeting: February 3, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, VA, NC, NMFS, USFWS (13 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from February 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Review and Set Fishery Specifications for the 2017-2018 Season (1:15 – 1:25 p.m.) Final Action
Background • The Mid-Atlantic and New England Councils implemented multiyear fishery specifications (e.g., ABC, commercial quota, and possession limits) for 2016 – 2018 (May 2015 – April 2019). • Earlier this month (October), the Mid-Atlantic Council reviewed the 2016 data update, fishery performance report, and staff and SSC recommendations, and recommended no changes to the ABC. The 2017/2018 commercial quota will be 39 million pounds and the 2018/2019 commercial quota will be 38 million pounds. **(Supplemental Materials)**

- The current trip limit for northern states (Maine through Connecticut) is 6,000 pounds/day.

Presentations

- Review of the MAFMC and NEFMC 2016-2018 Specifications by M. Appelman

Board Actions for Consideration at this Meeting

- Set the spiny dogfish specifications (which includes trip limits) for the 2017-2018 season

5. Consider 2016 Fishery Management Plan Review and State Compliance (1:25 – 1:30 p.m.) Action

Background

- Annual state compliance reports for spiny dogfish are due no later than July 1st
- The Plan Review Team reviewed the reports and drafted the 2016 Fishery Management Plan Review **(Briefing Materials)**

Presentations

- 2016 Draft Fishery Management Plan Review by M. Appelman

Board Actions for Consideration at this Meeting

- Consider 2016 Fishery Management Plan Review and State Compliance

6. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

SPINY DOGFISH MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
February 3, 2016

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These minutes are draft and subject to approval by the Spiny Dogfish Management Board.
The Board will review the minutes during its next meeting.

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1. **Approval of agenda by consent** (Page 1).

2. **Approval of proceedings of November 2015 by consent** (Page 1).

3. **Move to adopt a spiny dogfish 2016 commercial quota of 40,360,761 pounds which is consistent with the commercial quota recommended to NOAA Fisheries by the Mid-Atlantic and New England Fishery Management Councils** (Page 3). Motion by Emerson Hasbrouck; second by Eric Reid. Motion carried (Page 3).

4. **Move to recommend NOAA Fisheries adopt a 6000 pound trip limit, if the trip limit is approved in federal waters then set a 6000 pound trip limit in the northern region (ME through CT). If the trip limit is not approved in federal waters then a 5,000 pound trip limit will remain in the northern region (ME through CT)** (Page 6). Motion by Eric Reid; second by Ritchie White. Motion carries with one abstention from NOAA Fisheries (Page 7).

5. **Move to nominate Rob O'Reilly as Vice-Chair of the Spiny Dogfish Board** (Page 7). Motion by Ritchie White; second by Steve Heins. Motion carried (Page 7).

6. **Motion to adjourn** by consent (Page 7).

ATTENDANCE

Board Members

Terry Stockwell, ME, proxy for P. Keliher (AA)
Sen. Brian Langley, ME (LA)
Steve Train, ME (GA)
Doug Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
G. Ritchie White, NH (GA)
Jocelyn Cary, MA, proxy for Rep. Peake (LA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
William Adler, MA (GA)
Mark Gibson, RI, proxy for J. Coit (AA)
David Borden, RI (GA)
Eric Reid, RI, proxy for S. Sosnowski (LA)
Steve Heins, NY, proxy for J. Gilmore (AA)
Emerson Hasbrouck, NY (GA)
Pat Augustine, NY, proxy for P. Boyle (LA)
Adam Nowalsky, NJ, proxy for R. Andrzejczak (LA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Stewart Michels, DE, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Bill Goldsborough, MD (GA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Mike Luisi, MD, proxy for D. Blazer (AA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Kyle Schick, VA, proxy for R. Stuart (LA)
Louis Daniel, NC (AA)
Doug Brady, NC (GA)
Wilson Laney, USFWS
Peter Burns, NMFS

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Staff

Robert Beal
Toni Kerns
Ashton Harp
Megan Ware

Guests

John Clark, DE DFW
Jason Didden, MAFMC

The Spiny Dogfish Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, February 3, 2016, and was called to order at 12:10 o'clock p.m. by Chairman David V. Borden.

CALL TO ORDER

CHAIRMAN DAVID V. BORDEN: Thank you for having a seat. My name is David Borden; I am the Chairman of the Dogfish Board.

APPROVAL OF AGENDA

CHAIRMAN BORDEN: We have circulated a draft agenda. Are there any changes, additions, deletions to the agenda? If not we'll take the items in the order that they appear.

APPROVAL OF PROCEEDINGS

CHAIRMAN BORDEN: We have the proceedings from February, 2014. Are there any changes to those proceedings, additions, deletions, any objections to approving them as prepared? No objections they stand approved.

PUBLIC COMMENT

CHAIRMAN BORDEN: Public comments, we did not have anyone sign up to comment, but I'll ask. Is there anyone in the audience who wants to address the commission on issues that do not appear on the agenda? No hands up.

REVIEW AND SET 2016-2018 FISHERY SPECIFICATIONS

CHAIRMAN BORDEN: Review of the 2016 specifications. We have two reports here, one by the Mid-Atlantic Council on the Mid-Atlantic Council actions, the second on the New England Council action. Jason, will you please provide the board with a quick summary of the actions by the Mid-Atlantic?

REVIEW OF MID-ATLANTIC FISHERY MANAGEMENT COUNCIL ACTIONS

MR. JASON DIDDEN: I am going to quickly review some fishery performance items and then what the councils took on action for 2016 to 2018 spiny dogfish specifications. The council set up an advisory panel fishery performance report several years ago. The advisory panel meets, gives some input on the recent fishery performance as they go through.

The biggest thing that we have gotten and keep getting from them is the key determine of the fishery is markets and price. Their kind of goal for the fishery is to maintain stability in both, and slowly grow it. I think that is the overriding theme we keep getting with it. They say even though we haven't been catching the quota, there is no problem catching the trip limit.

Over the years sometimes processors do put in some days restrictions that limit catch, but again the theme that they really keep focusing on is that they're looking to grow this fishery slowly, not quickly, and looking to maintain stability. That is really the key thing. We do get some input every year on different regions wanting some changes to trip limits.

As soon as that comes up we also get input on, keep in mind that if you change the trip limits and one, overall it is going to have different impacts in different regions. While it may help out one region, it may shut another fishery down because of the dynamics of the fishery; as far as the trip limits go. Neither one of the councils took any action on changing the trip limits, which would just leave the federal trip limit status quo. We did get some input that some of the NMFS information on exports and what kinds of products are exported. There is some lack of clarity there; they want a bit more information on that. The name change issue keeps coming up. We did explore this with FDA a bit, but beyond the two currently allowed names, spiny dogfish shark and cape shark;

additional name changes through FDA appear unlikely to occur.

The blue line is spiny dogfish catches from the current fishing year. The fishing year is May 1 through the following April. The orange line is what the landings were the previous year. The red line at the top is a quota, the commercial quota. The commercial quota was approximately the same the year before in the orange line.

You can see they're catching a little less than half the quota, basically. It looks like this year we'll end up about the same or maybe a little bit lower than the previous fishing year. The council, I think you guys probably know the council process. Things go through the SSC, which are pretty binding for the council.

We had the Science Center, Paul Rego; who is now retired, do an assessment update. The first take on that assessment update basically led to about a 50 percent reduction in the commercial quota. Once all the discards come out, Canadian catch comes out; once all those things are taken care of the end result was about a 50 percent reduction in the commercial quota.

The Mid-Atlantic Council moved forward with ABCs based on that; but also asked the Science Center to kind of take another look at things, which they did. In 2014 we had a missing data point, the survey vessel had mechanical issues and the survey is basically looking at three year moving averages from the survey data, it is kind of the key driver there.

This year we had 2013 and 2015 but no 2014. With a three year average it is going to react pretty quickly to changes anyway. I think 2012 was a super high data point in the survey. We lost that very high data point and just relying on 2013 and 2015, and we had a substantial drop in the estimated biomass that then trickles down through the quotas.

When they went back and took another look at it, about ways to smooth the data and account for that missing year, Paul Rego; he's been working with Kalman filters as a way to do some smoothing and averaging with this assessment for quite some time. He did that along with a couple other options.

Our SSC reviewed those options and said, of what is available now, and based on their understanding of the performance of those smoothing and averaging, they decided the Kalman filter was the best way to go in terms of how it behaved. These are the biomass as it resulted from some of the different smoothing options.

The key thing to see here is that the current method, or the then current method, which was a three year moving average versus a Kalman filter; the medium biomass is a good bit higher with the Kalman filter. Again, it is not reacting quite so fast to the down trend as the three year average, which was really a two year moving average because we didn't have any 2014 data.

While for right now the Kalman filter provides a higher biomass and therefore a higher catch, when you look at the whole time series the Kalman results in the lowest average annual quotas. Basically the Kalman, when it sees a survey point that has a lot of uncertainty; it is down weighting those points. With dogfish, in the survey the highest values have the highest uncertainty. It is a very strong relationship. Those high values are getting down weighted in importance by the Kalman filter.

You can imagine it is basically going to be a slow up, medium down kind of way to proceed. If it sees a high value with high uncertainty it is going to react to that slowly. A low value with low uncertainty, and that is how things tend to be paired, it is going to react to that fairly quickly. The SSC sometime later this year is going to take another look at it, kind of step back; are there other smoothing options that may be more appropriate.

I'm not exactly sure when that will occur, but they did indicate that they want to take another look at it this year. It won't be at the March meeting but sometime after. These are just kind of all the specifications. The bottom numbers that are circled are how things work out. Again, instead of going from 50 million pounds to 25 million pounds you're more going from 50 million pounds to about 40 million pounds; give or take over the course of three years. That is where the council ended up, and I'll take any questions.

CHAIRMAN BORDEN: Questions for Jason?

MR. DANIEL McKIERNAN: Jason, thank you. Can you just describe how many years this filtering process will have to be used; given the missing data point?

MR. DIDDEN: Well the survey has always used a smoothing and it had been using three years. I think the SSC likes the performance of the Kalman filter better as a smoothing option than just a basic three year; or some of the other options. I think that absent another smoothing option that the SSC decides is better, this could be forever it would be used. I think it will really depend on either an assessment or the SSC evaluation of what's the best way to kind of do some multiyear averaging.

REVIEW OF NEW ENGLAND FISHERY MANAGEMENT COUNCIL ACTIONS

CHAIRMAN BORDEN: Other questions for Jason? If not we'll move on with the next item, which is a report on the New England Council.

MS. ASHTON HARP: No presentation necessary. The New England Fisheries Management Council approved the same specifications as the Mid.

CHAIRMAN BORDEN: Okay, in preparation for this, given the fact that both councils adopted this unanimously I think it was. Anyone can correct that if I misstated. I asked the staff to prepare a motion that would do the same thing and put it up just for discussion. If someone cares to make that as a motion I'll open the board for discussion. Have you got the motion?

A draft motion is on the table. Emerson Hasbrouck made the motion, Eric Reid seconded the motion. Discussion on the motion? Let me ask this, anyone at the table that is opposed to the motion? No opposition; the motion is adopted by unanimous agreement. Okay so the second issue is.

MS. TONI KERNS: If you could, we need the motion read into the record; please.

CHAIRMAN BORDEN: **The motion is to adopt the spiny dogfish 2016 commercial quota of 40,360,761 pounds, which is consistent with the commercial quota recommended to NOAA Fisheries by the Mid-Atlantic and New England Fishery Management Council; motion by Mr. Hasbrouck, seconded by Mr. Reid.** No further discussion? Yes, Peter Burns.

MR. PETER BURNS: Just a comment. I just want to recognize that NOAA Fisheries is still in rulemaking on this and we recognize that this is consistent with what the councils have recommended. But I'll be abstaining on this because we're still in the rulemaking process, thank you.

CHAIRMAN BORDEN: Thank you very much, Peter. Any further discussions, any objections to approving this motion as presented**? No objections; the motion stands approved.** The second issue is the two councils took no action on the trip limits; and that is one of the issues that can be considered at this point.

Just so everyone is clear, we have a system in terms of the management system. We have two slightly different management systems that operate. In the Mid-Atlantic we have a quota system, a regional quota system with state shares. The states manage those shares. Any of the fishermen in that region that have federal permits and fish in federal waters, are bound by the federal regulations and trip limit.

When they fish without their federal license in state waters they are bound by whatever the state water regulations are. In the New England area we do not have a state quota system, what we have is a regional quota system; and therefore the states basically adopt a trip limit for state waters that complements the trip limit in federal waters. Let me just open it up. Does anyone want to suggest a change in the trip limit? Eric Reid.

MR. ERIC REID: **I would like to make a motion to that effect, Mr. Chairman; if it is okay with you. I move to adopt a 6,000 pound trip limit on spiny dogfish for the fishing year 2016 to only be consistent with compatible action by NOAA in federal waters.** I have some rationale if I can get a second.

CHAIRMAN BORDEN: Is there a second? Ritchie White. We'll wait, Eric have you got that in writing?

MR. REID: Do I have it in writing?

CHAIRMAN BORDEN: We'll just make sure we get the motion up on the board. Then I'll come back to you, Eric and you can describe why.

MR. REID: You're missing the compatible with NOAA.

CHAIRMAN BORDEN: Eric, let me just ask this from the Chair's intent. The 6,000 pound trip limit applies in federal waters, right?

MR. REID: Yes, to be consistent with NOAAs.

CHAIRMAN BORDEN: Okay, but not just the northern area.

MR. REID: No, I would like to see it coastwide.

CHAIRMAN BORDEN: Eric, would you like to describe this, why you want to propose this, please?

MR. REID: There are more than a few reasons for it. One is currently we're underfishing the resource. We're not catching current or the proposed ABC. As far as the market goes we need to gradually increase the trip limit to methodically promote full market potential and the utilization of the resource.

We also need to reduce regulatory discards. We need to promote economies of scale in this fishery; it is a cheap fish and we need to take advantage of economies of scale in order to make it work for everybody. The higher trip limit would encourage more participation in the fishery, which is certainly warranted in this case.

CHAIRMAN BORDEN: All right so I'll open the discussion to the board, comments on the motion; anyone? Does anyone care to comment on the motion? Mike.

MR. MICHAEL LUISI: This would only happen in the event that NOAA also establishes 6,000 pound limits for all federal waters, correct?

CHAIRMAN BORDEN: Okay other comments on it; anyone else? I'm not seeing a lot of hands.

MR. DOUGLAS E. GROUT: I have a comment, but I think Luisi still had a follow up question.

CHAIRMAN BORDEN: Oh, excuse me, Mike.

MR. LUISI: I was just clarifying. I just wanted an answer. I am reading it again now and seeing that I think that is the intent that the 6,000 pound limit would apply to federal waters as well; not just the state waters in the northern region. I would speak in support of this.

I have advocated at the council level for the last few years for increases in federal waters trip limits, however I didn't use Mr. Reid's approach, which is a subtle approach. I kind of doubled limits and tripled limits and it wasn't going to fly. But I think this stepwise approach to trying to achieve a better harvest of the resource is a good thing, and I'll support the motion.

CHAIRMAN BORDEN: I just add from my own personal perspective as everyone knows, I have advocated higher trip limits on dogfish. But I would point out that the motion that Eric Reid is making is entirely consistent with the advice that Jason gave us from the industry. Don't do anything radical; just kind of slowly ratchet up the catch so that the market can adjust to it, back to Doug Grout, please.

MR. GROUT: Yes, I just wanted to say that I support this motion. Last year we did try to get a 1,000 pound increase in the trip limit. The information we get from our fishermen is that given the low value of dogfish, to be able to make this a viable trip, having somewhere between a 6 and 7,000 pound trip limit makes the trip a more cost effective trip. I would support this, but again only if this was something that was compatible with what happens in federal waters.

MR. DIDDEN: There were no motions at the councils. I don't know if the proposed rule by NMFS will have any consideration of any changes from the 5,000 pound trip limit for this year, although it is obviously something the councils could entertain in the future.

MR. BURNS: Yes I guess I'm a little confused about what would happen with this motion. As I mentioned we're rulemaking right now. It is assumed that the council recommendations for the trip limits would be 5,000 pounds; consistent with what happened last year, and so that is what we're strongly considering.

This would be inconsistent with that and it is unclear to me. This would be contingent upon our rulemaking, in favor of this I imagine. I'm not really sure what the commission would adopt in the event that we did not make rules that were consistent with this motion.

CHAIRMAN BORDEN: My response to that Peter would be, if this motion were to pass the Executive Director or Commission Chairman would send a letter to NOAA; basically saying this is what the commission adopted. Then NOAA within the constraints of its rulemaking process would either address it in one way or another, or maybe not address it. But at least on the record they would have a letter recommending a slightly different strategy. After all, the commission is, in my own view, an equal partner with the two councils on this. Doug Grout or someone else can comment on that.

MS. KERNS: I think the language is a little bit confusing if someone were to read this in a press release with nothing else, no discussion that we were going to a 6,000 trip limit. It may want to consider changing the language to say, only if NOAA Fisheries were to increase. Then a question to Peter, in order to consider this change from NOAA, would it be helpful if the commission sent a letter making that request and rationale for why we're making an increase request?

MR. BURNS: Yes, I think that certainly the commission can adopt what they want to adopt. We're in the middle of our rulemaking right now; trying to consider what the council has brought forward. If you sent a letter we would consider it; if we're still in our rulemaking process looking forward on this.

But the way that the motion is written it says that it would only go forward if we did it in federal waters, so it is unclear. Maybe if you want to go with a 6,000 pound limit I guess that would be the motion. But this is a contingency that it would only go in if we adopted it.

CHAIRMAN BORDEN: Discussion on that point. Bill Adler.

MR. WILLIAM A. ADLER: Yes I think it probably should be done, to the point where we say, we're going to 6,000 pounds and our partners, and I underline that; have our partners conform to us for a change.

DR. LOUIS B. DANIEL: The motion kind of changed a little bit. Is this just for the northern unit or is this now a coastwide 6,000 pound trip limit; just a point of clarification? If it is coastwide I have comments.

CHAIRMAN BORDEN: I think the intent is, and the motion maker can correct this, the intent is that it would be a recommendation that goes to NMFS for a coastwide 6,000 pound trip limit in federal waters, which currently you have a coastwide 5,000 pound trip limit in federal waters. Any of the state boats, particularly in the Mid-Atlantic area that want to fish in state waters simply drop their federal permit and then, for instance in the case of your state may fish for dogfish and land 20,000 pounds on a trip. Correct that Louis if I misinterpreted it.

DR. DANIEL: No that is my issue. We've got a 20,000 pound trip limit, and I don't want this to jeopardize that. That is an important component of our fishery.

CHAIRMAN BORDEN: This doesn't. It doesn't change it at all.

MR. McKIERNAN: To follow up on Toni's concerns, could this motion be reworked to be clearer before it is brought forward for a vote?

CHAIRMAN BORDEN: Toni is basically giving me the same advice you're giving me, Dan. Let's just take like a two minute break and we'll reword the motion and then bring it back. Don't leave the room. **All right we have a revised motion that we'll put up on the board.** I'll just read it and then I'll ask the maker and seconder to agree to this, or ask somebody to make it as a substitute, I guess.

Move to recommend to NOAA Fisheries to adopt a 6,000 pound trip limit. If the trip limit is approved in federal waters then set a 6,000 pound trip limit in the northern region; Maine through Connecticut. If the trip limit is not approved in federal waters then a 5,000 pound trip limit will remain in the northern region; Maine through Connecticut. Motion by Mr. Reid and seconded by Mr. White. Let me ask the maker and seconder of the motion. Do you agree to this perfection of a motion? Ritchie.

MR. RITCHIE WHITE: Yes.

CHAIRMAN BORDEN: Eric.

MR. REID: I agree with it. Hopefully Louis, you'll agree with it too.

CHAIRMAN BORDEN: Okay Louis, does this clarify what the intent is; getting back to the question you raised?

DR. DANIEL: Yes, and I support what Eric is trying to do 100 percent. This clarifies my concern about what the original motion said. The only question I would have would be that there is a 5,000 pound trip limit south of Connecticut in federal waters. I would defer to the other states.

But it would seem to me that we would want to go to the 6,000 pounds in federal waters coastwide. But accommodate Eric's request for a 6,000 pound trip limit in the northern states. That seems to me to be the most consistent way to do it, because otherwise south of Connecticut you've got a 5,000 pound trip limit and north you've got a 6,000 pound trip limit. That would be the only concern I would have.

CHAIRMAN BORDEN: I have Rob and then Mike; to that point please.

MR. ROB O'REILLY: My understanding is that the 6,000 pound trip limit would be in federal waters period, if National Marine Fisheries Service makes that change at some point.

CHAIRMAN BORDEN: I would add that is also my interpretation.

MR. LUISI: I was going to say the same thing. There is no line drawn through the federal waters that differentiates the north of Connecticut and south of Connecticut.

CHAIRMAN BORDEN: Okay discussion on the motion. Does anyone want to discuss the motion further? Peter Burns.

MR. BURNS: Just one more comment on this, Mr. Chairman. I just want to let you know that I appreciate you reworking the motion here. It looks like it would, if the trip limit is not approved in federal waters than the 5,000 pound trip limit would remain. Like I said, we've got two recommendations by the council that assumes that the trip limits would maintain a 5,000 pound. I'm going to abstain on this, because it is not consistent with what councils have recommended at this point.

CHAIRMAN BORDEN: Any further discussion. Let me ask whether or not there is any objection to approving this motion as revised. Any objection**? No objection the motion stands approved as submitted.**

ELECTION OF VICE-CHAIRMAN

CHAIRMAN BORDEN: Next item on the agenda is election of a Vice-Chairman.

MR. WHITE: **I would like to nominate the most distinguished commissioner from the Commonwealth of Virginia, Rob O'Reilly.**

CHAIRMAN BORDEN: Is there a second to that? Is it seconded; we've got to get a different state to second it? Seconded by Steve Heins, Pat Augustine, would you like to speak to this?

MR. PATRICK AUGUSTINE: Yes I would like to submit your name as Vice-Chair. No, I can't do that. Thank you very much, Ritchie White.

CHAIRMAN BORDEN: **Any objections to approving Rob O'Reilly as the Vice-Chair with acclamation and applause? You stand approved, welcome to the barrel.**

ADJOURNMENT

CHAIRMAN BORDEN: Okay any other business; if not the meeting stands adjourned?

(Whereupon the meeting was adjourned at 12:42 o'clock p.m. on February 3, 2016.)

2016 DRAFT REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR

SPINY DOGFISH
(*Squalus acanthias)*

2015/2016 FISHING YEAR

Spiny Dogfish Plan Review Team
Max Appelman, Atlantic States Marine Fisheries Commission, Chair
Dr. Gregory Skomal, Massachusetts Department of Marine Fisheries
Tina Moore, North Carolina Department of Environmental Quality
William Whitmore, Greater Atlantic Regional Fisheries Office
Peter Burns, Greater Atlantic Regional Fisheries Office

Prepared October 5, 2016

Executive Summary

The Mid-Atlantic (MAFMC) and New England Fishery Management Councils (NEFMC) have managed spiny dogfish within the U.S. EEZ since 1999. The Atlantic States Marine Fisheries Commission (ASMFC) implemented a complimentary Fishery Management Plan for state waters in 2002.

Spiny dogfish was declared rebuilt in 2008 when female SSB exceeded the target level for the first time since implementation of the Interstate FMP. Spiny dogfish are not overfished and overfishing is not occurring (NEFSC 2015a and 2015b). Female SSB was estimated to be 168,207 metric tons (370.8 million pounds) in 2015. In 2015, F on exploitable females was estimated to be 0.210 and has remained below the target level since 2005.

In 2015, total landings along the Atlantic coast were estimated at 8,726 metric tons (19.2 million pounds). U.S. commercial landings were estimated at 8,663 metric tons (19.1 million pounds). Atlantic coast landings from Canada were estimated at 1 metric ton (2,205 pounds). Landings from distant water fleets were estimated at 23 metric tons (50,706 pounds). U.S. recreational harvest was estimated at 39 metric tons (86,832 pounds).

The commercial quota for the 2015/2016 season was 50,610,988 pounds, and commercial landings for the 2015/2016 season were estimated at 22.0 million pounds. No regions or states exceeded their quota during the 2015/2016 season.

In 2015, all states have implemented management programs consistent with the Interstate FMP and Addendum I-V for Spiny Dogfish (with the exception of Connecticut; the state just recently came into compliance with Addendum V). Delaware requested *de minimis* status for the 2016/2017 fishing season.

Table of Contents

I. Status of the Fishery Management Plan

Date of FMP Approval:	November 2002
Amendments	None
Addenda	Addendum I (November 2005) Addendum II October 2008) Addendum III (April 2011) Addendum IV (August 2012) Addendum V (October 2014)
Management Unit:	Entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ
States with Declared Interest:	Maine – North Carolina (South Caroline, Georgia and Florida declared “no interest” in the FMP in 2014)
Active Boards/Committees:	Spiny Dogfish Management Board, Advisory Panel, Technical Committee, and Plan Review Team

In 1998, NMFS declared spiny dogfish overfished and initiated the development of a joint fishery management plan (FMP) between the Mid-Atlantic (MAFMC) and New England Fishery Management Councils (NEFMC) in 1999. NMFS approved the Federal Fishery Management Plan (FMP) in September 1999, but implementation did not begin until May 2000 at the start of the 2000/2001 fishing year.

In August 2000, the Atlantic States Marine Fisheries Commission (ASMFC) took emergency action to close state waters to the commercial harvest, landing, and possession of spiny dogfish when the Federal waters closed in response to the quota being fully harvested. With the emergency action in place, the Commission had time to develop an interstate FMP, which prevented the undermining of the Federal FMP and prevented further overharvest of the coastwide spiny dogfish population. Needing additional time to complete the interstate FMP, the ASMFC extended the emergency action twice through January 2003. During that time, the majority of spiny dogfish landings were from state waters because states had either no possession limits or less conservative possession limits than those of the Federal FMP.

The ASMFC approved the Interstate FMP for Spiny Dogfish in November 2002 (first implemented for the 2003-2004 fishing year). In general, the Interstate FMP (“FMP”) for spiny dogfish compliments the Federal FMP. The goal of the FMP is “to promote stock rebuilding and management of the spiny dogfish fishery in a manner that is biologically, economically, socially, and ecologically sound.” In support of this goal, the FMP established the following objectives:

1. Reduce fishing mortality and rebuild the spawning stock biomass to prevent recruitment failure and support a more sustainable fishery.
2. Coordinate management activities between state, Federal and Canadian waters to ensure complementary regulations throughout the species range.
3. Minimize the regulatory discards and bycatch of spiny dogfish within state waters.
4. Allocate the available resource in [a] biologically sustainable manner that is equitable to all the fishers.
5. Obtain biological and fishery related data from state waters to improve the spiny dogfish stock assessment that currently depends upon data from the Federal bottom trawl survey.

The original Interstate and Federal FMPs established an annual quota that was allocated via fixed percentages between two seasonal periods; 57.9% to Period I (May 1st to October 31st) and 42.1% to Period II (November 1st to April 30th). When the quota allocated to a period is exceeded, the amount over the allocation is deducted from the same period in the subsequent fishing year. The periods could have separate possession limits that are specified on an annual basis. The FMPs also allowed for a five percent rollover of the annual coastwide quota once the stock is rebuilt, and allows each state to harvest up to 1,000 spiny dogfish for biomedical supply or scientific research.

In November 2005, the Spiny Dogfish and Coastal Sharks Management Board (Board[1]) approved Addendum I to the Interstate FMP for Spiny Dogfish. Addendum I provides the Board with the flexibility to establish spiny dogfish specifications (quota and possession limits) for up to five years. The MAFMC and the NEFMC took similar action under Framework 1 (providing flexibility to adopt specifications for up to five years without the requirement of annual review and approval by NOAA Fisheries), which became effective February 2006.

In October 2008, the Board approved Addendum II which established regional quotas in place of the FMPs semi-annual period allocation. Under the addendum, the annual quota is allocated regionally with 58% to the states of Maine to Connecticut (Northern region), 26% allocated to the states of New York to Virginia (Southern region), and the remaining 16% allocated to North Carolina. The Board allocated a specific percentage to North Carolina because spiny dogfish are not available to their fishermen until late into the fishing season when most of the quota has already been harvested. Also included in the addendum to maintain the conservation goal of the plan is a quota payback provision whereby any overage of a regional or state quota would be deducted from the corresponding region/state in the subsequent fishing year. The seasonal allocation scheme as described in the 2002 FMP are still applied to federal waters.

In March 2011, the Board approved Addendum III (the addendum was implemented prior to the 2011/2012 fishing year). The addendum divided the combined Southern region and the North

[1] In May 2014, the Spiny Dogfish and Coastal Shark Management Board became two independent management boards

Carolina quotas from Addendum II (i.e., 42% of the annual coastwide quota) into state-specific shares (Table 2) for those states of New York – North Carolina. Also, the addendum permits those states to implement possession limits that best suits their needs, and allows for quota transfer (states in the Northern region continue to share 58% of the coastwide quota and thus do not have individual quotas necessary for transfers). Lastly, the addendum allows for rollovers of up to five percent of that state or regions final allocation. The Board has continued to implement the allocation percentages described in Addendum III, and may revisit those allocations at any time through the adaptive management process (e.g., an addendum). The seasonal allocation scheme as described in the 2002 FMP are still applied to federal waters.

In August 2012, the Board approved Addendum IV. This Addendum addressed the differences in the definitions of overfishing between the NEFMC, MAFMC and the ASMFC. The Board adopted the fishing mortality (F) threshold to be consistent with the Federal plan. Overfishing is defined as an F rate that exceeds the $F_{threshold}$. The $F_{threshold}$ is defined as F_{MSY} (or a reasonable proxy thereof) and based upon the best available science. The maximum fishing mortality threshold (F_{MSY}) or a reasonable proxy may be defined as a function of (but not limited to): total stock biomass, spawning stock biomass (SSB), total pup production, and may include males, females, both, or combinations and ratios thereof which provide the best measure of productive capacity for spiny dogfish. Currently F_{MSY} = 0.2439 which is that level of F that allows for the production of 1.5 female pups per female that will recruit to the spawning stock biomass.

In October 2014, the Board approved Addendum V. The addendum mandates that all spiny dogfish must be landed with fins-naturally-attached to the corresponding carcass (i.e., the removal of any fin of spiny dogfish at-sea in state waters is prohibited). The addendum modified the FMP to maintain consistency with the Shark Conservation Act of 2010, which prohibits the removal of all shark fins (except smooth dogfish) at-sea.

II. Status of the Stocks

Stock size estimates (e.g., female SSB) for spiny dogfish rely heavily on fishery-independent data collected during the NEFSC spring bottom trawl survey. Due to mechanical problems, the 2014 survey was unable to sample strata in the mid-Atlantic region. As a result, the 2015 assessment update for spiny dogfish was unable to produce reliable estimates of stock size for 2014, as well as stock size projections utilized for annual specifications. Accordingly, at the direction of the MAFMC and the Science and Statistical Committee, the NEFSC examined alternative methods to smooth out the effects of the missing 2014 survey data on projected estimates of SSB, F, and other stock status indicators (NEFSC 2015b). A Kalman filter approach was ultimately chosen as the best method to smooth out the effects of the missing data, and to project SSB forward.

Based on results of the most recent assessment, and in comparison to the biological reference points below, spiny dogfish are not overfished and overfishing is not occurring (NEFSC 2015a and 2015b). Spiny dogfish was declared rebuilt in 2008 when female SSB exceeded the target level for the first time since implementation of the Interstate FMP. Female SSB has remained above the target level and was estimated to be 168,207[2] metric tons (370.8 million pounds) in 2015 (Table 1 and Figure 1). In 2015, F on exploitable females was estimated to be 0.210 and has remained below the target level since 2005 (Table 1 and Figure 2).

	Female Spawning Stock Biomass (SSB)	Fishing Mortality (F)
Target	B_{msy} Proxy = SSB_{max} (the biomass that results in the maximum projected recruitment) = 159,288 metric tons	There is no F target defined for management use at this time
Threshold	½ of SSB_{max} = 79,644 metric tons	F_{msy} Proxy = 0.244

The next stock assessment for spiny dogfish is tentatively scheduled for 2018. In the interim, in order to inform fishery specifications, the NEFSC will conduct annual data updates to summarize the most recent information on the status of spiny dogfish.

III. Status of the Fishery

In the U.S., majority of spiny dogfish commercial fisheries operate in state waters targeting aggregations of large females. As a result, an estiamted 94% of the commercial landings (2014) are comprised of females which is consistent with the longterm pattern (NEFSC 2015a).

In 2015, total landings along the Atlantic coast were estimated at 8,726 metric tons (19.2 million pounds) which is slightly below average since 1981 (10,332 metric tons or 22.8 million pounds). In 2015, U.S. commercial landings were estimated at 8,663 metric tons (19.1 million pounds). Atlantic coast landings from Canada were significant from the early 1990s to the mid-late 2000s (hovering around 2,000 metric tons or 4.5 million pounds). In 2015, Canadian landings were estimated at 1 metric ton (2,205 pounds) which is the lowest reported value since 1988, but is more in line with the short term trend. In 2015, distant water fleets reported landings estimated at 23 metric tons (50,706 pounds). Recreational harvest is estimated via the Marine Recreational Information Program (MRIP). In 2015, recreational harvest (i.e., A + B1) of spiny dogfish on the Atlantic coast was estimated at 39 metric tons (86,832 pounds) which is a 26% increase compared to 2014. Landings estimates for the U.S. commercial and recreational sectors, Canada, and distant water fleets are detailed in Table 2.

In 2015, total dead discards from the U.S. commercial and recreational sectors were estimated at 3,322 metric tons (7.3 million pounds). Recreational releases (i.e., B2, fish caught by recreational anglers and released back to the water) are also estimated via the MRIP. In 2015, U.S. recreational releases of spiny dogfish were estimated at 1,224 metric tons (2.7 million pounds). Applying a 20% post-release mortality rate, 2015 recreational dead discards were estimated at 245 metric tons (539,757 pounds) marking a 74% decrease compared to 2014 (although more in line with the long term average). Commercial dead discards for U.S. landings

[2] 2015 female SSB estimated via a Kalman filter approach. Point estimates prior to 2015 using the Kalman filter were not available at the time of this report.

are estimated by multiplying total discards by the gear-specific mortality rates (NEFSC 2016). In 2015, U.S. commercial dead discards were estimated at 3,077 metric tons (6.8 million pounds). Dead discard estimates for the U.S. commercial and recreational sectors are detailed in Table 3.

IV. Status of Management Measures

Specifications

The spiny dogfish commercial fishery runs from May 1 – April 30. The coastwide quota for the 2015/2016 season was set at 50,610,988 million pounds with a maximum possession limit of 5,000 pounds for the northern region. Possession limits for states of New York – North Carolina vary by state and are detailed in Table 5.

Quotas

Per Addendum III, 58% of the annual quota is allocated to the northern region (states from Maine – Connecticut), and the remaining 42% is allocated to the states of New York – North Carolina via fixed percentages. Table 4 details 2015/2016 commercial quotas by region and state. Addendum III also specifies that when the quota allocated to a region or state is exceeded in a fishing season, the amount over the allocation will be deducted from the corresponding region or state in the subsequent fishing season. All regions and states harvested within their quota in 2014/2015 season, therefore no deductions were applied to 2015/2016 quotas. Five percent of the 2014/2015 final quota allocations rolled over for all regions and states for an adjusted 2015/2016 quota of 53,079,438 pounds (Table 4).

According to the Standard Atlantic Fishery Information System (SAFIS) and annual state compliance reports (see Section VI for more detail), commercial landings from the 2015/2016 fishing year were estimated at 9,990 metric tons (22.0 million pounds), which was less than half of the total available quota (Table 2). Massachusetts (36%), Virginia (19%), New Jersey (16%) and North Carolina (10%) accounted for the majority of commercial landings by weight (Table 4).

V. Status of Research and Monitoring

Under the Interstate FMP for Spiny Dogfish, the states are not required to conduct any fishery dependent or independent studies. The Interstate FMP requires an annual review of recruitment, spawning stock biomass, and fishing mortality which relies heavily on the NEFSC's spring trawl survey data. However, states are encouraged to submit any spiny dogfish information collected while surveying for other species. Table 5 details state implemented fishery-independent monitoring information relative to spiny dogfish compiled from annual state compliance reports. Please see individual reports for more information.

Exempted Fishing Permits (scientific/education permits)

States may issue exempted fishing permits for the purpose of biomedical supply, educational, or other scientific purposes. In 2015, North Carolina (55) and New Jersey (11) issued exempted fishing permits. Four reported catch of spiny dogfish totaling 125 fish (all but 11 were released alive).

VI. Annual State Compliance

The following lists the specific compliance criteria that a state or jurisdiction must implement in order to be in compliance with the Interstate FMP for Spiny Dogfish (*Section 5.1*):

1. States are required to close state waters to the commercial landing, harvest and possession of spiny dogfish for the duration of the seasonal period when the commercial quota is projected to be harvested in their state or region.
2. States are required to report landings weekly to NOAA Fisheries
3. Dealer permits issued pursuant to state regulations must submit weekly reports showing at least the quantity of spiny dogfish purchased (in pounds), the name, and permit number of the individuals from whom the spiny dogfish were purchased.
4. States in the northern region are required to implement possession limits as determined through the annual specification process.
5. States may issue exempted fishing permits for the purpose of biomedical supply not to exceed 1,000 spiny dogfish per year.
6. State regulations must prohibit "finning" as described in Addendum V.

Additionally, each state must submit a compliance report detailing its spiny dogfish fisheries and management program for the previous fishing year. Compliance reports are due annually on July 1st (Table 6) and must include at a minimum:

1. the previous fishing year's fishery and management program including activity and results of monitoring, regulations that were in effect and harvest, including estimates of non-harvest losses;
2. the planned management program for the current fishing year summarizing regulations that will be in effect and monitoring programs that will be performed, highlighting any changes from the previous year; and
3. the number of spiny dogfish exempted fishing permits issued in the previous fishing year, the actual amount (in numbers of fish and pounds) collected under each exempted fishing permit, as well as any other pertinent information (i.e. sex, when and how the spiny dogfish were collected). The report should also indicate the number of exempted fishing permits issued for the current fishing year.

Under the Spiny Dogfish FMP, a state may request *de minimis* status if its commercial landings of spiny dogfish are less than 1% of the coastwide commercial total. If granted, the state is exempt from the monitoring requirements of the commercial spiny dogfish fishery for the following fishing year. However, all states, including those granted *de minimis* status, must continue to report any spiny dogfish commercial or recreational landings within their jurisdiction via annual state compliance reports[3].

[3] In 2014, Georgia, South Carolina and Florida declared "no interest" in the FMP and were removed from the Spiny Dogfish Management Board. These states are no longer required to submit annual compliance reports.

Maine, Connecticut, New York, and Delaware qualify for *de minimis* status, however only Delaware is requesting *de minimis* status for the 2016/2017 fishing season (Table 6).

VII. Plan Review Team Recommendations

Based on annual state compliance reports, all states have regulations in place that meet or exceed the requirements of the Interstate FMP for Spiny Dogfish and Addenda I-V. However, Connecticut did not meet the May 1, 2015, compliance schedule of Addendum V and only recently came into compliance with the addendum via an agreement with fishermen which states that if spiny dogfish are found to be landed with fins detached, then the fishery will be closed state-wide. Also, the PRT recommends granting Delaware with *de minimis* status for the 2016/2017 fishing year.

VIII. Research Recommendations

The following research priorities pertaining to spiny dogfish were identified in Special Report No. 89 (2013):

Fishery-Dependent Priorities
High
- Determine area, season, and gear specific discard mortality estimates coastwide in the recreational, commercial, and non-directed (bycatch) fisheries.
- Characterize and quantify bycatch of spiny dogfish in other fisheries.
- Increase the biological sampling of dogfish in the commercial fishery and on research trawl surveys.
- Further analyses of the commercial fishery is also warranted, especially with respect to the effects of gear types, mesh sizes, and market acceptability on the mean size of landed spiny dogfish.

Fishery-Independent Priorities
- Conduct experimental work on NEFSC trawl survey gear performance, with focus on video work to study the fish herding properties of the gear for species like dogfish and other demersal groundfish.
- Investigate the distribution of spiny dogfish beyond the depth range of current NEFSC trawl surveys, possibly using experimental research or supplemental surveys.
- Continue to analyze the effects of environmental conditions on survey catch rates.

Modeling / Quantitative Priorities
- Continue work on the change-in-ratio estimators for mortality rates and suggest several options for analyses.
- Examine observer data to calculate a weighted average discard mortality rate based on an assumption that the rate increased with catch size.

Life History, Biological, and Habitat Priorities

- Conduct a coastwide tagging study to explore stock structure, migration, and mixing rates.
- Standardize age determination along the entire East Coast. Conduct an ageing workshop for spiny dogfish, encouraging participation by NEFSC, NCDMF, Canada DFO, other interested agencies, academia, and other international investigators with an interest in dogfish ageing.
- Identify how spiny dogfish abundance and movement affect other organisms.

Management, Law Enforcement, and Socioeconomic Priorities

- Monitor the changes to the foreign export markets for spiny dogfish, and evaluate the potential to recover lost markets or expand existing ones.
- Update on a regular basis the characterization of fishing communities involved in the spiny dogfish fishery, including the processing and harvesting sectors, based upon Hall-Arber et al. (2001) and McCay and Cieri (2000).
- Characterize the value and demand for spiny dogfish in the biomedical industry on a state by state basis.
- Characterize the spiny dogfish processing sector

IX. References

Northeast Fisheries Science Center (NEFSC). 2015a. Update on the Status of Spiny Dogfish in 2015 and Projected Harvests at the Fmsy Proxy and Pstar of 40%. Report to the Mid Atlantic Fishery Management Council (MAFMC) Scientific and Statistical Committee (SSC) August 26, 2015. 65 pages.

NEFSC. 2015b. Evaluation of Alternative Smoothing Options for Spiny Dogfish Abundance Estimates. Report to MAFMC SSC November 22, 2015. 28 pages.

NEFSC. 2016. Update of Landings, Discards and Survey Indices for Spiny Dogfish in 2016. Report to the MAFMC SSC August 29, 2016. 31 pages.

Special Report No. 89 of the Atlantic States Marine Fisheries Commission. 2013. Research priorities and recommendations to support interjurisdictional fisheries management.

X. Tables

Table 1: Spiny dogfish female spawning stock biomass (SSB) in millions of pounds and fishing mortality (F) point estimates, 1991-2015. A Kalman Filter was applied to the 2015 point-estimate. Point-estimates from 1991-2014 via the Kalman filter were not available at the time of this report. Although the absolute values will change after the Kalman filter is applied, the time series trend is similar. Source: NEFSC 2015a and 2015b.

Year	Female SSB	F
1991	516	0.082
1992	594	0.177
1993	485	0.327
1994	410	0.465
1995	294	0.418
1996	266	0.355
1997	252	0.234
1998	202	0.306
1999	114	0.289
2000	116	0.152
2001	136	0.109
2002	143	0.165
2003	129	0.168
2004	118	0.474
2005	105	0.128
2006	234	0.088
2007	312	0.090
2008	429	0.110
2009	360	0.113
2010	362	0.093
2011	373	0.114
2012	476	0.149
2013	466	NA
2014	NA	0.214
2015	371	0.210

Table 2: Landings estimates (pounds) of spiny dogfish off the Atlantic coast by commercial fisheries of the United States, Canada, and foreign fleets, and U.S. recreational harvest, 1981-2015. All values in pounds. Source: NEFSC 2015a and MRIP.

Year	Canada	Distant Water Fleets	U.S. Commercial	U.S. Recreational	Total Landings
1981	1,243,406	2,147,300	15,134,716	3,290,809	21,816,231
1982	857,597	802,482	11,928,240	155,228	13,743,546
1983		1,022,944	10,794,944	147,828	11,965,715
1984	4,409	862,006	9,811,419	201,247	10,879,082
1985	28,660	2,231,075	8,880,246	196,525	11,336,507
1986	44,092	811,300	6,057,436	403,806	7,316,634
1987	619,498	306,442	5,959,859	674,738	7,560,538
1988	2,205	1,426,389	6,845,658	793,826	9,068,078
1989	368,172	564,383	9,903,197	923,156	11,758,908
1990	2,885,848	866,416	32,475,331	393,464	36,621,058
1991	676,818	515,881	29,049,484	288,410	30,530,593
1992	1,913,610	147,710	37,165,286	535,770	39,762,376
1993	3,163,630	59,525	45,509,707	263,846	48,996,708
1994	4,012,408	4,409	41,441,357	341,311	45,799,486
1995	2,107,617	30,865	49,775,493	148,935	52,062,910
1996	950,191	520,290	59,823,640	56,990	61,351,111
1997	983,261	471,789	40,457,417	146,560	42,059,027
1998	2,325,874	1,338,204	45,476,080	133,761	49,273,919
1999	4,609,860	1,221,359	32,748,858	119,595	38,699,673
2000	6,042,863	886,257	20,407,500	11,262	27,347,883
2001	8,421,648	1,492,528	5,056,497	61,877	15,032,551
2002	7,901,358	1,044,990	4,847,674	451,666	14,245,687
2003	2,870,415	1,417,571	2,579,437	87,466	6,954,888
2004	5,207,312	727,525	2,164,011	264,970	8,363,819
2005	5,004,487	727,525	2,528,114	77,823	8,337,949
2006	5,377,068	22,046	4,957,360	175,290	10,531,764
2007	5,255,814	68,343	7,723,004	190,018	13,237,179
2008	3,466,368	288,805	9,057,020	251,427	13,063,620
2009	249,122	180,779	11,854,242	94,133	12,378,275
2010	13,228	279,987	11,993,133	35,418	12,321,766
2011	273,373	315,261	20,899,798	70,556	21,558,987
2012	143,300	302,033	23,501,249	41,413	23,987,996
2013	NA	134,482	16,120,181	80,859	16,335,523
2014	119,049	68,343	23,481,408	68,996	23,737,797
2015	2,205	50,706	19,098,623	86,832	19,238,366

Table 3: Total dead discards estimates (pounds) from the U.S. Atlantic coast spiny dogfish fishery by sector, 1981-2015. Commercial dead discards estimated via applying gear-specific mortality rates to discard estimates. Source: MRIP and NEFSC 2016.

Year	Commercial	Recreational (20% B2)	Total Dead Discards
1981	43,625,021	130,521	43,755,541
1982	50,245,935	153,982	50,399,918
1983	49,177,576	238,002	49,415,579
1984	46,931,730	186,871	47,118,601
1985	39,768,479	425,091	40,193,570
1986	38,222,379	523,373	38,745,752
1987	35,239,087	465,470	35,704,557
1988	35,307,210	386,152	35,693,362
1989	34,724,970	594,784	35,319,753
1990	41,754,621	515,830	42,270,451
1991	28,668,217	594,951	29,263,168
1992	41,401,992	449,048	41,851,040
1993	25,898,443	489,373	26,387,816
1994	18,435,804	426,776	18,862,580
1995	23,812,762	288,134	24,100,896
1996	13,136,779	145,103	13,281,882
1997	9,255,656	371,849	9,627,505
1998	7,305,008	268,875	7,573,883
1999	9,865,123	236,901	10,102,025
2000	6,128,182	304,436	6,432,619
2001	10,236,492	928,526	11,165,018
2002	10,392,799	737,755	11,130,554
2003	7,998,031	1,321,838	9,319,869
2004	12,011,321	1,450,007	13,461,328
2005	10,775,411	1,476,032	12,251,443
2006	10,847,557	1,565,462	12,413,019
2007	12,456,478	1,715,901	14,172,379
2008	9,843,805	1,188,294	11,032,099
2009	11,735,909	1,137,116	12,873,025
2010	8,146,291	871,034	9,017,325
2011	9,533,163	1,019,230	10,552,393
2012	10,081,275	605,902	10,687,177
2013	9,875,386	1,169,360	11,044,746
2014	10,657,861	2,090,825	12,748,685
2015	6,783,726	539,757	7,323,483

Table 4: Commercial quotas and landings estimates in pounds for May 1, 2015 - April 30, 2016 by region and state. Adjusted quota reflects a 5% rollover from 2014/2015 season. Due to confidentiality, NY – NC landings estimates have been redacted. Source: SAFIS, and annual state compliance reports.

State	Fixed Percent Allocation	Preliminary 2015/2016	Adjusted 2015/2016 quota	2015/2016* Landings	Proportion of Total Landings
Northern Region	58.00%	29,354,960	30,786,690	10,476,140	48%
NY	2.71%	1,370,067	1,436,889	[redacted]	[redacted]
NJ	7.64%	3,868,781	4,057,473	[redacted]	[redacted]
DE	0.90%	453,484	475,601	[redacted]	[redacted]
MD	5.92%	2,996,230	3,142,366	[redacted]	[redacted]
VA	10.80%	5,463,565	5,730,040	[redacted]	[redacted]
NC	14.04%	7,103,900	7,450,379	[redacted]	[redacted]
Total		**50,610,988**	**53,079,438**	**22,023,902**	

* Landings estimates from annual state compliance reports are cross-referenced with the SAFIS database, and the larger of the two estimates for each state and region is reported here.

Table 5: State implemented fishery-independent monitoring programs that encounter spiny dogfish. Source: annual state compliance reports. Note: this list is not comprehensive.

Fishery-Independent Monitoring Programs That Encounter Spiny Dogfish	Number of Spiny Dogfish Encountered	Comments
ME-NH Inshore Trawl survey	1 (spring), 14 (fall)	7 females, 8 males
RI DFW, Monthly and seasonal trawl survey	4	November
CT Long Island Sound Trawl Survey	19	Spring (April-June)
NJ Ocean Stock Assessment (trawl) Survey	5122 lbs	< 5% of that in 2013 and 2014
DE Bay Bottom Trawl (30- and 16-foot)	318 (30-ft)	0 (16-ft)
NC DMF Gill Net Survey	11	Post-2015, Inshore waters only
SC DNR nearshore bottom longline survey	NA	NA

Table 6: State-by-state compliance with the Interstate Fishery Management Plan for Spiny Dogfish, 2015/2016 reporting period. Source: annual state compliance reports, 2016. 'C' is compliant; 'NC' is noncompliant. South Carolina, Georgia and Florida were removed from the Spiny Dogfish Board in 2014

State	Report Submitted (Due July 1)	De Minimis Request	Biomedical^ Permit Harvest	Finning Prohibition	Possession limit (per trip)
Maine	C	No	No	C	4,000 lbs
New Hampshire	C	No	No	C	5,000 lbs
Massachusetts	C	No	No	C	5,000 lbs
Rhode Island	C	No	No	C	5,000 lbs
Connecticut	C	No	No	NC	5,000 lbs
New York	C	No	No	C	5,000 lbs
New Jersey	C	No	Yes	C	5,000 lbs
Delaware	C	Yes	No	C	10,000 lbs
Maryland	C	No	No	C	up to 10,000 lbs*
Virginia	C	No	No	C	5,000 lbs
North Carolina	C	No	Yes	C	20,000 lbs

^ includes harvest under exempted fishing permit for other scientific and educational purposes
* possession limits range from 1,000 – 10,000 pounds depending on permit category

XI. Figures

Figure 1: Spiny dogfish spawning stock biomass, 1990 – 2015. Point-estimate for 2015 was derived via application of a Kalman filter. Estimates from 1991-2014 via the Kalman filter were not available at the time of this report. Although the absolute values will change after the Kalman filter is applied, the time series trend is similar. NEFSC 2015a and 2015b.

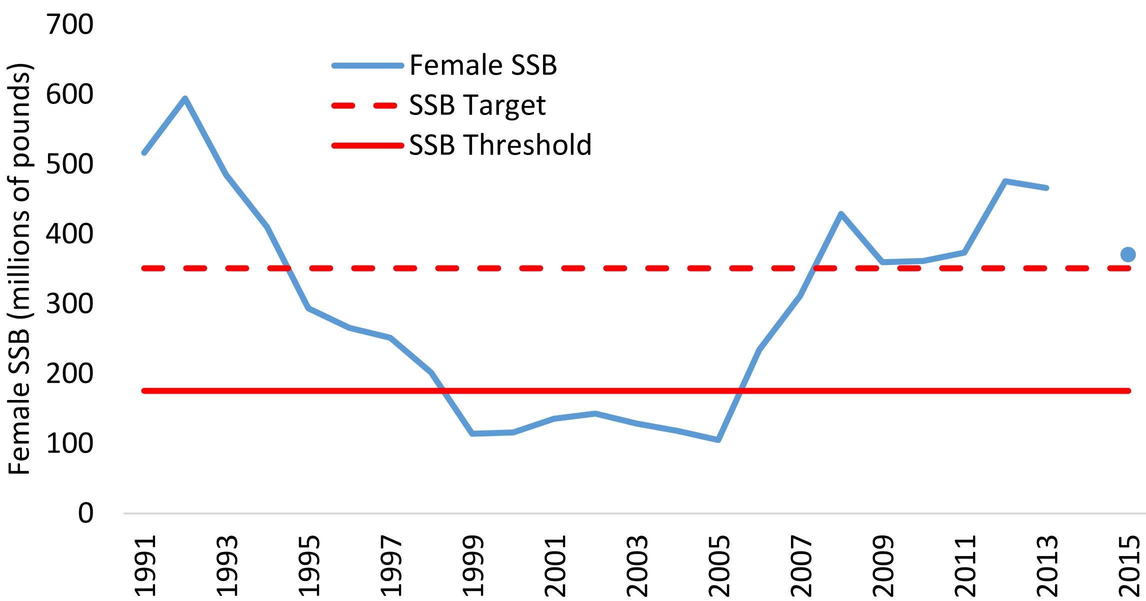
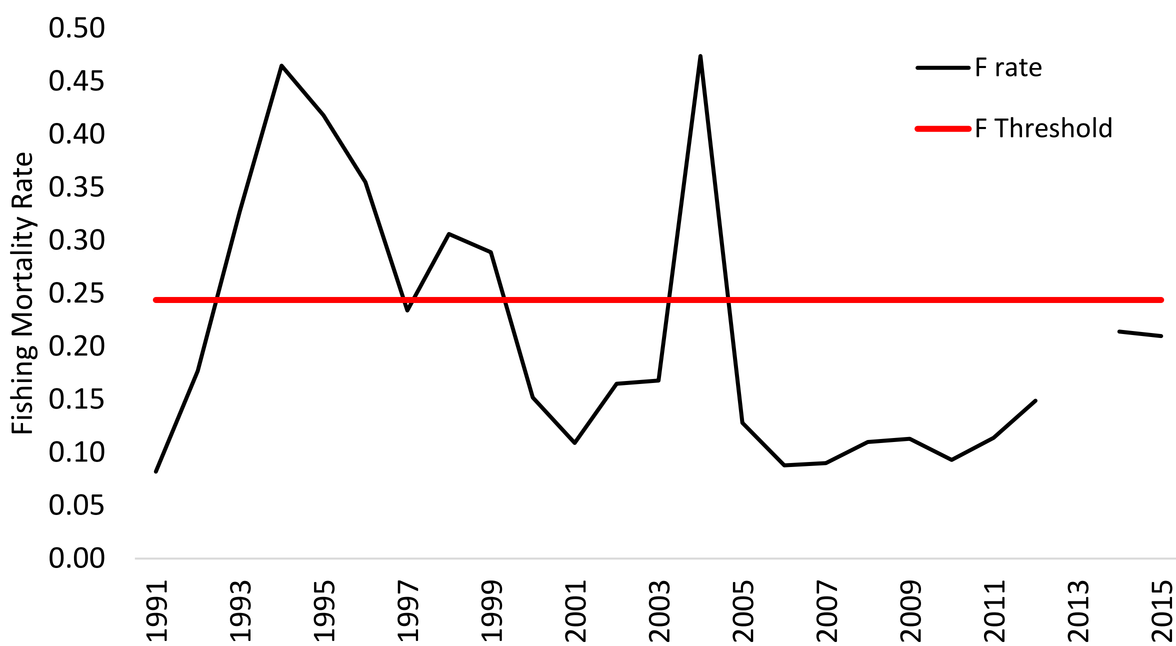


Figure 2: Fishing mortality rates in the spiny dogfish fishery, 1990 – 2014. 2013 point-estimate not available at time of this report. Source: NEFSC 2015a and 2015b.



Atlantic States Marine Fisheries Commission

Coastal Sharks Management Board

October 24, 2016
1:45 – 2:45 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order (*A. Nowalsky*)	1:45 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	1:45 p.m.
3.	Public Comment	1:50 p.m.
4.	Updates from NOAA Fisheries Highly Migratory Species (HMS) Division (*K. Brewster-Geisz*) • Review Proposed Rule for HMS Amendment 5b (Dusky Sharks) and 2016 Stock Assessment Results • Review Draft Environmental Assessment for Amendment 10 to the 2006 Consolidated HMS Fishery Management Plan: Essential Fish Habitat • Review Proposed Rule for Blacknose Possession Limits for Federally-Permitted Vessels • Review Proposed Rule for the 2017 Atlantic Shark Commercial Fishing Season	2:00 p.m.
5.	Set 2017 Coastal Sharks Fishery Specifications (*A. Harp*) **Final Action**	2:30 p.m.
6.	Other Business/Adjourn	2:45 p.m.

The meeting will be held at the Harborside Hotel; 55 West Street; Bar Harbor, ME; 207.288.5033

MEETING OVERVIEW

Coastal Sharks Management Board Meeting
October 24, 2016
1:45 – 2:45 p.m.
Bar Harbor, Maine

Chair: Adam Nowalsky (NJ) Assumed Chairmanship: 10/14	Vice Chair: Roy Miller	Law Enforcement Committee Representative: Chrisolm Frampton
Coastal Shark Technical Committee Chair: Carolyn Belcher (GA)	Coastal Shark Advisory Panel Chair: Lewis Gillingham (VA)	Previous Board Meeting: August 2, 2016
Voting Members: ME, MA, RI, CT, NY, NJ, DE, MD, VA, NC, SC, GA, FL, NMFS, USFWS (15 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Updates from NOAA Fisheries Highly Migratory Species (HMS) Division (2:00 – 2:30 p.m.)

Background
• Review Proposed Rule for HMS Amendment 5b (Dusky Sharks) and 2016 Stock Assessment Results
    • Dusky sharks have been a prohibited species since 2000, and may not be landed or retained in any fisheries. However, commercial and recreational fisheries sometimes interact with the species as bycatch during the course of normal operations.
    • Based on the results of the 2016 stocks assessment update (SEDAR 21), NMFS has determined that the status of the Atlantic dusky sharks continues to be "overfished" and "subject to overfishing".
• Review Draft Environmental Assessment for Amendment 10 to the 2006 Consolidated HMS Fishery Management Plan: Essential Fish Habitat. The Draft EA would address

revisions and updates to Atlantic HMS Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPCs). Amendment 10, considers several alternatives including:
    - Updating EFH designations and descriptions for several HMS;
    - Modifying the boundaries of the current HAPCs in order to reflect new information available for these species (i.e., bluefin tuna and sandbar shark); and
    - Potentially creating new HAPCs for lemon shark and sand tiger shark.
    - Draft Amendment 10 does not contain implementing regulations.
- Review Proposed Rule for Blacknose Possession Limits for Federally-Permitted Vessels
    - HMS is proposing a measure that would establish a commercial retention limit (CRL) of eight blacknose sharks for all Atlantic shark limited access permit holders in the Atlantic region south of 34°00′ N. latitude. Public comment period is closed.
- Review Proposed Rule for the 2017 Atlantic Shark Commercial Fishing Season
    - Proposed some adjustments to base quotas due to over and under harvests
    - Proposed to open all shark management groups approx. on January 1
    - Possession limit for large coastal (LCS) and hammerhead shark management groups to start at 36 sharks and will increase/decrease based on the available quota. For example, if approximately 20 percent of quota is caught at the beginning of the year, NMFS anticipates inseason reduction to 3 or fewer LCS or hammerhead sharks/vessel/trip. NMFS would consider an inseason increase (i.e., to 45 LCS or hammerhead sharks/vessel/trip) after considering the criteria for inseason adjustments around July 15, 2017.
- **Proposed Rule for Blacknose CRL, Dusky Stock Assessment Update, Amendment 10 Federal Register Notice, Proposed 2017 Specifications in Briefing Materials**

Presentations

- HMS Presentations by K. Brewster-Geisz

5. Set 2017 Coastal Sharks Fishery Specifications (2:30 – 2:45 p.m.)

Background

- Similar to the 2016 fishing season, NMFS is proposing a January 1 open date for all shark management group. Also proposing a 36 shark possession limit for large coastal and hammerhead management groups with the possibility of inseason adjustments.

Board Actions for Consideration at this Meeting

- Set the 2017 coastal shark specifications including commercial opening dates and commercial possession limits by management group.

6. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

COASTAL SHARKS MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
August 2, 2016

These minutes are draft and subject to approval by the Coastal Sharks Management Board.
The Board will review the minutes during its next meeting.

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INDEX OF MOTIONS

1. **Approval of agenda by consent** (Page 1).

2. **Approval of proceedings of May 2016 by consent** (Page 1).

3. **Move to approve Addendum IV with the following option: Issue 1, Option B, which would establish a catch composition requirement for the commercial processing of smooth dogfish at sea** (Page 5). Motion by Brandon Muffley; second by Emerson Hasbrouck. Motion carried (Page 7).

4. **Move to approve Addendum IV, with an implementation date of January 1, 2017, with the options selected here today** (Page 7). Motion by Brandon Muffley; second by Wilson Laney. Motion carried (Page 9). (Roll Call Vote: In favor – ME, MA, NY, NJ, DE, SC, GA, FL, USFWS, NMFS; Opposed – RI, CT, MD, VA, NC).

5. **Move to approve the FMP Review and compliance reports submitted** (Page 9). Motion by Bill Adler; second by Steve Heins. Motion carried (Page 9).

6. **Move to approve Katie Westfall as a member of the Coastal Sharks Advisory Panel** (Page 10). Motion by Robert Boyles; second by Stewart Michels. Motion carried (Page 10).

7. **Move to nominate Roy Miller as vice chair of Coastal Sharks Management Board** (Page 10). Motion by Stewart Michels; second by Mike Luisi. Motion carried (Page 10).

8. **Motion to adjourn** by consent (Page 10).

ATTENDANCE

Board Members

Rep. Jeffrey Pierce, ME, proxy for Sen. Langley (LA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
Bill Adler, MA (GA)
Jason McNamee, RI, proxy for J. Coit (AA)
Dave Simpson, CT (AA)
Rep. Craig Miner, CT (LA)
Rep. Melissa Ziobron, CT, Legislative proxy
Steve Heins, NY, proxy for J. Gilmore (AA)
Emerson Hasbrouck, NY (GA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Stewart Michels, DE, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
David Blazer, MD (AA)
Rachel Dean, MD (GA)
John Bull, VA (AA)
Rob O'Reilly, VA, Administrative proxy
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Cathy Davenport, VA (GA)
Michelle Duval, NC, proxy for B. Davis (AA)
Jerry Schill, NC, proxy for Rep. Steinburg (LA)
Robert Boyles, Jr., SC (AA)
Malcolm Rhodes, SC (GA)
Pat Geer, GA, proxy for Rep. Nimmer (LA)
Spud Woodward, GA (AA)
James Estes, FL, proxy for J. McCawley (AA)
Wilson Laney, USFWS
Karyl Brewster-Geisz, NMFS

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Lewis Gillingham, Advisory Panel Chair

Staff

Robert Beal
Toni Kerns
Shanna Madsen
Ashton Harp
Amy Hirrlinger
Mark Robson

Guests

Loren Lustig, PA
Tom Moore, PA
Jacob Kasper, U Conn
John Clark, DE DFW
Mike Luisi, MD DNR
Bob Ballou, RI DEM
Peter Aarrestad, CT DEEP
Justin Davis, CT DEEP
Colleen Giannini, CT DEEP
Joseph Gordon, PEW
Arnold Leo, E. Hampton, NY
Shaun Gehan, DC

The Coastal Sharks Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2016 and was called to order at 4:33 o'clock p.m. by Chairman Adam Nowalsky.

CALL TO ORDER

CHAIRMAN ADAM NOWALSKY: I would like to welcome everyone to the Coastal Sharks Management Board. I am Adam Nowalsky; and I'm joined by staff Ashton Harp.

APPROVAL OF AGENDA

CHAIRMAN NOWALSKY: We'll begin with board approval of the agenda. There is one item that I know of that we'll add under other business, regarding an announcement from HMS on black-nosed sharks.

Are there any other additions or changes to the agenda? Is there any objection to the acceptance of the agenda with that addition? Seeing none; the agenda is approved, as modified.

APPROVAL OF PROCEEDINGS

CHAIRMAN NOWALSKY: Next item of business is the approval of proceedings from the last board meeting; any comment or discussion on this, any objection to the acceptance of those? Seeing none; those proceedings are hereby accepted.

PUBLIC COMMENT

CHAIRMAN NOWALSKY: Next order of business is public comment for any items that are not on the agenda. Is there any member of the public that would like to comment on an item not on the agenda? Seeing none, we'll continue along.

DRAFT ADDENDUM IV

CHAIRMAN NOWALSKY: Our next order of business today will be decision on Draft Addendum IV, and I'll turn to Ashton to begin that presentation.

MS. ASHTON HARP: I'm going to review the public comment summary for Draft Addendum IV to the Coastal Sharks Interstate Fisheries Management Plan. I am going to start with the timeline. This addendum was initiated at the February, 2016 meeting. The Draft Addendum was developed and approved at the May meeting, and then public comment and public hearings took place from June to July.

I'm going to present the public comment summary today, and then the board can choose to move forward with Addendum IV or not.

OVERVIEW OF AMENDMENT 9 TO THE HIGHLY MIGRATORY SPECIES FMP

MS. HARP: I am providing here an overview of Amendment 9 to the Highly Migratory Species FMP. I am presenting this because there was some confusion during the public hearings on why the board chose certain measures and what the board was moving forward with.

Basically, what the board was picking from the HMS Amendment 9 to move forward with. I'm going to start at the bottom. In yellow are measures that were included in Amendment 9 that the board is not going to consider, and those include a federal commercial smoothhound shark permit, a recreational permit requirement, a modified VMS requirement and observer requirements. I should also note that Amendment 9 is specific to smooth dogfish as is Draft Addendum IV. All these measures are specific to smooth dogfish. In green, what the board has already considered. The board has considered a federal commercial shark dealer permit. This was in Amendment 9. The board has already passed that. That was in the Coastal Sharks Fisheries Management Plan, so there is no need to consider that again. The board has already considered smoothhound shark quotas. These were put in place via Addendum II, so the board doesn't need to consider those again.

There was also sink and drift gillnet requirements in Amendment 9 that the board had previously considered. They were in the original FMP, and then they were taken out via Addendum I. The board is not considering those again. What the board is considering is the blue box at the top is a 25 percent catch composition requirement to remove the fins of smooth dogfish at sea.

That is the basis of Draft Addendum IV that I'm presenting today. A quick overview of the Shark Conservation Act of 2010; within it, there is a limited exception on the fins naturally attached policy. It allows an individual engaged in commercial fishing to remove the fins of smooth dogfish while at sea, provided certain requirements are met. One would have to possess a state commercial fishing license that allows for them to fish for smooth dogfish.

The vessel has to be located between a shore in 50 nautical miles of an Atlantic state, and their fin-to-carcass ratio cannot exceed 12 percent. Now the Shark Conservation Act interpretation, with the final ruling for Amendment 9, HMS basically interpreted the Shark Conservation Act and specifically, the phrase within the Shark Conservation Act; commercial fishing for smooth dogfish to mean, a trip where smooth dogfish comprise at least 25 percent by weight of the total retained catch onboard at the time of landing.

One would need to have at least 25 percent of smooth dogfish onboard in order to remove the fins at sea. One could say that basically this addendum is kind of the commission's interpretation of the Shark Conservation Act. The management options that were taken to public comment include -– it's very cut and dried -- it is Option A; status quo.

A commercial fisherman that is fishing for smooth dogfish right now can completely process smooth dogfish at sea; meaning the fish may be headed, gutted, and all fins removed year round; there are no restrictions. Option B would be a commercial fisherman may remove smooth dogfish shark fins while at sea, provided smooth dogfish make up at least 25 percent by weight of total catch onboard at the time of landing.

PUBLIC COMMENT SUMMARY

MS. ASHTON HARP: With that, I'll go through the public comment summary. Those are the options that were presented to the public. For public hearings, there were five scheduled public hearings. Three of them had attendance, so two of them in Connecticut and New Jersey were held, but no attendance were there.

The one in New York had a NOAA Fisheries attendee, and then in Maryland and North Carolina, there were commercial harvesters that presented public comment. For the written comment, the majority of the written comments were actually from the public. As you can see, there were three harvester comments from North Carolina, and there were four organizations that provided public comment as well; so it was a total of 15 written comments, which I will review now.

The written comment summary. As I said, there were about 15 public and commercial harvesters that presented comments. For Option A, status quo, the three commercial harvesters from North Carolina were in favor of Option A, the status quo. There was nobody who submitted a written comment who was in favor of Option B, which is the 25 percent catch composition requirement. The majority of people were in favor of an option actually not presented in Draft Addendum IV. They would like to require all smooth dogfish to be landed with fins naturally attached, regardless of a catch composition requirement.

In just kind of digging into what do they specifically say; those people that were in favor of Option A or the non-option. For three comments in favor of status quo, they said they wanted to provide the best quality product; which entails processing the shark immediately. They said that processing smooth dogfish is a very time intensive endeavor, and one could not afford to discard in the event that the catch composition requirement is not met.

They also said the alternative in their view does not provide a conservation benefit. The 12 comments that were in favor of a fins naturally attached policy for smooth dogfish said that as long as there is a market for shark fins, then finning is a possibility; therefore, a fins naturally attached policy is the simplest, most enforceable method for preventing shark finning.

Moving on to the public hearing summary. As I mentioned, there were eight commercial harvesters from New Jersey and North Carolina that provided comment, all were in favor of status quo. Some of the comments that they provided were discarding processed fish will negatively affect the fishermen and the resource.

That smooth dogfish is sold primarily as a meat product; therefore, keeping the fins naturally attached will affect the quality. They were concerned that the at-sea weight estimates that they were doing may result in not meeting the catch composition requirement, and they might have subsequent penalties because of these estimates.

When they are at sea doing estimates, they are not sure if actually, indeed, they would meet it so, when they go to shore and are actually weighed, they could be off a little bit. They also said that it could impose safety concerns if fishermen have to continue to set nets to reach the catch composition requirement. Some viewed the alternative as not providing the conservation benefit for the resource. It was a really quick presentation. With that, I will take questions on the public comment summary provided.

CHAIRMAN NOWALSKY: Before we go to that, with her indulgence, I just wanted to turn to Karyl from HMS for a little bit more description. If we can go back to the slide about the interpretation of that 25 percent, and SCA defining a smooth nose shark commercial fishery; and perhaps you could add some context to that with regard to that interpretation.

MS. KARYL BREWSTER-GEISZ: When we took a look at the Shark Conservation Act, we took a very literal meaning. We looked through all the words, all the phrases, and we came across this phrase; commercial fishing for smooth dogfish. We interpreted that not to mean going commercial fishing and happening to catch one smooth dogfish or two smooth dogfish. You were commercial fishing for smooth dogfish.

We had looked at a variety of range-of-catch composition for this, ranging from 0 to 100 percent. At our draft stage we actually proposed 75 percent. We received a number of comments indicating that 75 percent was too much and would actually increase discards; because people wouldn't know until the end of the trip whether or not they had met the 75, so they would start removing the fins and then have to discard the smooth dogfish or decide to discard other fish. Looking at the data and looking at the economic impact, we actually decided to go with 25 percent. Twenty-five percent was actually supported by the state of New Jersey, in their comments to us. There were some states such as Maryland and Georgia who wanted to follow the ASMFC regulations.

North Carolina did not support 75 percent, but did not specifically come out in support of 25 percent either. Then there are other states such as Virginia, Florida and Delaware who provided comments to us that they didn't have any preference on the catch composition at that time. That's a little bit of the context. We were looking specifically at that phrase of commercial fishing for smooth dogfish; meaning that you were fishing for smooth dogfish.

CHAIRMAN NOWALSKY: With that backdrop, I'll turn to the board for questions of Ashton on the presentation, or anything regarding this element of this being a definition for commercial fishing with this 25 percent requirement.

MR. WILLIAM ADLER: It sounds like what we're trying to do here, according to the statement of the problem, is consistency with the federals and state FMPs. Now apparently, the status quo that we have in our plan, basically, just says you can fin them, and the Option B, the 25 percent thing, is that what the Feds have; and are we trying to get on the same page with the Feds at 25? Is that what we're trying to do here?

MS. HARP: We're presenting the option that would allow the ASMFC to yes, have a complementary management as the federal government, yes.

MR. ADLER: If I may, Mr. Chairman, and which is that, the status quo or the Option B?

CHAIRMAN NOWALSKY: Option B, the 25 percent.

MR. ADLER: Okay Option B puts us in the same ballpark with the federal rules; that's our problem.

CHAIRMAN NOWALSKY: That is correct. Next, I had Emerson Hasbrouck.

MR. EMERSON C. HASBROUCK: Thank you Ashton for your presentation. As you recall, at the New York public hearing, the issue came up that since smooth dogfish are now being managed by HMS that the federal regulations would extend into state waters, anyhow. Were you able to resolve that issue?

CHAIRMAN NOWALSKY: We're going to pull up a slide for that; just a moment, Emerson.

MS. HARP: I created this slide as a result of the New York public hearing, to kind of say that these are all the different regulations that were in Amendment 9, and the one that the board chose to move forward with as a possible alternative is the one in blue. If their vessel has a federal permit then the federal guidelines apply in state waters. The permit goes with the vessel, whether it is in state waters or in federal waters. But no, all of Amendment 9 does not automatically apply in state waters. It would have to be approved by this board.

CHAIRMAN NOWALSKY: Any other questions on the presentation on the addendum before we move on to the Advisory Panel report? Okay, seeing none; Lew.

ADVISORY PANEL REPORT

MR. LEWIS GILLINGHAM: This is going to be brief once Ashton pulls up the slide. We had four people in attendance on this telephone call. We did get an e-mail prior to the call from one of the members that were unable to be there. One participant was in favor of a fins naturally attached policy, and you saw that in the majority of the public comments.

But this is not Option A or Option B. One AP member, via the e-mail, who is a commercial shark fisherman, was in favor of the 25 percent catch composition, and two participants did not provide comments on the issue. I'm one of those two participants. I see this as virtually a non-issue, which is probably why you had so little input. With that, I'm not going to take up any more of your time. If you have any questions, I'll be happy to answer.

CHAIRMAN NOWALSKY: Any questions? Seeing none; we'll move on to Mark Robson with the Law Enforcement Committee report.

LAW ENFORCEMENT COMMITTEE REPORT

MR. MARK ROBSON: The Law Enforcement Committee had a teleconference call on July 8. We provided you a written memo dated July 7 in your package summarizing the discussions and recommendations of the Law Enforcement Committee. In a nutshell, we do support and recommend Option B, which would allow the at-sea fin removal for smooth dogfish.

The LEC makes this recommendation really in support of the need for consistency wherever possible, between state and federal waters. That is the overriding concern here. Having said that, there was a good bit of discussion about the difficulties of catch inspections for these fisheries and in particular, for shark identification, but the LEC members also recognized that smooth dogfish does possess enough unique physical characteristics that would allow it to be distinguished with some training by the officers, who are making these inspections of catch.

I would note also that there are opportunities for such training. I know NOAA provides, I think, quarterly workshops for shark identification that state and federal officers are able to take advantage of. The only other caveat again, sort of continuing on that theme of the difficulty of catch inspection and shark identification. We do want to reemphasize how difficult this can be, in terms of managing a routine inspection, either on the water or at the dock.

You are now talking about a fairly complicated and significantly involved inspection process, not only identifying the species, among mixed species catch, but in determining whether there is the right percentage of smooth dogfish fins relative to carcass weight, and now the determination that at least 25 percent of the catch is made up of smooth dogfish in order for it to qualify for the at-sea fin removal. While these are not unenforceable issues, I think you can all recognize how difficult those multiple levels of inspection and check of catch can be.

It does require significant marshalling of resources. It is not something that is one casually by officers; either on the water or in the field, at the docks. It is something that they do have to kind of marshal resources to be able to do that and make sure that they're getting the data and information collected correctly; and that they're making a good solid case, if there is one to be made. That concludes my comments, Mr. Chairman.

CONSIDER FINAL APPROVAL OF ADDENDUM IV

CHAIRMAN NOWALSKY: Questions for Mark? Okay, seeing none; that brings the issue back to the board for potential action. What we would need to move forward with, assuming the board wants to take action, would be to select an option and then approve the addendum, if that is the will of the board; and then the last step would be to set a timeline for implementation. I see a hand up, two hands up; we'll start with Brandon and then go to Michelle.

MR. BRANDON MUFFLEY**: I would like to make a motion, and I'll speak to it if I get a second. I would like to move to adopt Option B, which would establish a catch composition requirement for the commercial processing of smooth dogfish at sea**.

CHAIRMAN NOWALSKY: Give us a moment to get that up and then we'll ask for a second. Do you want the 25 percent specifically outlined here, or is that sufficient, Brandon?

MR. MUFFLEY: I don't think it has to be. I think it's implied. But since that's what it says in the addendum itself.

CHAIRMAN NOWALSKY: Very good, do we have a second. Okay, Emerson Hasbrouck seconded the motion. The motion before the board is move to approve Addendum IV with the following option, Issue 1, Option B. Motion by Mr. Muffley, seconded by Mr. Hasbrouck, I'll allow Brandon the opportunity to speak then go to Michelle, then I'll go for or against the motion.

MR. MUFFLEY: As we talked about, this is for a fishery that is targeting smooth dogfish, so the ability to reach 25 percent should not be an issue. I think we need consistency and we have strived to have as much consistency between what we're doing in state waters with what we are with federal waters across all shark species, so I don't know why we wouldn't achieve for consistency in this particular issue.

I also think we need to think about protected species issues. This fishery is primarily prosecuted with gillnets, and I think we need to be cognizant of those protected species issues. I think, going by this and having consistency across the board, will minimize those issues within state waters. I think it's the right approach. Thanks.

CHAIRMAN NOWALSKY: Let me go to Michelle, since she had her hand up.

DR. MICHELLE DUVAL: I am actually going to speak in opposition to the motion. I was actually prepared to make a motion for status quo for a number of reasons. It was noted earlier that North Carolina was not supportive of an interpretation of the statutory language to require any kind of catch composition threshold.

We have a lot of concern that this isn't actually going to achieve any conservation benefit for a number of reasons. The majority of the harvest of these fish occurs in state waters, and in our state the majority of that state waters harvest actually occurs south of Hatteras. Based on the information that was used to determine this catch threshold, most of the fishermen in that area would not have a northeast permit necessarily, so they wouldn't be submitting VTR reports.

The lack of information from any logbooks collected in the southeast concerned us. Additionally, this is a meat fishery. The quality of the meat depends on being able to process the fish immediately, and our concern is that this is either going to increase dead discards or increase targeting in order to achieve some 25 percent threshold; simply due to the fact that this is really a mixed bag type of fishery for the majority of our fishermen. The majority of folks are actually south of Hatteras. These fishermen are targeting Spanish mackerel and sea mullet, and so they are not necessarily going to have federal permits for other species anyway.

Again, we just see this as actually increasing dead discards. You have to make a decision when you bring that fish onboard if you're going to be throwing it back or harvesting it right away, and if you choose to process it then you might be in a position of having to throw dead fish overboard; and we just simply can't support that. So I cannot support this motion.

CHAIRMAN NOWALSKY: Can I have a show of hands of other people that would like to speak. I've got Jerry, Mike.

MR. JERRY SCHILL: Jerry Schill; I'm a proxy for Representative Steinburg, North Carolina. Michelle already articulated North Carolina perspective from a technical standpoint. The idea of consistency can be looked at another way. What is wrong with the state's being leaders and the Feds doing what the states decide to do?

That's certainly from the bottom up rather than the top down. But I think that the states need to stand up for this and indicate that the best way to manage this fishery is the status quo. We are very aware of the issue of gillnets and protective species in North Carolina, and I really don't see the element of protection this adds to protected species by adding a 25 percent threshold. I think it is a moot point.

CHAIRMAN NOWALSKY: Mike, were you going to speak in favor or against the motion? Against the motion, okay, let me see if I can find someone in favor of the motion first. Karyl, did you want to speak in favor, or did you just have something to add from the HMS perspective?

MS. BREWSTER-GEISZ: I wanted to respond a little bit to that. My understanding of the coastal shark FMP for this board was that it should be to strive toward consistency with the Federal FMP. In relation to Mr. Schill's comment about being driven by the state regulations, we are completely aware that the states do not have to be consistent with our regulations.

We, however, do have the federal statutes that we do have to be consistent with, so we cannot always s be consistent and go the other way and be consistent with the states. I keep having a thought that keeps going away. I will ask to come back to that.

CHAIRMAN NOWALSKY: Okay, next I'll go to Mike.

MR. MICHAEL LUISI: I often sit here and speak in favor of consistency. I think striving for that consistency is something that I'll continue to support on future issues. However, I share a lot of the same concerns that Michelle does regarding the type of fishery that operates in our state waters in Maryland; in that adding additional burden to non-federal permit holders who are commercially fishing and catch smooth dogfish, is going to lead to regulatory discards.

There is no doubt in my mind that fishermen who would normally have brought those fish home are just going to let them go dead or alive, in fear that they will not be able to at the dock comply with the measure. Back to the consistency issue with the federal government, I would say that the slide that was shown earlier in the presentation by Ashton, which addressed the yellow, the green and the blue issues that are part of the amendment, and haven't been considered by the states. There were the sink gillnets, and I don't remember the details of it, but there was another condition of the amendment which the states have said, it is not something that we want to take on, so I'm not going to support the motion as it stands.

CHAIRMAN NOWALSKY: Do we have anyone else from the board who would like to speak on the motion? Go back to Karyl again.

MS. BREWSTER-GEISZ: I remembered the thought that was in my head before. It had to do with the consistency in relation to enforcement. We have had a number of comments, discussion with enforcement, discussion with states; e-mails back and forth with fishermen who are already very confused about when they need to comply with the federal regulation of the 25 percent, and when they need to comply with the ASMFC.

It has been mentioned by several board members if they have the HMS permit they need to comply with the federal. That is correct, but it is beyond just the HMS smoothhound permit, it is any HMS permit; and a lot of these fishermen might have the HMS angling permit. If they do, they need to comply with the federal regulations; and that includes the 25 percent.

It is not just whether or not you have the federal smoothhound permit, it is any HMS permit. That is why we think consistency in this case is so important, because we've already seen increasing confusion between the two regulations.

CHAIRMAN NOWALSKY: Okay, do I have any other hands? Seeing none; I'm going to allow a moment for the board to caucus. **Okay, the motion before the board, move to approve Addendum IV with the following option, Issue 1, Option B; motion by Mr. Muffley, seconded by Mr. Hasbrouck. All those in favor of the motion, please raise your right hand. Okay, please, put your hands down. All those opposed please raise your right hand. I have six opposed, null votes, abstentions; 1 abstention, motion carries, 7 to 6 with one abstention.**

Okay, so the next matter of business would be to go ahead and put an implementation date in place before we approve the addendum. Well, let's do the implementation data first. I'll need a motion for that. I'll need a motion then to approve the addendum together, can we combine those two? We can combine those two, and then just before we call the final vote, I'll ask if there is any other public comment on this matter. I would be looking for a motion at this point for an implementation date and approval of the addendum.

CHAIRMAN NOWALSKY: Okay, I've got my pair of binoculars out, and I found Brandon with his hand up.

MR. MUFFLEY: I'll throw out a date and we can certainly take comment on it. I'll throw out January 1st of 2017 as an implementation date, and then approval of Addendum IV to the Coastal Sharks FMP.

CHAIRMAN NOWALSKY: **Okay, move to set an implementation date of January 1st, 2018 and approve Addendum IV with the option selected here today**. Is there a second to that motion? I'm going to need a stronger pair of binoculars. Got one from Wilson Laney, thank you Wilson, we'll get that up on the board. Go ahead, Bob.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Just a question of clarification. Maybe I heard wrong, but I think Brandon said 2017, and I think you said 2018. But maybe I was only halfway paying attention.

CHAIRMAN NOWALSKY: Brandon, is January 1st, 2017 the intention?

MR. MUFFLEY: Seventeen, yes.

CHAIRMAN NOWALSKY: Thank you for that clarification. Okay, I'll turn to the board for discussion; any further discussion on the motion? Is there any member of the public that would like to comment on the motion before we take final action on it? Okay, seeing none, given that this is a final action and noting discussion about some no votes to the original motion, we're going to call a roll call vote on this. We'll give you a couple moments to caucus, and then we'll call that roll. Okay, we'll go ahead and call the roll and I'll ask Ashton to do that.

MS. HARP: Maine.

REPRESENTATIVE JEFFREY PIERCE: Aye.

MS. HARP: Massachusetts.

MR. ADLER: Yes.

MS. HARP: Rhode Island.

MR. BALLOU: No.

MS. HARP: Connecticut.

MS. MELISSA ZIOBRON: No.

MS. HARP: New York.

MR. STEVE HEINS: Yes.

MS. HARP: New Jersey.

MR. MUFFLEY: Yes.

MS. HARP: Delaware.

MR. STEWART MICHELS: Yes.

MS. HARP: Maryland.

MR. LUISI: No.

MS. HARP: Virginia.

MR. O'REILLY: No.

MS. HARP: North Carolina.

DR. DUVAL: No.

MS. HARP: South Carolina.

MR. ROBERT BOYLES: Yes.

MS. HARP: Georgia.

MR. PAT GEER: Yes.

MS. HARP: Florida.

MR. JIM ESTES: Yes.

MS. HARP: U.S. Fish and Wildlife Service.

DR. WILSON LANEY: Yes.

MS. HARP: NOAA Fisheries.

MS. BREWSTER-GEISZ: Yes.

CHAIRMAN NOWALSKY: Okay, give us just a moment with the abacus**. Motion carries with a vote of 10 to 5**. Does staff have anything else on this issue? Okay, seeing none; we'll move on to the next agenda item, which is Consider the 2015 FMP Review and State Compliance. Ashton.

CONSIDER THE 2015 FMP REVIEW AND STATE COMPLIANCE

MS. HARP: I'm going to go through this fairly quickly. Moving on to the next slide, so this is the Coastal Sharks 2015 FMP Review, very quickly this is looking at the fisheries management plan, which was implemented in 2009 Addendum I, II, and III, and the focus of this FMP review was to review state implementation of Addendum III.

A quick timeline, so Addendum III was approved in October, 2013, state plans were reviewed and February, 2014 implemented in March of 2014; and we're not reviewing compliance of Addendum III. Very quickly, the elements of compliance, so states were required to create the following species management groups. I won't list them, but you can see them on here. There are eight commercial management groups that had to be put into state regulations.

There was also a regulation to apply a minimum recreational size limit of 78 inches for all hammerhead shark species, so it was two regulations; fairly simple. The board did approve a de minimis request from Maine and New Hampshire, which exempted those states from Addendum III. With all of that the PRT reviewed the state compliance reports and found all states to have regulations that are consistent with the FMP and associated addenda with one exception. Connecticut did not provide a compliance report prior to the FMP meeting, nor was it prior to when the FMP review was finalized.

The PRT still needs to review Connecticut's compliance report, to ensure those measures are consistent with the FMP. The board will be notified if any issues arise. But with that being said, the PRT would recommend that the board approve the 2015 Coastal Sharks FMP review at today's board meeting. The FMP review can be updated if necessary; any questions?

CHAIRMAN NOWALSKY: Any questions for Ashton? Bill Adler.

MR. ADLER: No, Mr. Chairman, I was prepared to make a motion.

CHAIRMAN NOWALSKY: Please do so.

MR. ADLER: I make a motion that the board approve the FMP review and compliance report submitted.

CHAIRMAN NOWALSKY: Is there a second to that motion, Steve Heins. Okay, motion to approve the FMP review and compliance reports, as submitted. Motion by Bill Adler; second by Steve Heins, any discussion on the motion, is there any objection to the motion? **Seeing none; the motion carries.**

The next order of business, review and populate the AP membership. We'll turn to Tina for that.

POPULATE THE COASTAL SHARK ADVISORY PANEL MEMBERSHIP

MS. TINA L. BERGER: I will be very quick. We received an application from Katie Westfall with the Environmental Defense Fund, Kim Fitzgerald, who is also with that organization, is no longer able to participate on the panel; and he suggested that Katie Westfall would be a good replacement.

He was appointed to the panel a number of years ago as a nontraditional stakeholder. I put that nomination before you for your approval.

As a second before you move forward with that I also wanted to note that we've had very poor participation on the Coastal Sharks AP since its inception, and would request that board members review their advisory panel members and replace them if possible.

CHAIRMAN NOWALSKY: We would need a motion to approve that AP member. Robert, are you making that motion?

MR. ROBERT BOYLES: **Yes sir, Mr. Chairman, I move to approve Katie Westfall as a member of the Coastal Sharks Advisory Panel**.

CHAIRMAN NOWALSKY: Thank you very much, do I have a second to that motion? Seconded by Stew Michels, discussion on the motion; any objection to the motion? **Seeing none; motion carries by consent.**

ELECTION OF VICE-CHAIR

CHAIRMAN NOWALSKY: Okay our next order of business is to elect a Vice-Chair. I see Stew Michels hand going up, Stew.

MR. MICHELS: **I would like to nominate Roy Miller as Vice-Chair.**

CHAIRMAN NOWALSKY: I have a nomination for Roy, seconded by Mike Luisi; any comments on the motion? Move to nominate Roy Miller as Vice-Chair, Coastal Shark Management Board; motion by Stew Michels, seconded by Mike Luisi**. Is there any objection to the motion? Seeing none; congratulations and thank you, Roy.** I believe that will be for the February meeting, or will that be for the annual meeting?

EXECUTIVE DIRECTOR BEAL: February.

OTHER BUSINESS

CHAIRMAN NOWALSKY: Okay, thank you. Our next order of business under other business is an announcement from HMS on blacknose sharks**,** Karyl.

HIGHLY MIGRATORY SPECIES ANNOUNCEMENT ON BLACKNOSE SHARKS

MS. BREWSTER-GEISZ: I just wanted to announce that we have a new proposed rule out, it filed with the Federal Register today and it publishes tomorrow. This proposed rule would affect any gillnet fishermen south of 34 degrees. We're basically proposing that the retention limit for blacknose sharks south of 34 degrees would be eight blacknose sharks per trip.

This is our attempt, in order to keep the blacknose and non-small-coastal shark fishery open as long as possible, so the non-small coastal shark quota can be filled. In recent years it has not been filled, and that fishery has been closing earlier and earlier as few fishermen have been targeting blacknose sharks.

The comment period on this will end on September 20th, and we have a webinar scheduled for August 16th, a public hearing in Cocoa Beach, Florida scheduled for August 24th. We'll be talking about it at our advisory panel meeting in September, and we'll also be talking about it at the South Atlantic Fishery Management Council meeting in September.

ADJOURNMENT

CHAIRMAN NOWALSKY: Any questions or discussion on that? Okay, seeing none; having completed the business of the agenda, we stand adjourned. Thank you all very much.

(Whereupon the meeting adjourned at 5:16 o'clock p.m. on August 2, 2016.)

This document is scheduled to be published in the
Federal Register on 10/05/2016 and available online at
https://federalregister.gov/d/2016-24077, and on **FDsys.gov**

BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN: 0648-XE882

Stock Status Determination for Atlantic Dusky Sharks

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice.

SUMMARY: This action serves as a notice that NMFS, on behalf of the Secretary of Commerce (Secretary), has determined that Atlantic dusky sharks (*Carcharhinus obscurus*) are still overfished and subject to overfishing.

FOR FURTHER INFORMATION CONTACT: Tobey Curtis by phone at 978-281-9273 or Karyl Brewster-Geisz by phone at 301-427-8503.

SUPPLEMENTARY INFORMATION:

Background

Atlantic dusky sharks are managed under the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP) and its amendments. Dusky sharks have been a prohibited species since 2000 and may not be landed or retained in any fisheries. However, multiple commercial and recreational fisheries sometimes interact with the species as bycatch during the course of normal operations. The 2016 assessment was an update to the 2011 stock assessment for dusky sharks. Thus, no new methodology was introduced, though all model inputs were updated with more recent data (i.e. effort, and 2010-2015 for all the indices of relative abundance, which included observer and survey data).

Dusky sharks were first assessed in 2006, and all model results indicated that the stock had been heavily exploited, with depletion estimates between 62 and 80 percent from virgin biomass, and a rebuilding timeframe of 100 to 400 years. Dusky sharks were again assessed in 2011 through the Southeast Data, Assessment, and Review (SEDAR) process in SEDAR 21. The SEDAR 21 dusky shark assessment indicated that the species was overfished (spawning stock biomass $[SSB]_{2009}/SSB_{MSY}$=0.41-0.50) and was experiencing overfishing (F_{2009}/F_{MSY}=1.39-4.35).

All documents and information regarding the 2010 SEDAR 21 benchmark assessment and 2016 update can be found on the SEDAR webpage at *http://sedarweb.org/sedar-21*.

2016 Dusky Shark Stock Assessment Update Results

The 2016 dusky shark stock assessment update used an age-structured catch-free production model since the species' prohibited status made the use of catch as an input largely impractical.

In the 2011 SEDAR 21 assessment, the reviewers determined that there were five scenarios analyzed in the assessment that were plausible. Thus, in the 2016 update, the five scenarios reflective of plausible states of nature were analyzed and projections for each scenario were conducted. The five scenarios were: (1) the base scenario; (2) a high natural mortality scenario; (3) a U-shaped natural mortality curve allowing senescence; (4) a high productivity scenario; and (5) a low productivity scenario. Under all scenarios, the 2016 update found the stock is still overfished (spawning stock fecundity $[SSF]_{2015}/SSF_{MSST}$ = 0.44 - 0.69). Under all scenarios, the 2016 update found the stock was also still subject to overfishing (F_{2015}/F_{MSY} = 1.08

- 2.92).

The assessment was peer reviewed by two reviewers. Overall, the peer reviewers determined the stock assessment to be based on the best scientific information available. Based on these results, NMFS has determined that the status of dusky sharks is overfished and overfishing is occurring.

Dated: September 30, 2016

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Emily H. Menashes,

Acting Director,

Office of Sustainable Fisheries,

National Marine Fisheries Service.

[FR Doc. 2016-24077 Filed: 10/4/2016 8:45 am; Publication Date: 10/5/2016]

SEDAR

Southeast Data, Assessment, and Review

Update assessment to SEDAR 21

HMS Dusky Shark

July 2016

SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

Table of Contents

1. INTRODUCTION

1.1. TERMS OF REFERENCE

1. Update the approved dusky shark base model and sensitivity runs reflective of plausible states of nature identified in SEDAR 21 with data through 2015.
2. Document any changes or corrections made to model and input datasets and provide updated input data tables.
3. Update model parameter estimates and their variances, model uncertainties, estimates of stock status and management benchmarks, and projections of future stock status as conducted in SEDAR 21.
4. Develop a stock assessment update report to address these TORs and fully document the input data and results of the stock assessment update.

NOTE: The intent of update assessments is to expedite appraisals of stock status by using only the methods and data sets used in the base model and approved during the preceding SEDAR assessment of that stock. Accordingly, it is not the intent of this update to resolve any outstanding issues identified in the initial SEDAR 21 assessment. However, because the SEDAR reviewers identified several scenarios, in addition to the base run, as plausible states of nature, we will not limit the updated analyses to the base scenario only.

2. DATA REVIEW

The SEDAR 21 CIE reviewers identified five scenarios, including the base run, as plausible states of nature. Therefore, we updated the analyses for all five scenarios reflective of plausible states of nature identified and approved in the preceding SEDAR 21 assessment. However, only two of the previously approved input data sets were updated: the indices of relative abundance (CPUE) and the relative effort series (sections 2.2 and 2.4 below). The remaining previously approved input data sets (sections 2.1 and 2.3 below) were unchanged from the previous assessment.

2.1. LENGTH COMPOSITIONS, AGE COMPOSITIONS, AND SELECTIVITIES

No changes were introduced to the data or methodology for length compositions, age compositions, or selectivity previously identified and approved for dusky sharks during the preceding SEDAR 21 assessment. Briefly, age composition data were not available and length composition data were not input directly into the model. However, length composition data were used to generate age-frequency distributions through an age-length key. The age-frequency distributions produced were then used to estimate selectivity curves externally to the stock assessment model. Two types of selectivity curve were identified and approved during the preceding SEDAR 21 assessment for the CPUE series:

1) A logistic curve:

$$s = \frac{1}{1+e^{-\left(\frac{a-a_{50}}{b}\right)}},$$

where a_{50} is the median selectivity age (inflection point) and b is slope.

2) A double logistic curve of the form:

$$s = \frac{\frac{1}{1+e^{-\left(\frac{a-a_{50}}{b}\right)}}\times\left(1-\frac{1}{1+e^{-\left(\frac{a-c_{50}}{d}\right)}}\right)}{s_{max}},$$

where a_{50} and c_{50} are the ascending and descending inflection points, b and d are the ascending and descending slopes, respectively, and s_{max} is the maximum selectivity.

The VIMS LL (Virginia Institute of Marine Science) was represented by the double logistic curve, with age at full selectivity of 1 followed by a quickly descending right limb to reflect the fact that mostly juveniles are caught.

The LPS (Large Pelagic Survey) was also represented by the double logistic curve with fully selected age at 4 and with an ascending portion of the curve prior to the inflection point covering the younger age classes. The reason for the dome shape was to reflect the fact that larger, older animals could escape by breaking the monofilament line.

The BLLOP (Bottom Longline Observer Program) was assumed to fully select all ages, thus s=1 for all ages.

The NELL (Northeast Longline) survey was assumed to follow a logistic curve with full selectivity age of 6.

The PLLOP (Pelagic Longline Observer Program) was also represented by the double logistic curve with fully selected age at 5 and the dome shape also to reflect the fact that larger, older animals could escape by breaking the monofilament leader.

The model also considered three fleets: pelagic longline, commercial bottom longline, and recreational, which were assigned the selectivity functions corresponding to the PLLOP, BLLOP, and LPS CPUE series, respectively. All selectivities used in the assessment are summarized in Table 2.1 and Figure 2.1.

2.2. INDICES OF RELATIVE ABUNDANCE

The five indices of relative abundance described above (VIMS LL, LPS, BLLOP, NELL, and PLLOP), which were identified and approved during the preceding SEDAR 21 assessment, were updated here (Table 2.2, Figure 2.2). The VIMS LL and NELL indices are fishery independent, whereas the BLLOP, PLLOP, and LPS are fishery dependent (the first two, commercial, and the last, recreational). The updated indices were standardized using the same GLM techniques identified and approved for each index during the preceding SEDAR 21 assessment, except that the data were updated here to 2015. The CVs associated with the updated indices are provided in Table 2.3. The updated indices and their CVs were used in the five scenarios reflective of plausible states of nature as described in section 3 of this report.

Figure 2.3 shows each updated index superimposed on the index used for SEDAR 21 (ending in 2009). The updated VIMS LL index tracked the old index fairly closely and showed a clearly declining trend since 2009. The updated LPS index showed an oscillating but generally flat trajectory since 2009. The updated standardized BLLOP index tracked the old index relatively closely, but the series had to be truncated to 2013 because of regulatory changes introduced in 2014. After 2009, the BLLOP index showed a very high peak in 2012 followed by a strong decrease until 2013, with an overall slightly negative tendency since 2009. The updated NELL index, which only had two additional data points since 2009, showed a strong linear increase since 2009. The updated PLLOP index tracked the old index very closely and displayed a generally negative tendency since 2009.

2.3. LIFE HISTORY INPUTS

No changes were introduced to the data or methodology for life history inputs previously identified and approved for dusky sharks during the preceding SEDAR 21 assessment. The life history inputs used in the SEDAR 21 base run and this update are presented in Table 2.4. These include age and growth, several parameters associated with reproduction, including sex ratio, reproductive frequency, fecundity at age, maturity at age, month of pupping, and natural mortality (M). The values of M are intended to represent a maximum compensatory response in the absence of fishing. For fecundity, since the Age-Structured Catch-Free Model (ASCFM; as described below in section 3 of this report) tracks only females, the number of pups per female

(7.13) is multiplied by 0.5 to account for a 50/50 sex ratio, and further multiplied by 0.33 to account for an agreed-upon triennial reproductive cycle. Since the proportion of females in maternal condition—a quantity that accounts for the time it takes for a female to become pregnant and produce offspring after it reaches maturity and which is more appropriate than using the proportion of mature females (Walker 2005) —was not available, we offset the maturity ogive by one year (the gestation period) as a proxy to using the maternity ogive.

The ASCFM uses most life history characteristics as constant inputs and others are estimated parameters, which are given priors and initial values, as described below in section 3 of this report.

2.4. RELATIVE EFFORT SERIES

The relative effort series for three fleets (bottom longline (BLL); recreational (REC); pelagic longline (PLL)), which were previously identified and approved during the preceding SEDAR 21 assessment, were updated here (Table 2.5, Figure 2.4). We followed the same rationale for deriving relative effort for the three fleets as described in section 3.5 of the preceding SEDAR 21 Data Workshop report, except that the effort data were updated here for the period 1960 – 2015. The updated effort series were used to determine a single annual weighted selectivity vector for modeling fishing mortality in the five scenarios reflective of plausible states of nature as described in section 3 of this report.

The derivation is as follows. First, the annual numbers of hooks from all pelagic longline fleets operating in the northwest Atlantic Ocean were obtained from the International Commission for the Conservation of Atlantic Tunas (ICCAT) Task II database up to 2014. Note that the updated effort series obtained from ICCAT differs from that used in SEDAR 21 because the effort estimation methodology has been improved and the new effort estimates are considered to be more reliable than those used for SEDAR 21 (Paul DeBruyn, International Commission for the Conservation of Atlantic Tunas, pers. comm.). A series of relative effort for 1960 – 2015 was then created by standardizing the annual effort to the 2014 value. The average relative effort for 2012 – 2014 was used to produce an estimate for 2015. Second, for both the REC and BLL fleets, it was thought that there was not much effort before 1980. The directed shark bottom longline fleet is known to have developed in the 1970s, while the recreational fishery did not develop until about the late 1970s, Therefore, from 1960 to 1980, effort for both the recreational and the bottom longline fishery was set to very low levels to reflect the fact these fisheries had not really developed yet. For the remaining years, relative effort trends for these two fisheries were derived by comparing available total removals (landings + dead discards) to removals from the PLL fleet (assuming that removals would be proportional to effort). Removals from the recreational sector were first available in 1981, in 1982 from the bottom longline fishery, and 1992 from the pelagic longline fishery, although their magnitude and reliability is questionable owing to identification and reporting issues (see section 3). Indeed, for the years where removals were available there were often large fluctuations, on the order of several orders of magnitude, among the removals from the three sources. This was not believed to be a reflection of drastic changes in effort, but rather be due possibly to misidentification, misreporting or expansion factors based on very small sample sizes. In SEDAR 21, an exploratory exercise was undertaken to identify the period when the magnitude of the removal ratios REC:PLL and BLL:PLL was lowest, resulting in the years 2002-2007. Those years were thus used to derive an average ratio of removals for REC:PLL and BLL:PLL. Third, these estimated ratios of removals were then used to obtain relative effort in 1990-2015 for REC and BLL by multiplying the annual PLL relative effort by each corresponding ratio of removals (0.89 for REC:PLL and 0.46 for BLL:PLL). Fourth, these estimated annual relative effort series were then projected back from 1990 to 1980 by assuming a linear decrease with a slope equal to the value in 1990 divided by 11 (number of years from 1970 to 1980). Although dusky sharks have been a prohibited species since 2000, there is incidental catch and discard and thus we did not eliminate effort after 2000. Table 2.5 lists the values and Figure 2.4 displays them graphically.

2.5. REFERENCES

Walker, T. I. 2005. Reproduction in fisheries science. In: Reproductive Biology and Phylogeny of Chondrichthyans: Sharks, Batoids, and Chimaeras (Ed. W.C. Hamlett) pp. 81-127. Science Publishers Inc., Enfield, NH, USA.

2.6 TABLES

Table 2.1. Selectivity curves for indices of relative abundance used in the assessment update. Parameters are ascending inflection point (a_{50}), ascending slope (b), descending inflection point (c_{50}), descending slope (d), and maximum selectivity (s_{max}).

Series	Selectivity	a_{50}	b	c_{50}	d	max(sel)
BLLOP	Fixed at 1					
VIMS	Double logistic	0	0.25	2	4.50	0.55
LPS	Double logistic	3.03	0.06	14.05	4.33	0.91
PLLOP	Double logistic	2.19	0.82	13.56	7.77	0.73
NELL	Logistic	3.10	0.28			

Table 2.2. Updated standardized indices of relative abundance used in the assessment update (scaled by the mean).

YEAR	VIMS LL	LPS	BLLOP	NELL	PLLOP
1961	-	-	-	-	-
1962	-	-	-	-	-
1963	-	-	-	-	-
1964	-	-	-	-	-
1965	-	-	-	-	-
1966	-	-	-	-	-
1967	-	-	-	-	-
1968	-	-	-	-	-
1969	-	-	-	-	-
1970	-	-	-	-	-
1971	-	-	-	-	-
1972	-	-	-	-	-
1973	-	-	-	-	-
1974	-	-	-	-	-
1975	2.904	-	-	-	-
1976	-	-	-	-	-
1977	0.440	-	-	-	-
1978	5.421	-	-	-	-
1979	-	-	-	-	-
1980	2.221	-	-	-	-
1981	1.195	-	-	-	-
1982	-	-	-	-	-
1983	-	-	-	-	-
1984	-	-	-	-	-
1985	-	-	-	-	-
1986	-	2.275	-	-	-
1987	0.458	2.353	-	-	-
1988	-	0.785	-	-	-
1989	0.193	1.680	-	-	-
1990	0.152	1.243	-	-	-
1991	0.209	1.290	-	-	-
1992	0.043	0.420	-	-	5.806
1993	0.403	3.040	-	-	2.442
1994	-	0.566	0.703	-	3.377
1995	0.227	0.883	1.291	-	1.398
1996	0.792	1.285	1.034	0.030	1.712
1997	-	0.882	1.280	-	0.626
1998	0.282	0.600	1.066	0.116	2.395
1999	1.062	0.453	1.331	-	0.438
2000	1.154	0.756	0.499	-	0.958
2001	0.608	0.343	0.692	0.134	0.389
2002	1.256	0.588	0.385	-	0.176
2003	0.529	0.420	0.453	-	0.127
2004	0.937	0.532	0.575	0.441	0.725
2005	1.945	0.577	0.756	-	0.601
2006	2.220	0.199	0.505	-	1.008
2007	0.507	1.007	0.555	0.717	0.389
2008	0.589	1.358	0.677	-	0.242
2009	2.091	0.878	0.789	1.714	0.251
2010	1.286	0.970	1.230	-	0.169
2011	0.410	0.789	0.886	-	0.221
2012	0.802	0.904	5.023	2.113	0.206
2013	0.423	1.162	0.271	-	0.174
2014	0.185	0.863	-	-	0.111
2015	0.057	0.902	-	2.736	0.061

Table 2.3. Updated coefficients of variation used in the assessment update for weighting the indices of relative abundance.

YEAR	VIMS LL	LPS	BLLOP	NELL	PLLOP
1961	1	1	1	1	1
1962	1	1	1	1	1
1963	1	1	1	1	1
1964	1	1	1	1	1
1965	1	1	1	1	1
1966	1	1	1	1	1
1967	1	1	1	1	1
1968	1	1	1	1	1
1969	1	1	1	1	1
1970	1	1	1	1	1
1971	1	1	1	1	1
1972	1	1	1	1	1
1973	1	1	1	1	1
1974	1	1	1	1	1
1975	0.477	1	1	1	1
1976	1	1	1	1	1
1977	0.610	1	1	1	1
1978	0.745	1	1	1	1
1979	1	1	1	1	1
1980	0.447	1	1	1	1
1981	0.328	1	1	1	1
1982	1	1	1	1	1
1983	1	1	1	1	1
1984	1	1	1	1	1
1985	1	1	1	1	1
1986	1	0.152	1	1	1
1987	0.373	0.135	1	1	1
1988	1	0.317	1	1	1
1989	0.903	0.180	1	1	1
1990	0.544	0.166	1	1	1
1991	0.814	0.165	1	1	1
1992	0.918	0.305	1	1	0.228
1993	0.499	0.245	1	1	0.174
1994	1	0.395	0.334	1	0.174
1995	0.863	0.328	0.291	1	0.214
1996	0.389	0.414	0.288	0.819	0.253
1997	1	0.406	0.291	1	0.318
1998	0.545	0.499	0.336	0.593	0.256
1999	0.459	0.685	0.359	1	0.349
2000	0.331	0.532	0.854	1	0.270
2001	0.438	0.686	0.455	0.546	0.337
2002	0.428	0.621	0.607	1	0.807
2003	1.097	0.386	0.427	1	0.593
2004	0.517	0.347	0.416	0.363	0.272
2005	0.316	0.358	0.568	1	0.261
2006	0.253	0.505	0.620	1	0.244
2007	0.501	0.248	0.760	0.476	0.287
2008	0.618	0.215	0.820	1	0.379
2009	0.501	0.268	0.477	0.366	0.257
2010	0.281	0.259	0.427	1	0.337
2011	0.388	0.279	0.445	1	0.313
2012	0.377	0.270	0.362	0.383	0.330
2013	0.647	0.276	0.661	1	0.334
2014	0.624	0.307	1	1	0.338
2015	1.014	0.264	1	0.283	0.455

Table 2.4. Life history inputs used in the assessment update (all these quantities are treated as constants in the model).

Age	Proportion mature	M
1	0.00	0.104
2	0.00	0.104
3	0.00	0.104
4	0.00	0.104
5	0.00	0.104
6	0.00	0.098
7	0.00	0.092
8	0.00	0.088
9	0.00	0.084
10	0.00	0.080
11	0.00	0.077
12	0.00	0.074
13	0.00	0.072
14	0.00	0.070
15	0.01	0.068
16	0.02	0.066
17	0.05	0.064
18	0.13	0.063
19	0.28	0.061
20	0.51	0.060
21	0.74	0.059
22	0.88	0.058
23	0.95	0.057
24	0.98	0.056
25	0.99	0.055
26	1.00	0.054
27	1.00	0.053
28	1.00	0.052
29	1.00	0.052
30	1.00	0.051
31	1.00	0.048
32	1.00	0.048
33	1.00	0.048
34	1.00	0.048
35	1.00	0.048
36	1.00	0.048
37	1.00	0.048
38	1.00	0.048
39	1.00	0.048
40	1.00	0.048

Sex ratio at birth:	1:1
Reproductive frequency:	3 yr
Pupping month:	June
Gestation period:	12 months
Fecundity:	7.13 pups
L_{inf}	350.3 cm FL
k	0.039
t_0	-7.04
Weight vs length relation:	$W=0.000032415L^{2.7862}$
maturity ogive:	a=-19.76, b=0.99

Table 2.5. Updated relative effort for three fleets used in the assessment update (BLL=commercial bottom-longline shark fishery; REC=recreational fishery; PLL=pelagic longline fishery).

Year	PLL	REC	BLL
1960	0.032	0.001	0.001
1961	0.020	0.001	0.001
1962	0.103	0.002	0.002
1963	0.248	0.002	0.002
1964	0.463	0.003	0.003
1965	0.447	0.003	0.003
1966	0.246	0.001	0.001
1967	0.217	0.001	0.001
1968	0.308	0.002	0.002
1969	0.243	0.002	0.002
1970	0.335	0.002	0.002
1971	0.509	0.002	0.002
1972	0.396	0.002	0.002
1973	0.466	0.002	0.002
1974	0.690	0.002	0.002
1975	0.626	0.002	0.002
1976	0.632	0.002	0.002
1977	0.660	0.002	0.002
1978	0.612	0.002	0.002
1979	0.877	0.002	0.002
1980	0.721	0.056	0.029
1981	0.714	0.111	0.057
1982	0.706	0.167	0.086
1983	0.599	0.222	0.115
1984	0.859	0.278	0.144
1985	0.984	0.333	0.172
1986	1.162	0.389	0.201
1987	0.843	0.444	0.230
1988	0.853	0.500	0.258
1989	0.793	0.555	0.287
1990	0.686	0.611	0.316
1991	0.789	0.702	0.363
1992	0.906	0.806	0.417
1993	0.905	0.806	0.416
1994	1.144	1.018	0.526
1995	1.232	1.096	0.567
1996	1.056	0.940	0.486
1997	1.053	0.937	0.484
1998	1.001	0.891	0.461
1999	1.112	0.990	0.512
2000	1.147	1.021	0.528
2001	0.855	0.761	0.393
2002	1.288	1.147	0.593
2003	1.401	1.247	0.645
2004	2.028	1.805	0.933
2005	1.033	0.919	0.475
2006	1.236	1.100	0.568
2007	1.071	0.953	0.493
2008	1.073	0.955	0.494
2009	1.281	1.140	0.589
2010	1.167	1.038	0.537
2011	1.487	1.324	0.684
2012	1.686	1.501	0.776
2013	1.534	1.365	0.706
2014	1.000	0.890	0.460
2015	1.407	1.252	0.647

2.6. FIGURES

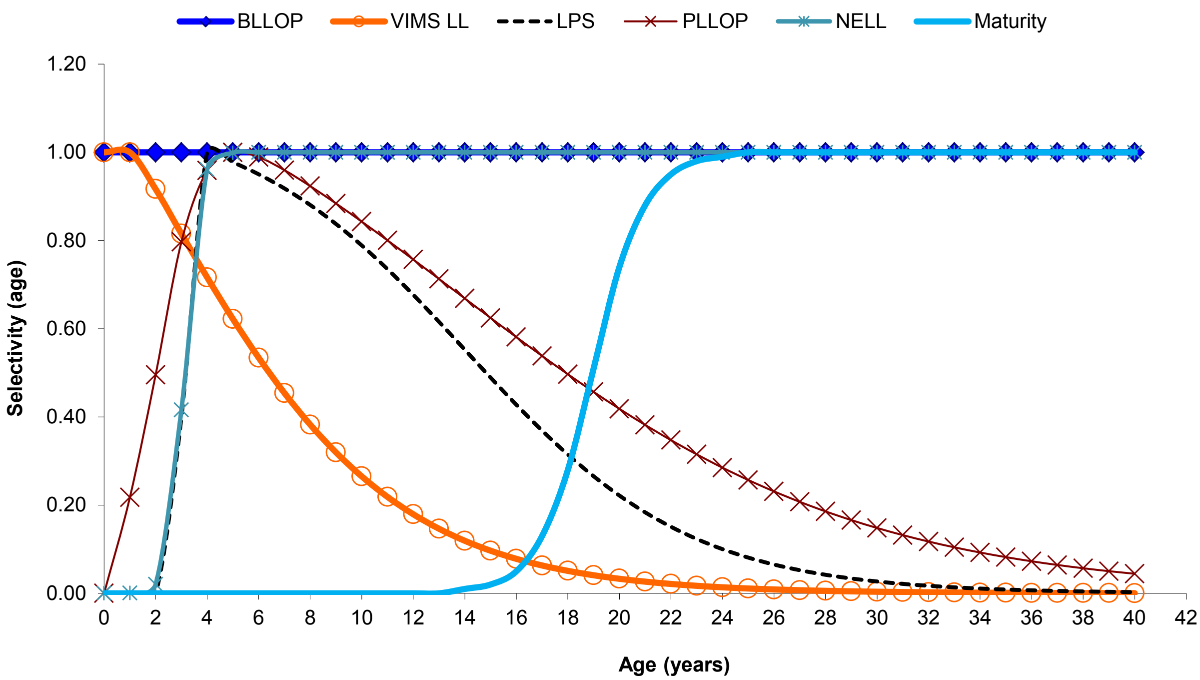

Figure 2.1. Selectivity curves for indices of relative abundance used in the assessment update. The maturity ogive for dusky shark has been added for reference.

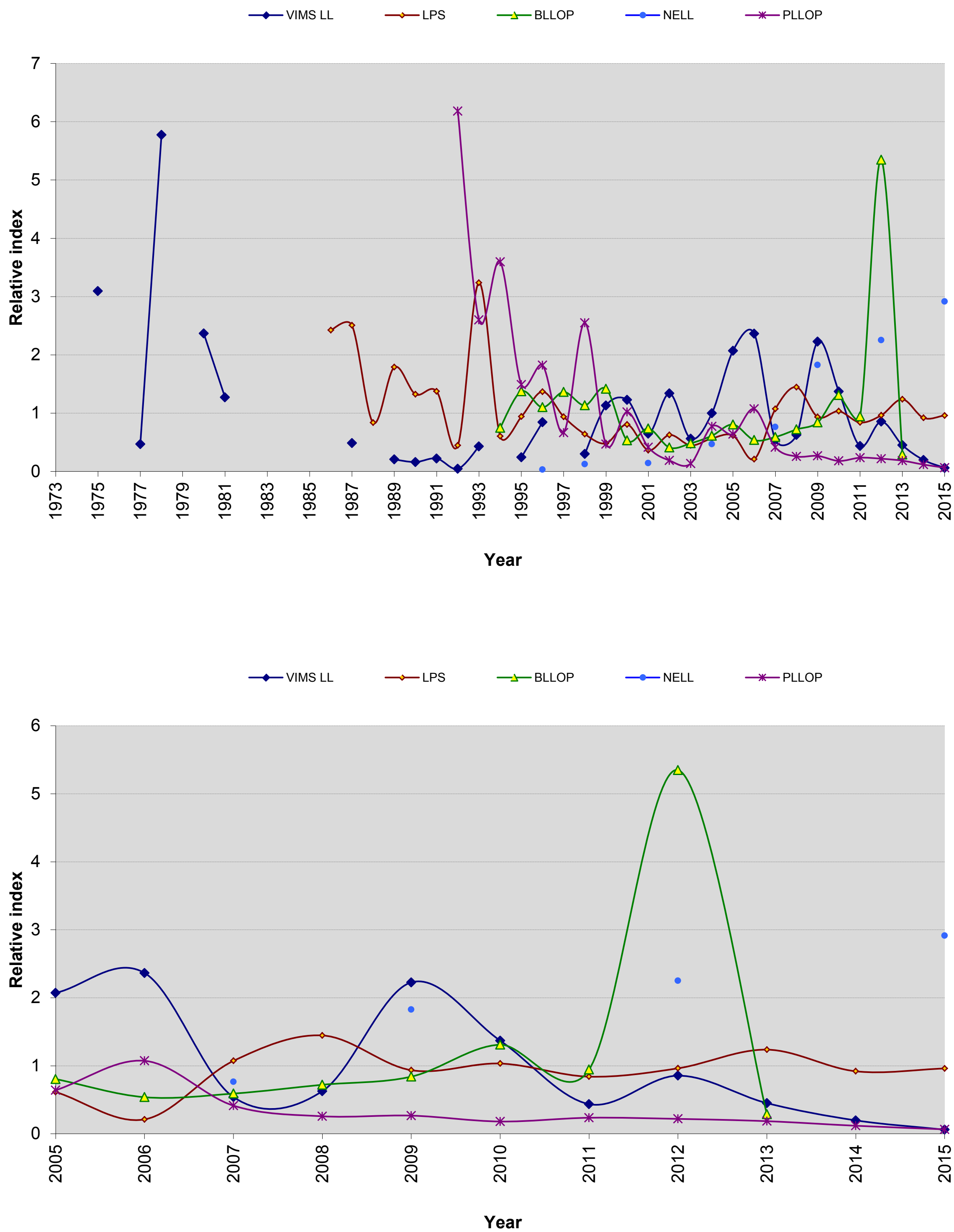

Figure 2.2. Updated indices of relative abundance for dusky shark (VIMS LL, LPS, BLLOP, NELL, and PLLOP) used in the assessment update. Top panel: complete time period; bottom panel: past decade. All indices are statistically standardized and scaled (divided by their respective mean and a global mean for overlapping years).

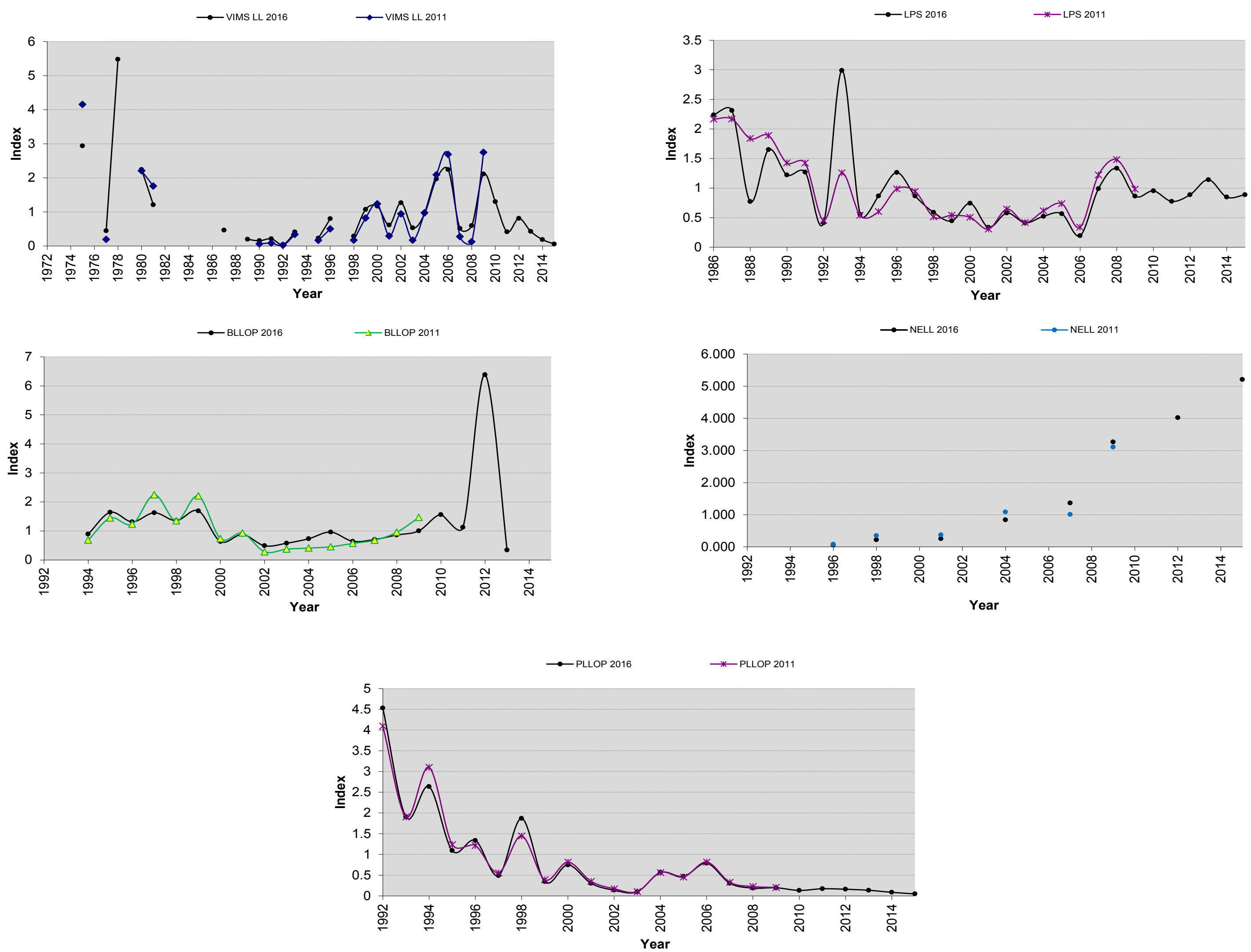

Figure 2.3. Indices of relative abundance for dusky shark used in the preceding SEDAR 21 assessment (2011) vs. those used in this assessment update (2016). From top to bottom and left to right: VIMS LL, LPS, BLLOP, NELL, and PLLOP. All indices are scaled (divided by the mean of overlapping years).

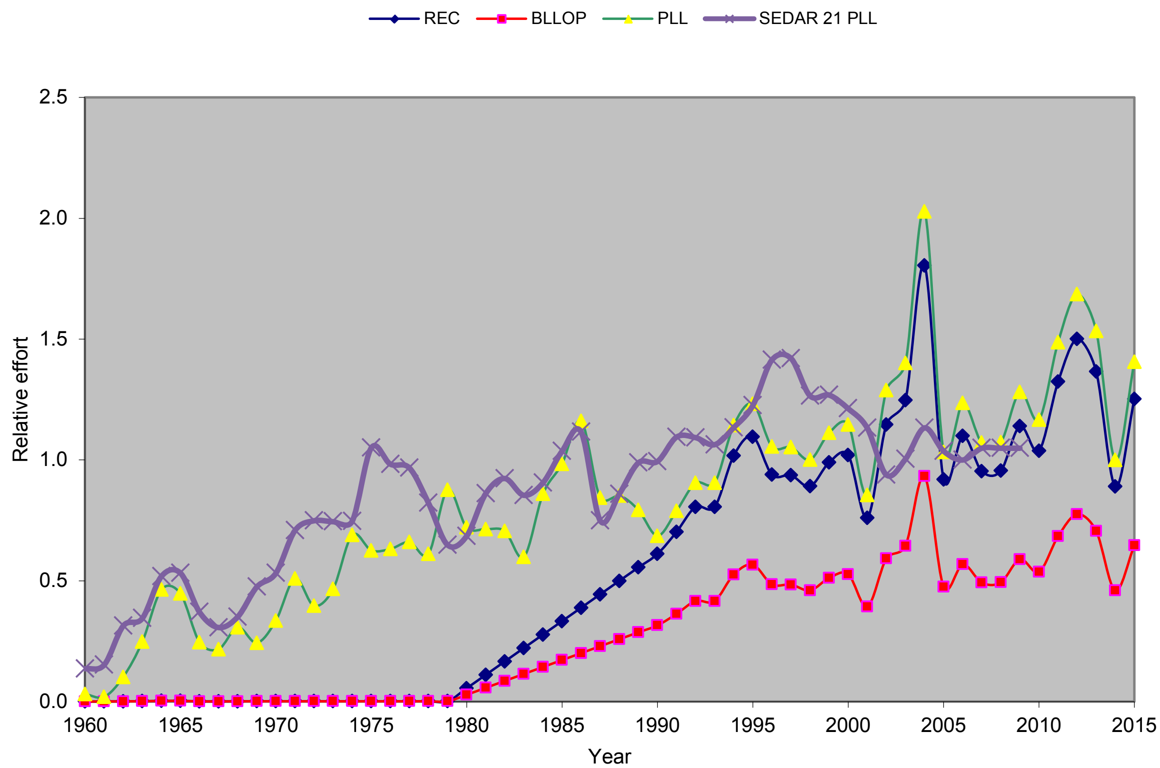

Figure 2.4. Updated relative effort for three fleets (BLL=commercial bottom-longline shark fishery; REC=recreational fishery; PLL=pelagic longline fishery).The PLL effort series used in the preceding SEDAR 21 assessment (SEDAR 21 PLL) is shown for reference.

3. STOCK ASSESSMENT MODEL AND RESULTS

3.1. ASSESSMENT METHODS

3.1.1. Age-Structured Catch-Free Model (ASCFM) Description

In fisheries where there is a high degree of uncertainty in reported catches, or catches are not reported at all, stock assessment models that rely on catch data may not be appropriate. For numerous shark species there is uncertainty about the magnitude of commercial and recreational catches, in part due to identification problems. The level of reported discards is especially uncertain and may be underestimated because sharks are often not brought aboard for positive identification and may therefore go unreported. Without accurate knowledge of the magnitude of total catches and discards, it is not possible to estimate absolute abundance levels for the population. An alternative modeling methodology appropriate to these situations is to re-scale the model population dynamics as proportional to virgin (unexploited) conditions. If estimates of effort are available for the time series of exploitation, this information can be incorporated to guide model estimates of annual fishing mortality. Information about population declines relative to virgin can also be incorporated if there is expert opinion or data to suggest possible estimates of depletion. If catch and effort information are available from sampled trips or observer programs, then standardized catch rates can be developed and incorporated into the model.

In the present application, dusky shark landings are first available in the early 1980s at very low levels. Commercial landings during this time period are two to three orders of magnitude lower than those from the recreational fishery. It is not believed that this is a real trend in landings, but rather that it reflects underreporting and poor species identification. Indeed, dusky sharks—especially immature individuals—are easy to confuse with some other similar-looking species, in particular silky sharks. This has likely led to identification problems in the past in the commercial fisheries, but is most problematic in the recreational fisheries, where anglers unfamiliar with shark identification may incorrectly identify dusky sharks, leading to over- or under-representation of the expanded recreational catches. Underreporting (or mis-reporting as other species) is also likely to have occurred in the commercial fisheries because take of the species was prohibited in 1999. Dead discard estimates of dusky shark from the pelagic longline fishery are first available in 1992 as a result of the observer program that placed observers on a fraction of the vessels to estimate both discards and landings. With such high uncertainty in the series of reported catch and discard, the catch-free methodology was selected as an appropriate application for SEDAR 21. The ASCFM was initially developed by Porch et al. (2006) for use in a goliath grouper assessment for which only life history information and relative abundance (CPUE) indices were available.

3.1.2. Data Sources

The ASCFM was fit to life history data and the five abundance indices included in the SEDAR 21 base run and four alternative states of nature (see section 2 for a description of these data sources).

3.1.3. Model Configuration and Equations

The ASCFM used in this update assessment builds upon the methodology first described by Porch et al. (2006) as used by Cortés et al. (2006) in a previous assessment of dusky sharks, and as used in the preceding SEDAR 21 assessment. A first step in applying the catch-free methodology is to determine a year in which the population can be considered to be at virgin conditions. From that year forward, information on fishing effort and/or prior information about possible levels of depletion allow the model to estimate the relative number at age for the year that data (e.g., catch rates) are first available. The period from virgin conditions just prior to availability of fishery data is referred to as the *historic* period. In the present incarnation of the ASCFM, the time period spanning the first year with fishery data through the end of 1999 is referred to as the *first modern* period. The time period from 2000 to the end of the assessment period (2015) is referred to as the *second modern* period (landings for dusky shark were prohibited during the second modern period).

The underlying equations are simply a re-scaled age-structured production model. The stock-recruitment relationship is defined in terms of the spawning stock in year y and the resultant recruits in year $y+r$, and the first model age is a_r. Assuming that all survival beyond recruitment is density independent, then at virgin conditions the population age structure beyond a_r can be calculated from the expected survival at age from natural mortality:

$$N_{a,1} = \begin{cases} 1 & a = a_r \\ N_{a-1,1} \exp^{(-M_{a-1})} & a_r < a < A \\ N_{a-1,1} \dfrac{\exp^{(-M_{A-1})}}{1-\exp^{(-M_{A-1})}} & a = A \end{cases} , \quad (3.1)$$

where A is the age of the plus-group (assumed to be 40 years in the present assessment).

Subsequent annual relative recruitment, r_y, is modeled as following a Beverton-Holt function (with recruitment deviations set to zero). This function can be parameterized in terms of $\hat{\alpha}$, the maximum number of recruits produced by each spawner over its lifetime (Myers et al. 1999). The parameter $\hat{\alpha}$ is equivalent to the slope of the spawner-recruit curve at the origin multiplied by φ_0 (unexploited number of pups per recruit). The slope of the stock-recruit curve at the origin is equivalent to density-independent survival of pups (e^{-M_0} ; see section 3.1.4). The Beverton-Holt function is given by:

$$r_y = \frac{e^{-M_0}\varphi_0 S_{y-a_r}}{1+(e^{-M_0}\varphi_0 - 1)S_{y-a_r}} \quad . \tag{3.2}$$

In (3.2), S_{y-a_r} is a measure of relative spawning stock fecundity, which is calculated as:

$$S_y = \frac{\sum_{a=a_r}^{A} E_a N_{a,y} \exp^{(-(F_{a,y}+M_a)t_s)}}{\sum_{a=a_r}^{A} E_a N_{a,1} \exp^{(-M_a t_s)}} \quad . \tag{3.3}$$

In (3.3), E_a is per-capita eggs by age class (the product of fecundity and maturity at age was used as a proxy for eggs in the present application), $F_{a,y}$ is total fishing mortality on age *a* in year *y*, and t_s is the fraction of the year elapsed at the time of spawning. Since this assessment employs a constant fec_{age} value (i.e., fecundity does not vary by age), fecundity cancels out of (3.3); in fact (3.3) may be interpreted as either relative mature spawning stock biomass, or relative spawning stock fecundity.

The parameter φ_0 in (eq. 3.2) is calculated as:

$$\varphi_0 = \sum_{a=1}^{A-1} fec_a \times mat_a \prod_{j=1}^{a-1} \exp(-M_j) + fec_A \times mat_A \frac{\exp(-M_{A-1})}{1-\exp(-M_{A-1})} \prod_{j=1}^{A-2} \exp(-M_j) \, , \tag{3.4}$$

where fec_a is fecundity at age and mat_a is maturity at age (Goodyear 1993).

This implementation of the catch-free model can incorporate multiple fleets that may be exploiting the resource. Annual, fleet-specific apical fishing mortality can potentially be estimated from fleet-specific effort series, if available (“apical” in this context refers to the fishing mortality that would be experienced by an age class that is fully vulnerable). However, effort series for the two other fleets considered (i.e., bottom longline and recreational) were missing, and initial efforts to incorporate effort series derived using proportionality constants (section 2.4) resulted in collinearity when attempting to estimate fleet-specific parameters. As such, total age-specific fishing mortality was modeled as follows:

$$F_{a,y} = Fapical_{\,y} \bar{v}_{a,y} \, , \tag{3.5}$$

where $\bar{v}_{a,y}$ gives mean vulnerability (selectivity) at age in year *y* across all fleets:

$$\bar{v}_{a,y} = \frac{\sum_{fleet} v_{fleet,a} Effort_{fleet,y}}{\sum_{fleet} Effort_{fleet,y}} \tag{3.6}$$

(see sections 2.1 and 2.4 for fleet specific vulnerability schedules ($v_{fleet,a}$) and derivation of effort series, respectively). Since the pelagic long line (PLL) fleet dominated the fishery early in the time series, we modeled apical fishing mortality as proportional to PLL effort the first 20 years of the assessment model, and as a correlated random walk thereafter:

$$Fapical_y = \begin{cases} \beta_1 \times Effort_{PLL,y} & y < 1980 \\ Fapical_{y-1} \exp(\delta_y) & 1980 \le y \le 2015 \end{cases}. \tag{3.7}$$

An advantage of estimating total fishing mortality in this manner is that it implicitly includes both discard mortality as well as mortality of those animals retained in the catch. The correlated random walk structure was induced by setting

$$\delta_y = \begin{cases} \varepsilon_y & y = 1980 \\ \rho\delta_{y-1} + \varepsilon_y & 1981 \le y \le 1999 \\ \tau & y = 2000 \\ \rho\delta_{y-1} + \varepsilon_y & 2001 \le y \le 2015 \end{cases}, \tag{3.8}$$

where ρ is a correlation coefficient and ε_y is sampling error (assumed to be normally distributed).

A break in the correlated walk series was implemented in 2000 to allow for the possibility of reduced fishing mortality following prohibition of dusky landings in late 1999. The correlation coefficient ρ was fixed to 0.5 in all runs; see section 3.1.4 for description of prior distributions on ε_y and τ.

Given recruitment (i.e., it is assumed that $N_{1,y} = r_y$ from Eq. 3.2, with a_r=1), and fishing and natural morality at age, abundance is propagated forward in the usual fashion:

$$N_{a,y} = \begin{cases} N_{a-1,y-1} \exp^{(-(M_{a-1}+F_{a-1,y-1}))} & 2 < a < A \\ N_{A-1,y-1} \exp^{(-(M_{a-1}+F_{a-1,y-1}))} + N_{A,y-1} \exp^{(-(M_A+F_{A,y-1}))} & a = A \end{cases} \quad (3.9)$$

When fitting to indices of abundance and catch rates, the model predicts values for index *j* in year *y* as:

$$\tilde{U}_{j,y} = \frac{q_j v_{j,0} N_{1,y+1}}{\theta_y^{1-t_j}} + q_j \sum_{a=1}^{A} v_{j,a} N_{a,y} \exp^{(-(M_a+F_{a,y})t_j)} \quad . \quad (3.10)$$

(all indices were measured in numbers). Here, q_j is the catchability coefficient, $v_{j,a}$ is age-specific vulnerability for index *j* (see section 2.1 for fleet specific vulnerability schedules), and t_j is the fraction of the year that has elapsed prior to the timing of index *j* (assumed to be 0.5 for all indices). The first term in the expression is an attempt to account for indices that catch pups; since recruitment is assumed to occur at age 1, the number of pups alive when the index was collected in the previous year is back predicted using the year-specific value of pup survival, computed as

$$\theta_y = \frac{N_{1,y+1}}{\sum_a N_{a,y} fec_a mat_a} \quad . \quad (3.11)$$

3.1.4. Parameter Estimation

Parameters were estimated by minimizing an objective function (the negative log joint posterior density function) using AD Model Builder software (Otter Research, Ltd. 2004). The (log) joint posterior distribution was specified up to a proportionality constant and included log likelihood components for observed data (Λ_1), process error components (Λ_2), prior distribution components (Λ_3), and several penalties intended to keep parameter values within plausible ranges during estimation (Λ_4). The total objective function was then given by $\Lambda = \Lambda_1 + \Lambda_2 + \Lambda_3 + \Lambda_4$, with each component as described below.

Observed data log likelihood—The observed data log likelihood was specified as lognormal, but included a number of variance terms that could be estimated or fixed to allow for a wide range of choices for how to fit the data. The overall contribution is provided by

$$\Lambda_1 = 0.5\sum_i \sum_y \frac{(\log(U_{i,y}) - \log(\widetilde{U}_{i,y}))^2}{\sigma^2_{i,y}} + \log(\sigma^2_{i,y}), \tag{3.12}$$

where $U_{i,y}$ and $\widetilde{U}_{i,y}$ give observed and predicted indices, respectively, and

$$\sigma^2_{i,y} = \log(1 + \mathrm{CV}^2_{\mathrm{i,y}}) + \sigma^2_i + \sigma^2_{\mathrm{overall}}. \tag{3.13}$$

Here, $\sigma^2_{\mathrm{overall}}$ gives an (estimated) baseline level of variance which is applied to all indices, $\mathrm{CV}_{i,y}$ gives the observed CV reported along with index *i* in year *y* (for example, as a byproduct of the CPUE standardization process), and σ^2_i gives an estimated "additional" level of process variance for index *i* that is unaccounted for in observed CVs. Typically, it will not be possible to estimate $\sigma^2_{\mathrm{overall}}$ and σ^2_i in the same model run.

Process errors—Process errors for *F* were included as part of the random walk model for *F* (described in section 3.1.3). The objective function contribution for these deviations was given by

$$\Lambda_2 = 0.5 \sum_{1976 \le y \le 1999,\, 2001 \le y \le 2015} \frac{(\varepsilon_y - \rho\varepsilon_{y-1})^2}{0.1} + \log(0.1). \tag{3.14}$$

Prior distributions—The following set of prior distributions was implemented:

- Historical *F*-effort relationship (see Equation 3.7): $p(\beta_1)$: Uniform(0,0.7)
- Pup survival at low biomass: $p(\exp(-M_0))$: Lognormal(median = 0.814, CV = 0.3)
- Catchability: $p(q_i)$: Uniform(0.0001, 100)
- Additional variance: $p(\sigma^2)$: Uniform(0, 2.0)
- Depletion in 1975: $p(B_{1975})$: Lognormal(median = 0.83, CV = 0.2).

The total contribution for prior distributions to the objective function was then

$$\Lambda_3 = \log(p(\beta_1)) + \log(p(\exp(-M_0))) + \sum_i \log(p(q_i)) + \sum_i \log(p(\sigma^2_i)) + \log(p(\beta_{1975})) \tag{3.15}$$

Penalties and constraints—The following set of penalties was implemented:

- Penalty for $F_{2000} > F_{1999}$. A penalty was implemented to mirror the a priori notion that fishing mortality rates should decrease following prohibition of dusky landings: $P_1 = I_{F_{2000} > F_{1999}} (F_{2000} - F_{1999})^2 \times 1000$
- Penalty for apical F exceeding 1.0: $P_2 = \sum_y I_{Fapical_y > 1.0} (Fapical_y - 1.0)^2 \times 1000$

The total contribution for penalties was then $\Lambda_4 = P_1 + P_2$. The additional constraint $F_{2015} = (F_{2014} + F_{2013} + F_{2012})/3$ was also made, since retrospective runs suggested the terminal fishing mortality estimate was subject to substantial negative bias.

The model started in 1960 and ended in 2015, with the historic period covering 1960-1974, the first modern period spanning 1975-1999, and the second modern period spanning 2000-2015. Estimated model parameters were pup (age-0) survival, catchability coefficients associated with indices, a parameter representing the slope of the relationship between PLL effort and fishing mortality for the period 1960-1979, additional variance parameters for each index, relative depletion in 1975, and fishing mortality in the modern periods. Fishing mortality starting in 1980 was modeled using a correlated random walk and so are not 'full' parameters. Pup survival (see above) was given an informative lognormal prior with median=0.81 (mean=0.85, mode=0.77), a CV of 0.3, and was bounded between 0.50 and 0.99.

A list of estimated model parameters is presented in Table 3.1 (other parameters were held constant and thus not estimated, see section 3.2). The table includes predicted parameter values and their associated SDs from ASCFM, initial parameter values, minimum and maximum values a parameter could take, and prior densities assigned to parameters.

3.1.5. Uncertainty and Measures of Precision

Initial model runs were made by maximizing the joint posterior (minimizing the negative of the objective function) using AD Model Builder software (Otter Research Ltd. 2004). Subsequent runs attempted to better quantify uncertainty by estimating marginal posterior distributions for key assessment parameters. We used the "likelihood profiling" procedure in AD Model Builder, which attempts to directly integrate the joint likelihood function. This procedure was used to quantify uncertainty in terminal stock status, terminal fishing mortality, and productivity parameters for the base run and the four plausible alternative states of nature referred to in the TORs for this update.

More specifically, the SEDAR 21 CIE review identified five scenarios, including the base run, as plausible states of nature (see the SEDAR 21 HMS Dusky Shark Assessment Report, their section V Table 7 and their section VI Table 6.3). Consequently, for this update, uncertainty in data inputs and model configuration was examined through the updated analysis of the five scenarios reflective of plausible states of nature previously identified and approved in the preceding SEDAR 21 assessment: (1) the base scenario; (2) a high natural mortality scenario; (3) a U-shaped natural mortality curve allowing senescence; (4) a high productivity scenario; and (5) a low productivity scenario. These sensitivities consisted of the following:

1. Base scenario—The base scenario as described above.

2. High natural mortality scenario—The base run used a "maximum survival" approach to derive natural mortality estimates to ensure producing a positive population growth rate in the absence of fishing. However, model runs using this natural mortality vector tended to result in estimates of productivity that were a little higher than expected for typical long-lived shark species (steepness estimates were typically in the 0.45-0.55 range in contrast to expected levels in the 0.25-0.35 range; see e.g. Brooks et al. 2010). It thus seemed plausible that the assumed natural mortality values were too low. As an alternative, we solved for a constant c such that cM_a resulted in a virgin spawners-per-recruit value of 2.0 (which would impose a lower bound on e^{-M_0} of 0.5). For this sensitivity run, the base natural mortality vector was multiplied by the resulting estimate of $c = 1.342$.

3. U-shaped natural mortality scenario—Plots of abundance by age revealed a relatively large proportion of sharks that were forty years old or larger, which raised concerns that the results of the assessment might be unduly influenced by the presence of such a large cryptic biomass of mature, older individuals. Since older individuals are rarely encountered (likely due to a number of processes such as dome-shaped selectivity), it is difficult to assess the validity of the presence of such a cryptic biomass via standard survey methods. As one way of examining the importance of older classes in estimates of stock status, we conducted a sensitivity run with elevated rates of natural mortality for older age classes (representing senescence; Table 3.2).

4. High productivity scenario—Whereas the base run used a triennial reproductive cycle, 7.1 pups per reproductive female, and median pup survival of 0.81, this scenario assumed a more productive stock characterized by a biennial cycle, 10 pups per female, and median pup survival of 0.97.

5. Low productivity scenario—In contrast to scenario (4), this scenario assumed a less productive stock characterized by a triennial reproductive cycle, 4 pups per reproductive female, and median pup survival of 0.51.

3.1.6. Benchmark Calculations

Since reliable catch data are not available, the model is unable to scale to absolute levels of population biomass, and therefore cannot calculate an absolute level of MSY or SSF_{MSY}. Rather, it is possible to estimate MSY and SSF_{MSY} relative to the unexploited level of recruitment (R_0). This is done as follows.

First, the vector of vulnerability used for equilibrium calculations is derived from the vector of total age-specific fishing mortality in the final year of the model:

$$\dot{v}_a = \frac{F_{a,y}}{\max\{F_{a,y}\}} \tag{3.16}$$

Next, the value of fishing mortality ($\tilde{F}_{MSY}$) that generates the maximum sustainable relative yield (MSY/R_0) is found by solving

$$\frac{MSY}{R_0} = \max_F \left\{ \frac{\dot{R}_F}{R_0} \sum_a w_a F \dot{v}_a \frac{1-\mathrm{e}^{(-M_a - F\dot{v}_a)}}{M_a + F\dot{v}_a} \mathrm{e}^{(-\sum_{i=0}^{a-1}(M_i + F\dot{v}_i))} \right\} \tag{3.17}$$

In the above expression, the term to the right of the summation is simply the calculation of yield per recruit for a given fishing mortality, F; this then gets scaled by the relative equilibrium recruitment that results from that F, R_F. Relative equilibrium recruitment can be calculated from

$$\frac{\dot{R}_F}{R_0} = \tilde{r}_F = \frac{\tilde{s}_F}{SPR_F} \tag{3.18}$$

where SPR_F is simply the ratio of pups per recruit with fishing mortality F to pups per recruit with $F = 0$ (eq. 3.4), i.e.

$$SPR_F = \frac{\sum_{age} fec_{age} \cdot mat_{age} \prod_{j=1}^{age-1} \mathrm{e}^{(-M_j - Fv_j)}}{\sum_{age} fec_{age} \cdot mat_{age} \prod_{j=1}^{age-1} \mathrm{e}^{(-M_j)}} = \frac{\varphi_F}{\varphi_0} \tag{3.19}$$

Finally, in (3.18), the equilibrium number of relative spawners at fishing mortality F ($\tilde{s}_F$) can be calculated by dividing eq. (3.2) by r and then solving for s:

$$\tilde{s}_F = \frac{e^{-M_0}\varphi_0 SPR_F - 1}{e^{-M_0}\varphi_0 - 1} \tag{3.20}$$

Replacing the term for relative recruitment in (3.17) with $\tilde{s}_F$ /SPR$_F$ and solving for the F that maximizes the expression, results in the equilibrium estimate of relative MSY.

The minimum spawning stock threshold (MSST) is typically calculated as (1-M)*SSF$_{MSY}$ when absolute spawning stock fecundity is estimable. Although only relative estimates are possible here (i.e., SSF$_{2015}$/SSF$_{MSY}$), it is still possible to calculate SSF$_{2015}$/SSF$_{MSST}$ as described above. Since natural mortality was assumed to be age-specific in this assessment, we calculated an age-independent M as $\overline{M}_a$ for ages 1-40. This procedure results in the same cumulative survivorship up to the plus group (age A=40) for the two approaches (age specific vs. age independent). Specifically, we used a value of M=0.066 for all MSST calculations.

3.1.7. Projection Methods

Projections were conducted for the updated analysis of the five scenarios reflective of plausible states of nature previously identified and approved in the preceding SEDAR 21 assessment, (see section 3.1.5 of this report). Projections were governed with the same set of population dynamics equations as the original assessment model, but allowed for uncertainty in initial conditions at the beginning of the time series (that is, in 2015) as well as in underlying productivity. Projections were run using Monte Carlo bootstrap simulation, where initial biomass (B_{2015}^{boot}), fishing mortality (F_{2015}^{boot}), and pup survival at low biomass ($\exp(-M_0)_{2015}^{boot}$) were sampled from a multivariate normal distribution with expectations equivalent to posterior modes from the updated analysis of the five scenarios reflective of plausible states of nature, and standard deviations set to the posterior standard deviation (obtained numerically by rejection sampling of the "profile likelihood" posterior approximation). Covariance values were obtained from the Hessian approximation of the variance-covariance matrix at the posterior mode. The multivariate normal approximation was chosen because it reduces the probability of selecting values of the different parameters that are unlikely to have generated the data (for instance, high fishing mortality and low pup survival).

Since the ASCFM is on an arbitrary scale, it at first appears difficult to provide any advice on landings, annual biological catch, or catch limits. However, managers often need such information to set quotas. As in SEDAR 21, we thus scaled the ASCFM estimates of abundance to levels that would best explain observed removals in years where managers had the most confidence in reported catch using the same techniques previously identified and approved during the preceding SEDAR 21 assessment. In particular, we estimated a scaling parameter ψ to match observed removal data from 1993 to 1998. These years were chosen because they were after catch reporting was mandatory, but before landings of dusky sharks were prohibited (after which, removals were purportedly negatively biased). To do this, total removals in dressed weight (including both landings and discards) were input into the ASCFM, and a value of ψ was estimated that minimized

$$\Lambda_5 = 0.5\sum_i \sum_y \frac{(\log(C_{i,y}) - \log(\tilde{C}_{i,y}))^2}{\sigma_C^2} + \log(\sigma_C^2) \ , \tag{3.21}$$

where $C_{i,y}$ and $\tilde{C}_{i,y}$ were observed and predicted catches, respectively. The variance term σ_C^2 was set to a large value (2,000,000) so that the catch data did not affect estimation of any parameter but ψ. Catches were predicted using the Baranov catch equation:

$$\tilde{C}_{i,y} = \psi \sum_a N_{a,y} \frac{F_{a,y}}{Z_{a,y}} (1 - \exp^{-Z_{a,y}}) w_a, \tag{3.22}$$

where w_a is dressed weight at age. A comparison of observed to predicted catch data (Fig 3.1) shows the ASCFM predicted catches throughout the entire time series when scaled in this manner for the base model configuration. Using this formulation, ψ was estimated at 5705.9 for the base model configuration. For each scenario, a scalar parameter ψ was estimated as in Equations 3.21 and 3.22 to scale up abundance to the level of absolute removals.

Projections were started in 2015 and used 10,000 Monte Carlo bootstrap simulations with initial values drawn from a multivariate normal distribution (described above). Moments of the bootstrap runs were summarized using quantiles, with median used for the central tendency, and the 30th percentile used as the criterion for whether a projection had a 70% chance of rebuilding by the rebuilding year.

Projections were conducted for the five scenarios reflective of plausible states of nature in order to examine the utility of different rebuilding strategies under each scenario and to characterize uncertainty as to these underlying "states of nature" and encapsulate the range of possible underlying productivity, mortality, and states of the stock in the terminal year of the assessment. For each scenario, we estimated the following:

(1) The year in which $F = 0$ would result in a 70% chance of recovery (Year$F$=0_{p70})

(2) The target rebuilding year, which was calculated as $\text{Year}_{\text{rebuild}}$ = (Year$F$=0_{p70})+40 (generation time is estimated at 40 years, as described below)

(3) The fixed annual fishing mortality rate (apical F) that would allow recovery of the stock with a probability of 0.5 by $\text{Year}_{\text{rebuild}}$ (F-$\text{Year}_{\text{rebuild}}$ P50)

(4) The fixed annual fishing mortality rate (apical F) that would allow recovery of the stock with a probability of 0.7 by $\text{Year}_{\text{rebuild}}$ (F-$\text{Year}_{\text{rebuild}}$ P70)

(5) The fixed annual level of total removals in lb dressed weight (total allowable catch) that would allow recovery of the stock with a probability of 0.5 by $\text{Year}_{\text{rebuild}}$ (TAC-$\text{Year}_{\text{rebuild}}$ P50)

(6) The fixed annual level of total removals in lb dressed weight (total allowable catch) that would allow recovery of the stock with a probability of 0.7 by $\text{Year}_{\text{rebuild}}$ (TAC-$\text{Year}_{\text{rebuild}}$ P70)

All projections assumed the selectivity function for 2015; projections thus assume that the current allocation of effort within the fishery (between fleets) stays the same. They also assumed that any change in management would not take effect until 2019 (estimated 2015 fishing levels were thus assumed for 2015-2018).

Generation time is often needed for certain calculations regarding possible rebuilding times, and was calculated using the formula:

$$\frac{\sum_x l(x)b(x)x}{\sum_x l(x)b(x)}, \qquad (3.23)$$

where *l(x)* is cumulative survival to age *x*, and *b(x)* is female pup production per female by age (cf., Gotelli 2001). Using this method, generation time was calculated as 40.5 in the SEDAR 21 assessment, which is considerably larger than the value obtained from an earlier 2006 assessment (for which generation time was computed as 30 years). This difference is largely a result of accounting for a large number of age classes in the SEDAR 21 assessment calculation. If generation time is instead calculated with a maximum age of 40, generation time is 29, and more along the lines of the 2006 assessment.

3.2. RESULTS

3.2.1. Measures of Overall Model Fit

Estimates of additional variance were negligible for the LPS index and relatively small for the BLLOP index, indicating lower levels of process error (Table 3.1). As a result, the assessment model tended to 'key in' on these indices and fit them better (Figure 3.2). In contrast, additional variance was estimated to be considerably larger for the PLLOP and VIMS indices, and especially for the NELL survey, indicating substantial process error not accounted for in input CVs. As such, fits to these indices were quite poor (Figure 3.2).

In general, the ASCFM was unable to fit any of the indices perfectly. The reproductive constraints of the species (i.e., low fecundity) limits the stock's capability to dramatically increase in abundance from year to year, making it difficult to match some of the observed index patterns (e.g., large interannual fluctuations in some time series).

3.2.2. Parameter Estimates and Associated Measures of Uncertainty

A list of model parameters is presented in Table 3.1. The table includes predicted parameter values with associated SDs, initial parameter values, minimum and maximum allowed values, and prior density functions assigned to parameters. Priors designated as constant were estimated as such; parameters that were held fixed (not estimated) are described elsewhere (e.g., see section 2 of this report) and are not included in this table.

3.2.3. Stock Abundance and Recruitment

Predicted stock abundance at age relative to unfished equilibrium (virgin) numbers at age (relative abundance) is presented in Table 3.3 and Figure 3.3. Recruitment is assumed to occur at age 1, and predicted recruitment relative to virgin conditions (relative recruitment) is presented in Table 3.3. Recruitment is predicted to have remained at roughly virgin levels until the late 1980s, after which it progressively declined; by 2015, depletion in relative recruitment is estimated to be around 50% (only 50% of the virgin recruitment levels) and depletion in numbers ca. 65%. Declines in spawning stock fecundity (discussed below) are estimated to be partially compensated for by increases in pup survival (i.e., density dependent recruitment; Figure 3.4).

3.2.4. Total Stock Biomass and Spawning Stock Fecundity

Predicted total stock biomass relative to virgin conditions (relative biomass), and predicted spawning stock fecundity relative to virgin conditions (relative spawning stock fecundity; S_y in Equation 3.3) are presented in Table 3.3. All trajectories in Table 3.3 show relatively little depletion until the late 1980s; however, by 2015, depletion in relative spawning stock fecundity is estimated to be around 81% (only 19% of the virgin stock remaining) and depletion in relative biomass ca. 73%.

3.2.5. Fishery Selectivity

As explained in section 2.1 and shown in Table 2.1 and Figure 2.2, selectivities are estimated externally to the model and a functional form inputted for each fleet and index. In Figure 2.2 one can see that most indices fully select for immature animals.

3.2.6. Fishing Mortality

Predicted apical fishing mortality rates are presented in Table 3.4 and Figure 3.5. Fishing mortality was low from 1960 through the early 1980s, and then is estimated to have ramped up to unsustainably high levels in the l990s (see section 3.2.9), and to have declined following prohibition of dusky landings in 2000. The moratorium on dusky shark catch appears to have been an effective management tool in this regard, although terminal estimates of fishing mortality still indicate the stock is undergoing overfishing (see section 3.2.9).

3.2.7. Stock-Recruitment Parameters

The estimated maximum theoretical pup (age-0) survival (i.e., that would occur as biomass approaches zero) obtained from the base run of the updated dusky shark ASCFM was 0.88 (Tables 3.1 and 3.6; Figure 3.6). The corresponding Beverton-Holt steepness value ($h=\hat{\alpha} / (4+\hat{\alpha})$); see section 3.1.3) was 0.51 (Table 3.5), which is substantially higher than the ca. 0.25-0.35 range that has been reported for several long-lived elasmobranchs (see, e.g., Brooks et al. 2010;

Cortés et al. 2015). See section 3.2.3 above and the next section for further discussion on pup survival.

3.2.8. Evaluation of Uncertainty

Estimates of asymptotic standard errors for all model parameters are presented in Table 3.1. Posterior distributions for several model parameters of interest were obtained through likelihood profiling as implemented in AD Model Builder. Prior and posterior distributions for pup survival are shown in Figure 3.6. There appeared to be information in the data since the posterior is different from the prior. The mode for the posterior of pup survival was estimated at a higher value than the prior mode.

Posterior distributions were also obtained for several benchmarks (Figure 3.7). The distribution for relative spawning stock fecundity (SSF_{2015}/SSF_0) is fairly wide, but most of the density is concentrated between 0.05 and 0.40, indicating substantial depletion (i.e. 60 – 95%) for such a long-lived species. In contrast, posterior distributions for spawning stock fecundity relative to MSY and MSST levels (SSF_{2015}/SSF_{MSY} and SSF_{2015}/SSF_{MSST}, respectively) were much tighter, and indicated that relative spawning stock fecundity in 2015 was between 45 and 60% of MSY levels. The posterior for apical fishing mortality relative to MSY levels (F_{2015}/F_{MSY}) indicated considerable uncertainty in terminal estimates of fishing mortality relative to MSY levels (Figure 3.7).

Results of the five plausible states of nature are summarized in Table 3.5. Estimates of spawning stock fecundity relative to unfished equilibrium (SSF_{2015}/SSF_0) ranged from 0.14 (High Productivity scenario) to 0.32 (Low Productivity scenario). Estimates of spawning stock fecundity at MSY relative to unfished equilibrium (SSF_{MSY}/SSF_0) ranged from 0.28 to 0.47. Estimates of biomass-related benchmarks, defined here as spawning stock fecundity relative to MSY and MSST, ranged from 0.49 to 0.68 for SSF_{2015}/SSF_{MSY}, and 0.52 to 0.73 for SSF_{2015}/SSF_{MSST}. All five scenarios thus resulted in the same conclusion that the stock was overfished, providing evidence that stock status determination based on biomass-related point estimates is robust to changes in natural mortality and productivity.

Estimates of F_{MSY} ranged from 0.007 to 0.054. Stock productivity, expressed as steepness, ranged from 0.25 to 0.71. The High *M*, U-shaped *M*, and low productivity scenarios resulted in lower estimates of productivity, with steepness values ranging from 0.25 to 0.32. This level of productivity is more typical of levels expected a priori given the life history of the species (as described in section 3.1.5). In all, with the exception of the U-shaped *M* scenario, all scenarios found that the stock was still undergoing overfishing, although the estimates were imprecise (CVs>1).

We also performed "likelihood profiling" for the four alternative states of nature. Posterior probability distributions for SSF_{2015}/SSF_{MSST} were tight and indicated that spawning stock fecundity ranged from 0.45 to 0.80 of MSST levels overall. Posterior distributions for F_{2015}/F_{MSY} were also tight, with the exception of the low productivity scenario, and indicated that fishing mortality in 2015 was well above that corresponding to MSY levels, with mass well above 1.0 (Figure 3.8).

Examination of retrospective plots (Figures 3.9 and 3.10) suggested that there was relatively little retrospective pattern in estimates of relative spawning stock fecundity trajectories, although removal of one to five years of data resulted in larger terminal relative SSF than in the base run and the trajectories only coincided with that of the base run around 1980. There was more retrospective pattern in estimates of terminal apical fishing mortality rate, with removal of one, two, or three years of data predicting a lower terminal F than in the base run, but removal of four or five years greatly reducing the discrepancy

3.2.9. Benchmarks/Reference Points

Benchmarks and MSY reference points for the five plausible states of nature scenarios are summarized in Table 3.5 and detailed information is presented for the base run in Tables 3.6 and 3.7 and presented visually in Figures 3.11 and 3.12. As noted above, all runs clearly indicated an overfished stock (most of the density in the histograms indicated that $SSF_{2015} < SSF_{\mathrm{MSST}}$; Table 3.5 and Figures 3.7, 3.8). The estimates of current (2015) apical fishing mortality relative to MSY ($F_{2015}/F_{\mathrm{MSY}}$) in all the runs were very uncertain (CV = 0.83 – 1.51; Table 3.5), but, as discussed above, posterior distributions for the five runs all indicated that overfishing was still occurring (most of the density in the histograms indicated that $F_{2015} > F_{\mathrm{MSY}}$; Table 3.5 and Figures 3.7, 3.8).

The base model estimated that overfishing started occurring in 1984 ($F_{1984} > F_{\mathrm{MSY}}$) and has occurred ever since (Table 3.7 and Figure 3.12). The base run also indicated that the stock first became overfished in 2003 ($SSF_{2003} < SSF_{\mathrm{MSST}}$; Table 3.7 and Figure 3.11) All runs estimated that the stock is currently overfished ($SSF_{2015} < SSF_{\mathrm{MSST}}$) and, perhaps with the exception of the U-shape M run, that overfishing is still occurring (Table 3.5; Figures 3.13 and 3.14). These conclusions thus generally agree with those from SEDAR 21 (2011) and the preliminary 2006 assessment (Cortés et al. 2006).

3.2.10. Projections

Results of projections are summarized in Table 3.8 and Figures 3.15 – 3.19. The target year for rebuilding ($\mathrm{Year}_{\mathrm{rebuild}}$) ranged from 2086 to 2200 depending on the plausible state of nature for the projection scenario (Base, High M, U-shaped M, High Productivity, and Low Productivity). Projections under all scenarios suggested that fishing mortality would need to be reduced in order to meet rebuilding targets. Since removals are generally not known for this stock, this would most likely need to be accomplished using effort reductions. For example, projections for the low productivity scenario were the most extreme, indicating that the annual effort level would need to be reduced to about 9% of its current value to result in a 70% chance of stock recovery by $\mathrm{Year}_{\mathrm{rebuild}}$ =2200 (i.e., a reduction in apical F from 0.023 to around 0.002; Table 3.8 and Figure 3.19). In contrast, projections for the U-shaped natural mortality scenario suggested that a reduction of fishing mortality to about 55% percent of its current value would be required to rebuild the stock by $\mathrm{Year}_{\mathrm{rebuild}}$ = 2096 (i.e., a reduction in apical F from 0.019 to around 0.010; Table 3.8 and Figure 3.17). If catches predicted in the fixed removal scenarios using the scaling parameter ψ (see equation 3.22) are believed to be true, there would be a 70% probability that total catches ranging from ca. 3,200 to ca. 37,200 lb dw would allow stock recovery by the rebuilding year.

3.3. DISCUSSION

As was the case for the previously completed SEDAR 21 dusky shark assessment, an issue of concern regarding the indices of relative abundance, is that many of them show interannual variability that does not seem to be compatible with the life history of the species, suggesting that the GLMs used to standardize the indices did not include all factors to help track relative abundance, that the spatial scope of sampling is too limited to yield precise inference about stock-wide trends, and that the indices are tracking a particular segment of the population only. The poor fit to some of the indices is likely the result of the model attempting to reconcile different signals provided by different indices and fitting a more central tendency. The ASCFM estimated additional variance for each index, which helped to alleviate, but not solve, this problem.

The ASCFM for the five plausible states of nature indicated that dusky sharks are currently overfished and, except for one model run, that overfishing has been occurring since the mid-1980s. These conclusions largely mirror results from the previous assessments (SEDAR 21 and Cortés et al. 2006). While fishing mortality is estimated to have declined dramatically since the 1990s, fishing mortality in the six additional years of data available since SEDAR 21 took place did not continue to decline, but instead slightly increased. This was a consequence of the trends displayed by the updated indices of abundance (section 2.2), which showed a stable (LPS), slightly declining (BLLOP, PLLOP), and strongly declining (VIMS LL) trends since 2009, with only the NELL index, which consisted of two points only (2012 and 2014; Figure 2.3), showing a strongly increasing trend.

Estimates of biomass-based stock status were robust in all cases to changes in life history parameters determining productivity. Estimates of fishing mortality-based status were also robust to these changes, with the exception of the U-shaped *M* scenario, which predicted that the stock was only on the verge of undergoing overfishing. This is notable because the estimates of steepness obtained ranged from 0.25 for the low productivity scenario to 0.71 for the high productivity scenario, with values for the low productivity, high *M*, and U-shaped *M* scenarios ranging from 0.25 to 0.32, which are likely more representative of long-lived shark species such as the dusky shark (Brooks et al. 2010; Cortés et al. 2015).

The combination of some life-history parameters and the vulnerability of dusky sharks to the various gears long before they become mature suggest a population that cannot support much exploitation. However, the prohibition on catches in recent years appears to have reduced, but apparently not ended, overfishing. With the present allocation of effort among fishing sectors, projection results indicate that the stock appears to be capable of rebuilding by the end of the current rebuilding time period (2086-2200, depending on the scenario), and that it could sustain a small amount of fishing-related mortality during this period. Current estimates are that fishing mortality would have to be reduced to 0.002–0.042, which would take a 47–91% reduction in total effort (i.e., corresponding to a 47–91% approximate reduction in fishing mortality to achieve rebuilding with a 70% probability by $\text{Year}_{rebuild}$ for the five scenarios reflective of plausible states of nature; Table 3.8) These results are consistent with those from the previously completed SEDAR 21 assessment for dusky shark (see section VI: Addenda and post-review updates), which indicated reductions in *F* ranging from 47% to 97% were needed to achieve rebuilding with a 70% probability. How this could be achieved is not entirely clear, as most of the mortality now comes from commercial discards and possibly from recreational fisheries too.

We also provided an estimate of the total weight of removals associated with different reductions in total *F*, but caution that these are estimates only, and subject to considerable uncertainty because the data used to scale up to absolute abundance were themselves uncertain. If catches predicted in the fixed removal scenarios are believed to be true, there would be a 70% probability that total catches ranging from ca. 3,200 to ca. 37,200 lb dw would allow stock recovery by the rebuilding year (Table 3.8).

3.4. REFERENCES

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3.5. TABLES

Table 3.1. List of parameters estimated in the base run of the updated dusky shark ASCFM. The list includes predicted parameter values with associated SDs, initial parameter values, minimum and maximum allowed values, and prior density functions assigned to parameters. Priors designated as constant were estimated as such; parameters that were held fixed (not estimated) are not included in this table. Fishing mortality was modeled as an auto-correlated random walk so they are not 'full' parameters and thus not presented here. All SD estimates are based on a Hessian approximation to the numerically maximized posterior surface.

	Predicted					Prior pdf		
Parameter/Input name	Value	SD	Initial	Min	Max	Type	Value	SD(CV)
Pup (age-0) survival	8.81E-01	2.54E-01	8.14E-01	5.00E-01	9.90E-01	lognormal	0.814	(0.3)
Catchability coefficient LPS index	3.78E-01	1.16E-01	2.20E-02	1.00E-04	1.00E+01	constant	0	1
Catchability coefficient BLLOP index	1.61E-01	5.59E-02	3.20E-02	1.00E-04	1.00E+01	constant	0	1
Catchability coefficient VIMS LL index	1.56E-01	4.40E-02	7.41E-02	1.00E-04	1.00E+01	constant	0	1
Catchability coefficient NELL index	1.03E-01	6.75E-02	1.20E-02	1.00E-04	1.00E+01	constant	0	1
Catchability coefficient PLLOP index	1.81E-01	6.79E-02	1.70E+00	1.00E-04	2.00E+01	constant	0	1
Historic effort/F relationship	1.87E-02	2.23E-02	0.1	1.00E-13	0.7	constant	0	(0.5)
Additional variance LPS index	3.06E-08	4.33E-05	4.00E-01	0	2	constant	0	0.1
Additional variance BLLOP index	1.15E-02	1.14E-01	4.00E-01	0	2	constant	0	0.1
Additional variance VIMS LL index	6.95E-01	3.00E-01	4.00E-01	0	2	constant	0	0.1
Additional variance NELL index	2.00E+00	3.13E-03	4.00E-01	0	2	constant	0	0.1
Additional variance PLLOP index	8.23E-01	3.41E-01	4.00E-01	0	2	constant	0	0.1
Depletion in 1975	9.73E-01	3.19E-02	0.83	0	∞	lognormal	0.83	(0.202)

Table 3.2. Values of natural mortality (*M*, instantaneous natural mortality rate) at age used in the U-shaped *M* scenario (senescence).

Age	U-shaped M
1	0.137
2	0.124
3	0.114
4	0.106
5	0.099
6	0.093
7	0.088
8	0.083
9	0.079
10	0.076
11	0.073
12	0.070
13	0.068
14	0.066
15	0.064
16	0.062
17	0.061
18	0.059
19	0.058
20	0.057
21	0.069
22	0.081
23	0.093
24	0.104
25	0.115
26	0.125
27	0.134
28	0.144
29	0.152
30	0.160
31	0.168
32	0.175
33	0.182
34	0.188
35	0.193
36	0.198
37	0.203
38	0.207
39	0.211
40	0.214

Table 3.3. Predicted recruitment (Rec/Rec_0), abundance (N/N_0), total stock biomass (B/B_0), and spawning stock fecundity (SSF/SSF_0) obtained from the base run of the updated dusky shark ASCFM. Because the ASCFM is on a relative scale, model estimates of recruitment (in numbers; Equation 3.2), abundance (in numbers; Equation 3.9), total biomass (in kg; abundance multiplied by weight at age), and spawning stock fecundity (in numbers; Equation 3.3) are calculated relative to unfished equilibrium (virgin) levels.

Year	Rec/Rec_0	N/N_0	B/B_0	SSF/SSF_0
1960	1	1	1	1
1961	1.00	1.00	1.00	1.00
1962	1.00	1.00	1.00	1.00
1963	1.00	1.00	1.00	1.00
1964	1.00	1.00	1.00	1.00
1965	1.00	0.99	1.00	1.00
1966	1.00	0.99	0.99	1.00
1967	1.00	0.99	0.99	0.99
1968	1.00	0.99	0.99	0.99
1969	1.00	0.98	0.99	0.99
1970	1.00	0.98	0.99	0.99
1971	1.00	0.98	0.98	0.99
1972	1.00	0.98	0.98	0.99
1973	1.00	0.98	0.98	0.98
1974	1.00	0.97	0.98	0.98
1975	0.99	0.97	0.97	0.98
1976	0.99	0.96	0.97	0.97
1977	0.99	0.96	0.97	0.97
1978	0.99	0.96	0.96	0.96
1979	0.99	0.95	0.96	0.96
1980	0.99	0.95	0.95	0.95
1981	0.99	0.94	0.95	0.95
1982	0.99	0.94	0.94	0.94
1983	0.99	0.93	0.93	0.93
1984	0.98	0.92	0.92	0.92
1985	0.98	0.91	0.91	0.91
1986	0.98	0.89	0.90	0.90
1987	0.97	0.87	0.88	0.88
1988	0.97	0.85	0.86	0.86
1989	0.96	0.82	0.83	0.83
1990	0.95	0.79	0.80	0.80
1991	0.94	0.76	0.77	0.77
1992	0.93	0.73	0.74	0.74
1993	0.92	0.69	0.71	0.71
1994	0.91	0.66	0.67	0.67
1995	0.89	0.63	0.64	0.63
1996	0.88	0.59	0.60	0.59
1997	0.86	0.56	0.56	0.55
1998	0.84	0.52	0.52	0.51
1999	0.81	0.48	0.47	0.46
2000	0.78	0.44	0.43	0.42
2001	0.75	0.40	0.39	0.38
2002	0.72	0.38	0.36	0.35
2003	0.69	0.37	0.34	0.33
2004	0.67	0.36	0.33	0.31
2005	0.65	0.36	0.31	0.29
2006	0.63	0.36	0.31	0.28
2007	0.61	0.37	0.30	0.26
2008	0.60	0.37	0.30	0.25
2009	0.58	0.37	0.29	0.24
2010	0.57	0.37	0.29	0.23
2011	0.56	0.37	0.29	0.22
2012	0.54	0.37	0.28	0.21
2013	0.53	0.36	0.28	0.21
2014	0.52	0.36	0.27	0.20
2015	0.50	0.35	0.27	0.19

Table 3.4. Apical instantaneous fishing mortality rates (apical *F*) by year obtained from the base run of the updated dusky shark ASCFM.

Year	F
1960	0.001
1961	0.000
1962	0.002
1963	0.005
1964	0.009
1965	0.008
1966	0.005
1967	0.004
1968	0.006
1969	0.005
1970	0.006
1971	0.010
1972	0.007
1973	0.009
1974	0.013
1975	0.012
1976	0.012
1977	0.012
1978	0.011
1979	0.016
1980	0.018
1981	0.021
1982	0.024
1983	0.029
1984	0.036
1985	0.044
1986	0.056
1987	0.069
1988	0.084
1989	0.097
1990	0.107
1991	0.116
1992	0.124
1993	0.135
1994	0.151
1995	0.171
1996	0.196
1997	0.226
1998	0.256
1999	0.280
2000	0.280
2001	0.247
2002	0.195
2003	0.145
2004	0.107
2005	0.082
2006	0.066
2007	0.057
2008	0.053
2009	0.053
2010	0.055
2011	0.059
2012	0.065
2013	0.071
2014	0.075
2015	0.070

Table 3.5. Summary of stock status results obtained from the updated dusky shark ASCFM for the five scenarios reflective of plausible states of nature (Base, High *M*, U-Shaped *M,* High Productivity, and Low Productivity; see section 3.1.5 of this report for definitions of each scenario). Measures of relative spawning stock fecundity (SSF_{2015}/SSF_0 and SSF_{MSY}/SSF_0) are defined as in Equations 3.3 and 3.20, respectively. The minimum spawning stock threshold (SSF_{MSST}) is defined in section 3.1.6. The Beverton-Holt steepness value corresponding to the estimated maximum theoretical pup (age-0) survival (i.e., that would occur as biomass approaches zero) is also provided (see section 3.2.7). All estimates of CV are based on the numerical Hessian evaluated at the posterior mode.

	Base		High *M*		U-shaped *M*		High productivity		Low productivity	
	Est	CV	Est	CV	Est	CV	Est	CV	Est	CV
F_{MSY}	0.035	0.062	0.017	0.062	0.019	0.061	0.054	0.052	0.007	0.062
SSF_{MSY}/SSF_0	0.35	0.19	0.43	0.45	0.43	0.45	0.28	0.08	0.47	0.06
SSF_{2015}/SSF_0	0.19	0.53	0.26	0.36	0.29	0.36	0.14	0.65	0.32	0.37
SSF_{2015}/SSF_{MSST}	0.58	0.61	0.66	0.69	0.72	0.69	0.52	0.66	0.73	0.37
SSF_{2015}/SSF_{MSY}	0.54	0.61	0.61	0.69	0.67	0.69	0.49	0.66	0.68	0.37
F_{2015}/F_{MSY}	2.02	1.23	1.44	1.48	0.99	1.51	2.48	0.83	3.04	1.49
Pup survival	0.88	0.29	0.93	0.29	0.94	0.29	0.97	NA	0.51	NA
Steepness	0.51	0.14	0.32	0.20	0.32	0.20	0.71	NA	0.25	NA

Table 3.6. Summary of MSY quantities and management benchmarks obtained from the base run of the updated dusky shark ASCFM. All estimates of CV are based on the numerical Hessian evaluated at the posterior mode.

Quantity	Est	CV
SSF_{2015}/SSF_{MSY}	0.54	0.61
SSF_{2015}/SSF_{MSST}	0.58	0.61
F_{2015}/F_{MSY}	2.02	1.23
SPR_{MSY}	0.51	0.04
F_{MSY}	0.035	0.06
SSF_{MSY}/SSF_0	0.35	0.19
SSF_{MSST}/SSF_0	0.33	0.19
F_{2015}	0.070	1.23
N_{2015}/N_0	0.35	0.38
SSF_{2015}/SSF_0	0.19	0.53
B_{2015}/B_0	0.27	0.44
Pup survival	0.88	0.29
Alpha	4.14	0.29
$F_{20\%}$	0.085	0.07
$F_{30\%}$	0.063	0.06
$F_{40\%}$	0.048	0.06
$F_{50\%}$	0.036	0.07
$F_{60\%}$	0.026	0.07
SPR_0	4.70	NA

Table 3.7. Estimated temporal trends in stock status obtained from the base run of the updated dusky shark ASCFM for apical fishing mortality relative to MSY levels (F/F_{MSY}) and spawning stock fecundity relative to MSY and MSST levels (SSF/SSF_{MSY} and SSF/SSF_{MSST}, respectively).

Year	F/F_{MSY}	SSF/SSF_{MSY}	SSF/SSF_{MSST}
1960	0.02	2.83	3.03
1961	0.01	2.83	3.03
1962	0.06	2.83	3.03
1963	0.13	2.83	3.03
1964	0.25	2.83	3.03
1965	0.24	2.82	3.02
1966	0.13	2.82	3.02
1967	0.12	2.81	3.02
1968	0.17	2.81	3.01
1969	0.13	2.81	3.01
1970	0.18	2.80	3.00
1971	0.27	2.80	3.00
1972	0.21	2.79	2.99
1973	0.25	2.78	2.98
1974	0.37	2.77	2.97
1975	0.34	2.76	2.96
1976	0.34	2.75	2.95
1977	0.35	2.74	2.94
1978	0.33	2.73	2.93
1979	0.47	2.72	2.91
1980	0.51	2.70	2.90
1981	0.59	2.69	2.88
1982	0.70	2.67	2.86
1983	0.84	2.64	2.83
1984	1.03	2.61	2.80
1985	1.28	2.58	2.76
1986	1.60	2.54	2.72
1987	1.99	2.49	2.67
1988	2.41	2.43	2.60
1989	2.79	2.36	2.53
1990	3.09	2.28	2.44
1991	3.32	2.19	2.35
1992	3.56	2.10	2.25
1993	3.89	2.00	2.15
1994	4.35	1.90	2.04
1995	4.93	1.80	1.92
1996	5.65	1.68	1.80
1997	6.51	1.56	1.68
1998	7.37	1.44	1.54
1999	8.05	1.31	1.41
2000	8.05	1.19	1.28
2001	7.10	1.09	1.16
2002	5.62	1.00	1.07
2003	4.18	0.93	0.99
2004	3.08	0.87	0.93
2005	2.35	0.83	0.88
2006	1.90	0.79	0.84
2007	1.65	0.75	0.80
2008	1.53	0.72	0.77
2009	1.52	0.69	0.74
2010	1.59	0.66	0.71
2011	1.71	0.63	0.68
2012	1.87	0.61	0.65
2013	2.03	0.58	0.62
2014	2.15	0.56	0.60
2015	2.02	0.54	0.58

Table 3.8. Summary of projection results obtained for the updated dusky shark ASCFM for the five scenarios reflective of plausible states of nature (Base, High *M*, U-Shaped *M,* High Productivity, and Low Productivity; see section 3.1.5 of this report for definitions of each scenario).See section 3.1.7 of this report for definitions of YearF=0p70, $Year_{rebuild}$, *F*-$Year_{rebuild}$, and TAC-$Year_{rebuild}$. Total allowable catch (TAC) is total annual removals in lb dressed weight.

	Terminal conditions					*F*-$Year_{rebuild}$		TAC-$Year_{rebuild}$ (lb dressed weight)	
Scenario	F_{2015}	F_{2015}/F_{MSY}	SSF_{2015}/SSF_{MSY}	YearF=0p70	$Year_{rebuild}$	P50	P70	P50	P70
Base	0.070	2.02	0.54	2058	2098	0.027	0.023	33149	23802
High M	0.024	1.44	0.61	2087	2127	0.011	0.007	18772	10512
U-shaped M	0.019	0.99	0.67	2056	2096	0.014	0.010	29459	20349
Hi Prod	0.134	2.48	0.49	2046	2086	0.047	0.042	49533	37226
Low Prod	0.023	3.04	0.68	2160	2200	0.004	0.002	6944	3227

3.6. FIGURES

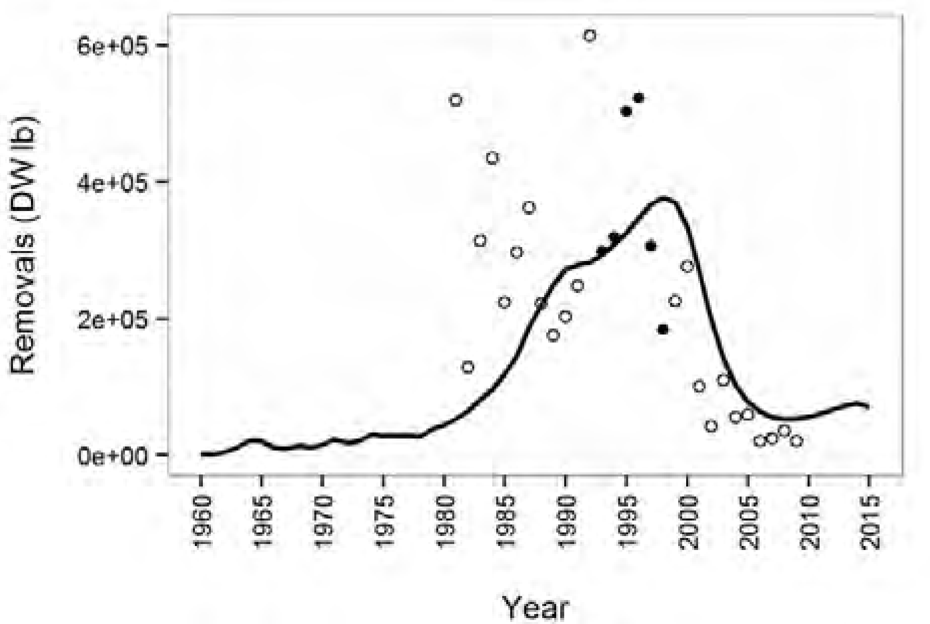
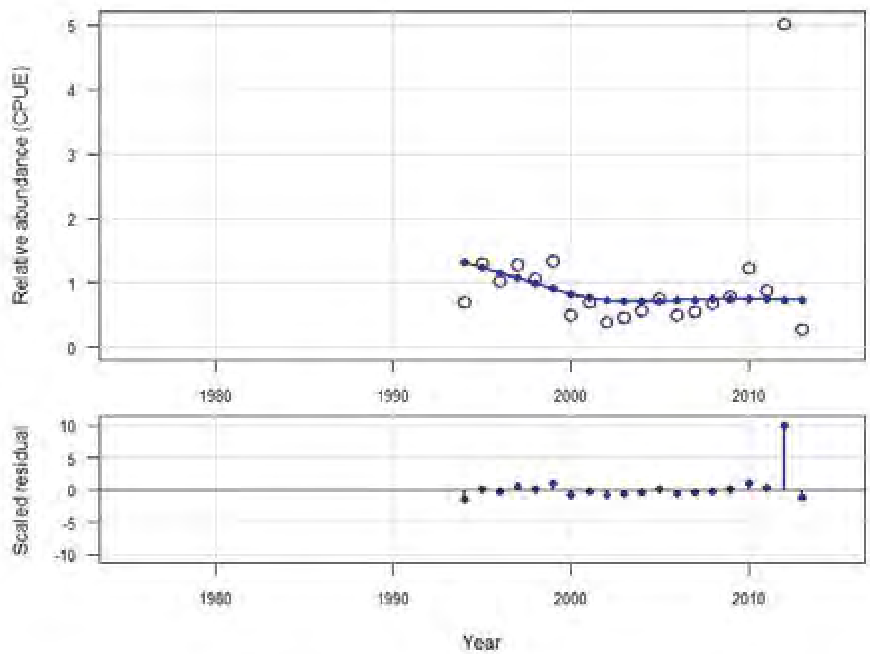


Figure 3.1. Predicted catches (total removals; black line) obtained from the base run of the updated dusky shark ASCFM when observed removals during 1993-1998 (solid points) are used to scale abundance levels up to the absolute scale. Open circles represent observed catches in other years. The estimated scaling factor is used to generate predicted removals for stock projections. Note that observed removals were thought to be unreliable in SEDAR 21, and thus not recommended for use in fitting stock assessment models. All values are in dressed weight (lb).

A. BLLOP



B. PLLOP

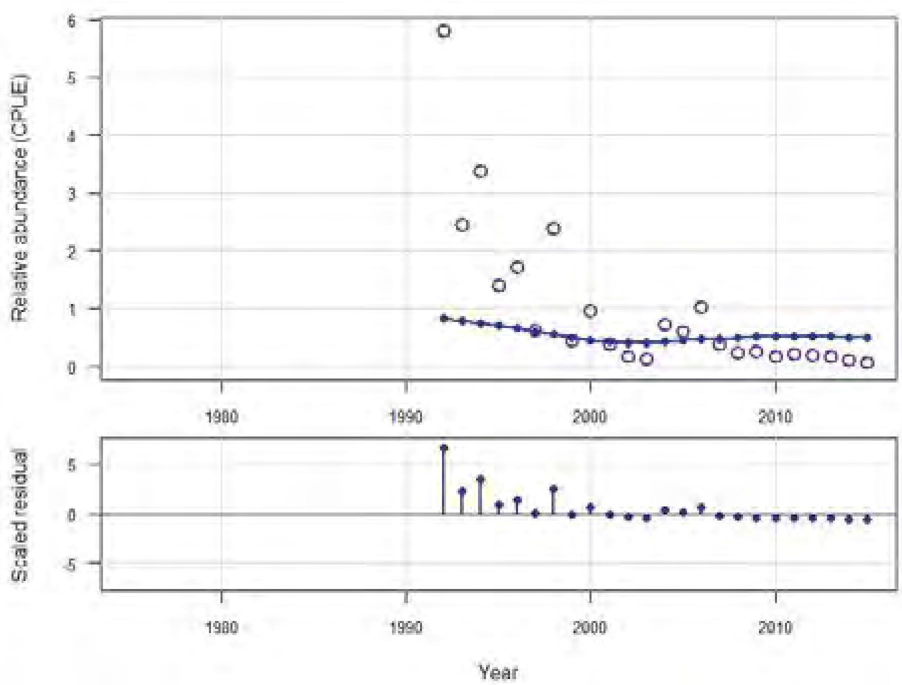
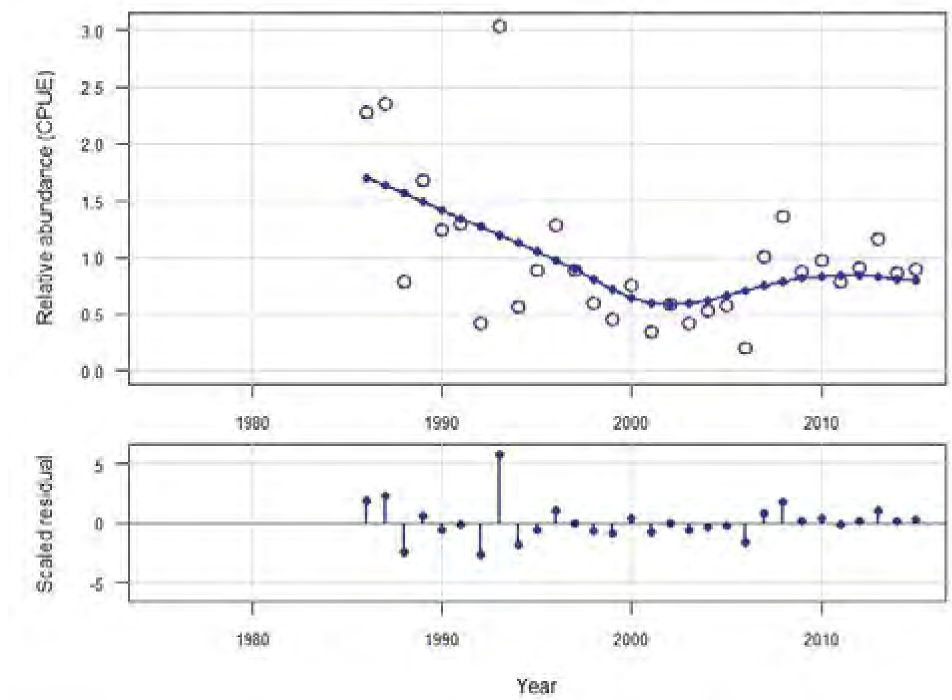


Figure 3.2. Fits to indices obtained from the base run of the updated dusky shark ASCFM. The line with solid circles denotes ASCFM predictions, while open circles denote observed values. Bottom panels give scaled residuals.

C. LPS



D. VIMS LL

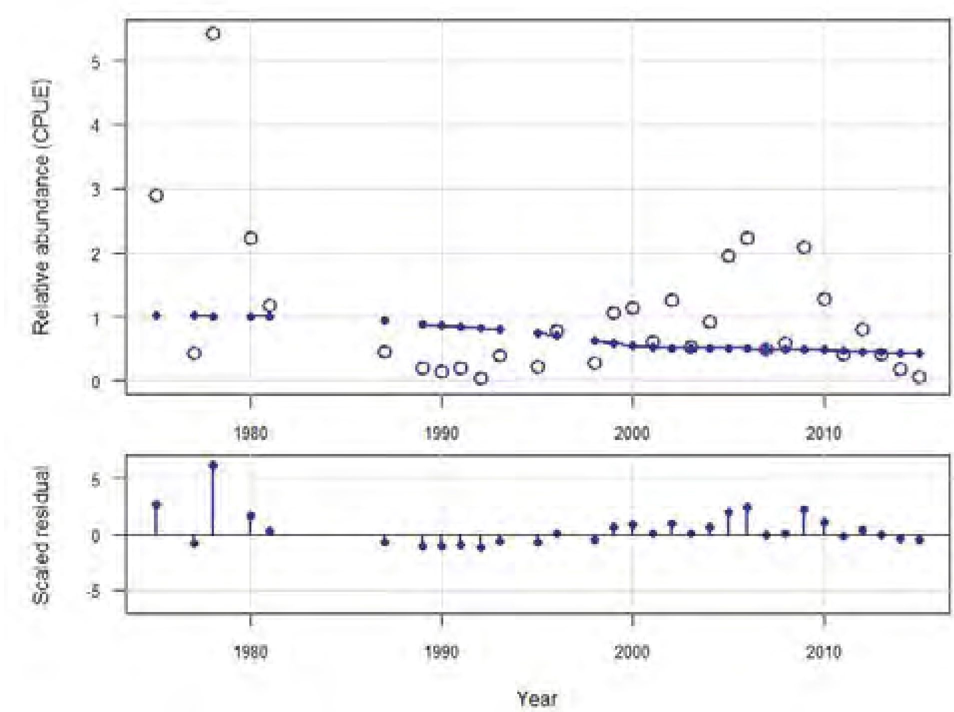


Figure 3.2. Fits to indices for the base run (continued).

E. NELL

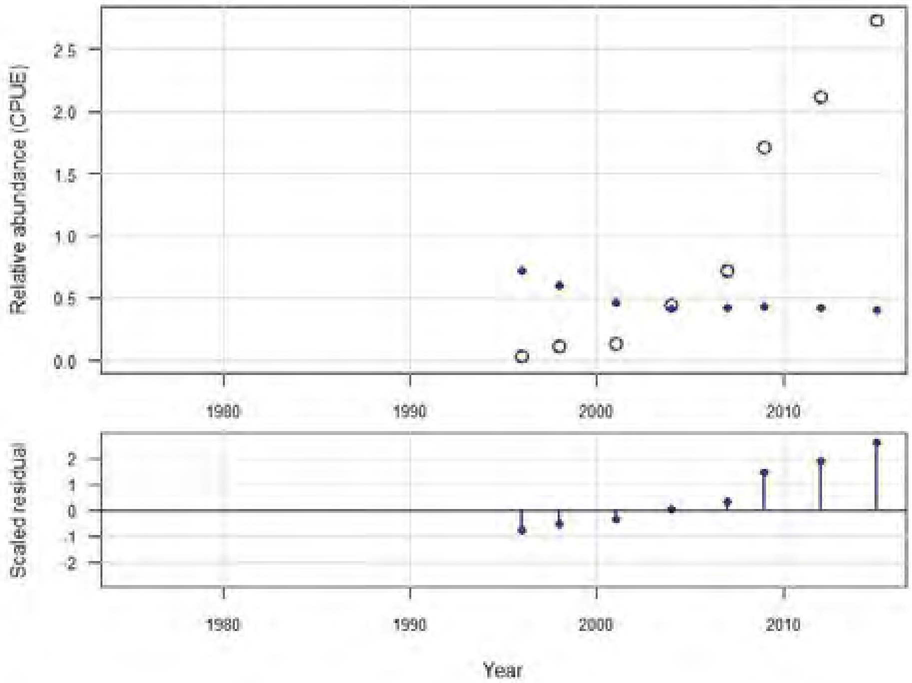


Figure 3.2. Fits to indices for the base run (continued).

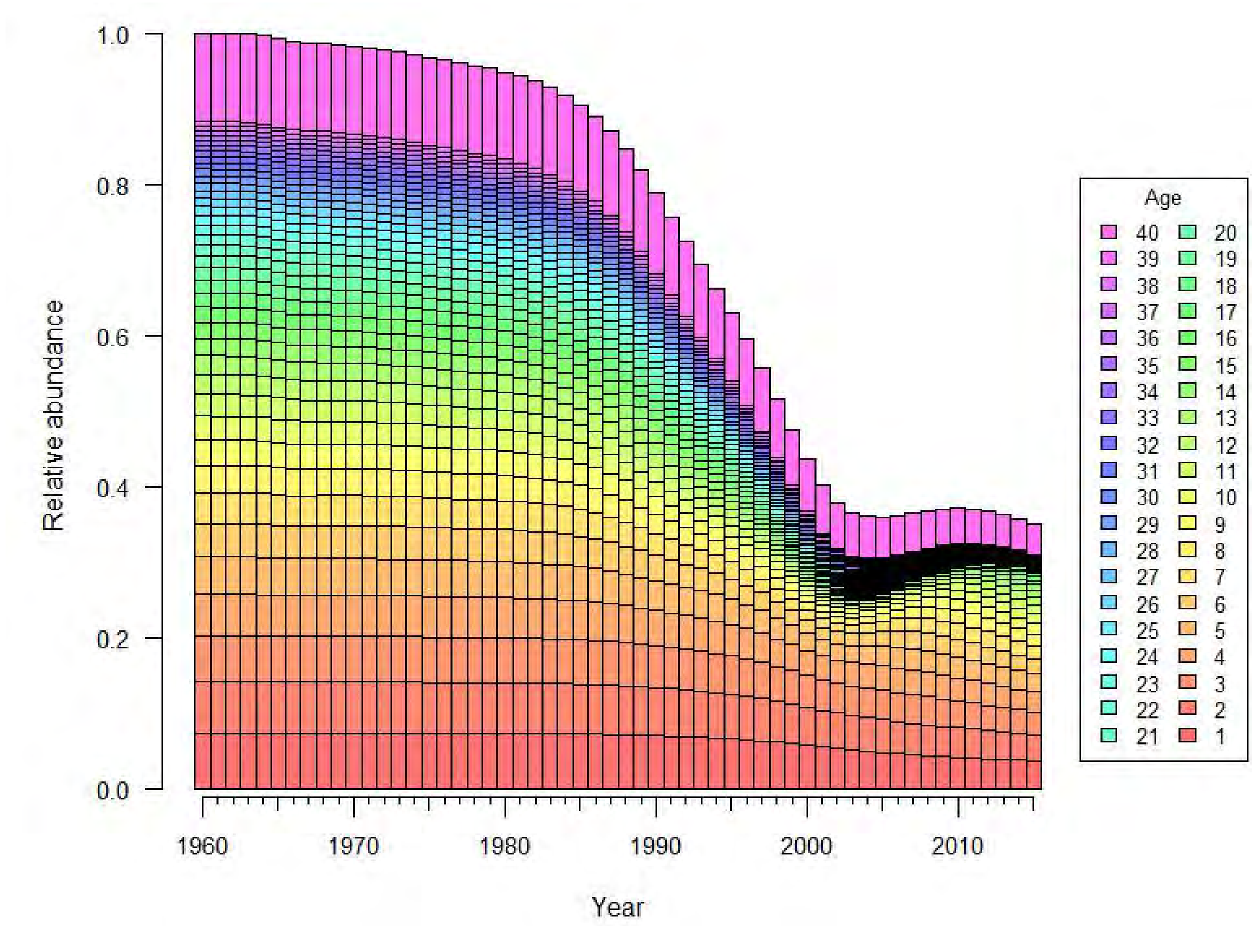


Figure 3.3. Predicted stock abundance at age relative to the unfished equilibrium (virgin) numbers at age (relative abundance) obtained from the base run of the updated dusky shark ASCFM, 1960 – 2015.

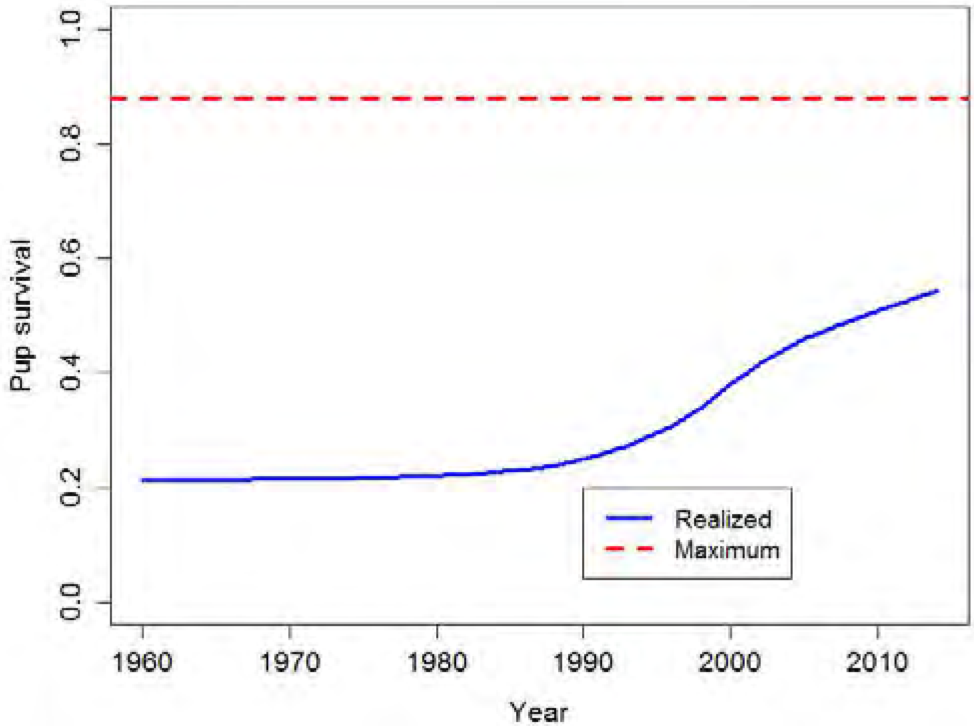


Figure 3.4. Realized pup survival for 1960 – 2014 predicted from the base run of the updated dusky shark ASCFM (Equation 3.11). Pup survival is assumed to be density dependent, with an estimated maximum theoretical value of 0.88 in the base run (Tables 3.1 and 3.6).

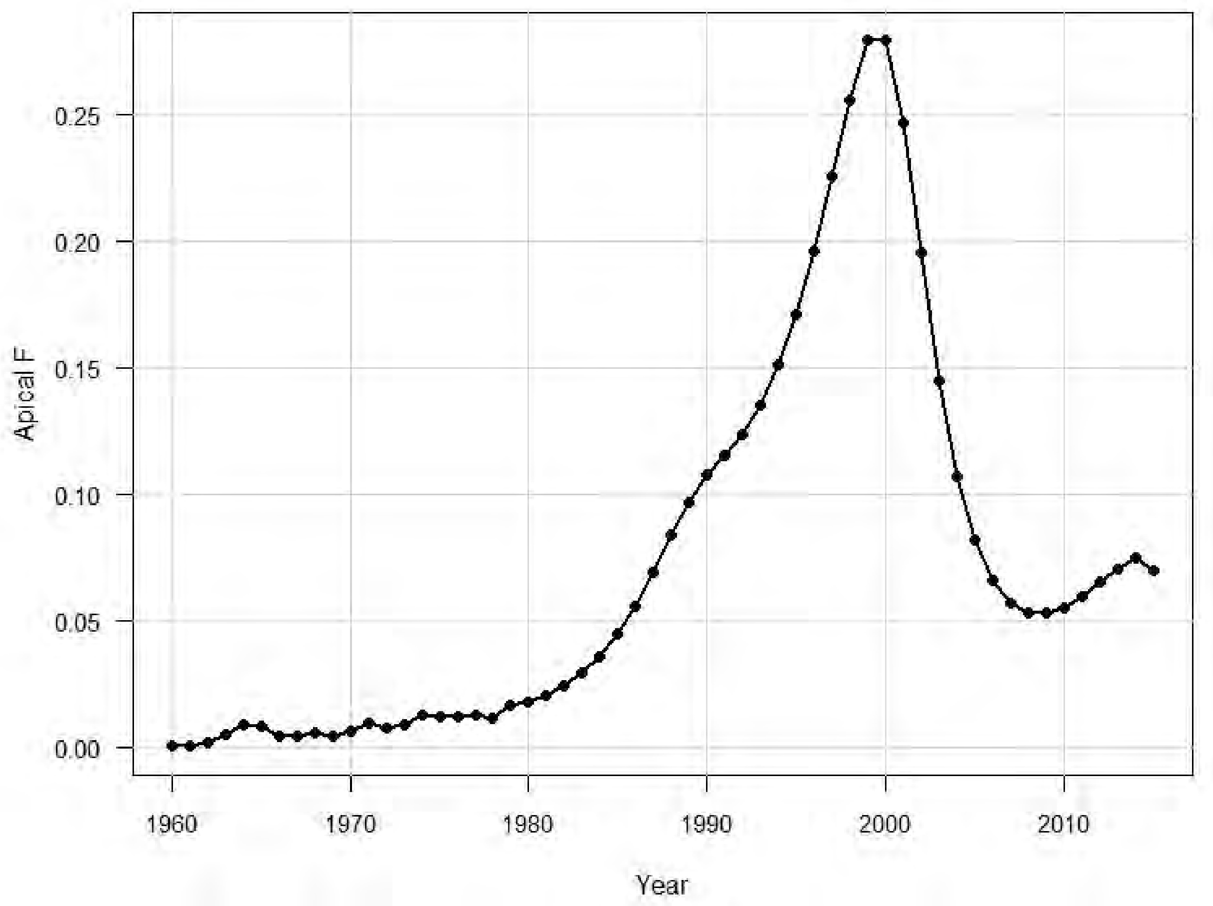


Figure 3.5. Apical instantaneous fishing mortality rate (apical *F*) by year obtained from the base run of the updated dusky shark ASCFM.

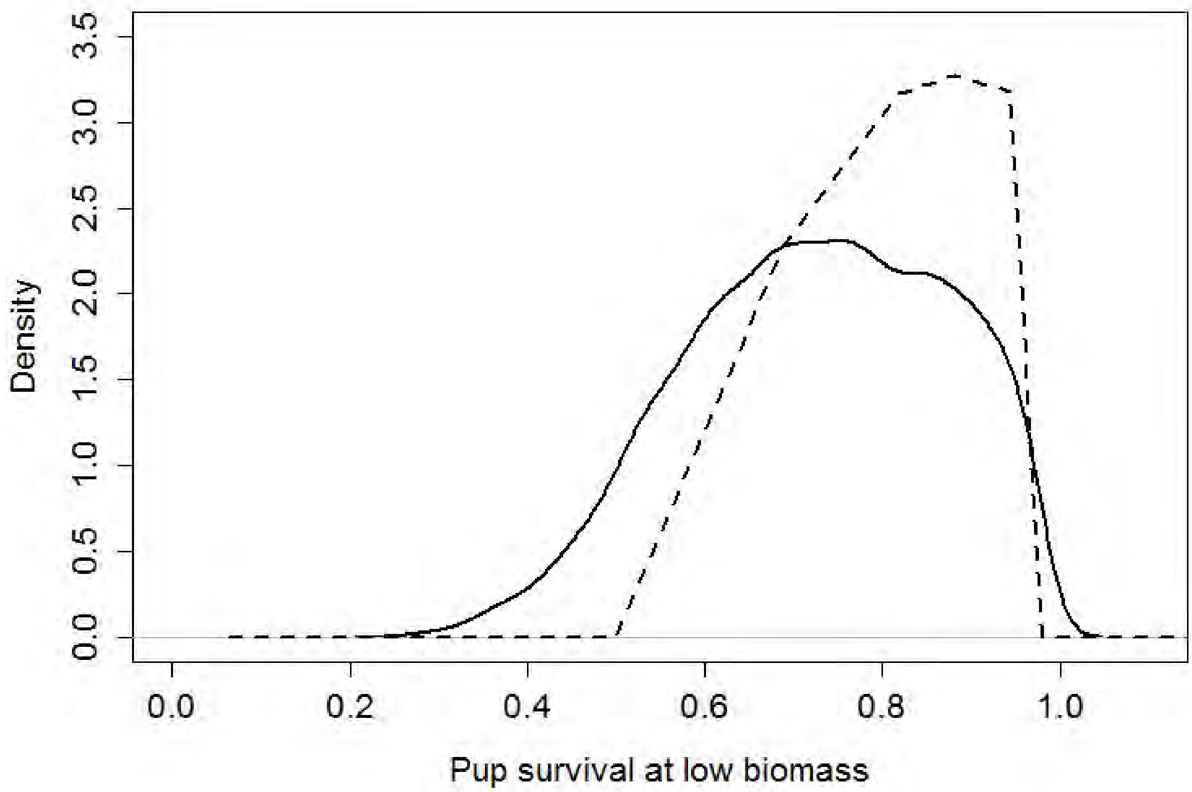


Figure 3.6. Prior (solid line) and estimated posterior distribution (dashed line) for pup survival at low stock size obtained from the base run of the updated dusky shark ASCFM. Pup survival at low stock size was constrained to be between 0.5 and 0.98.

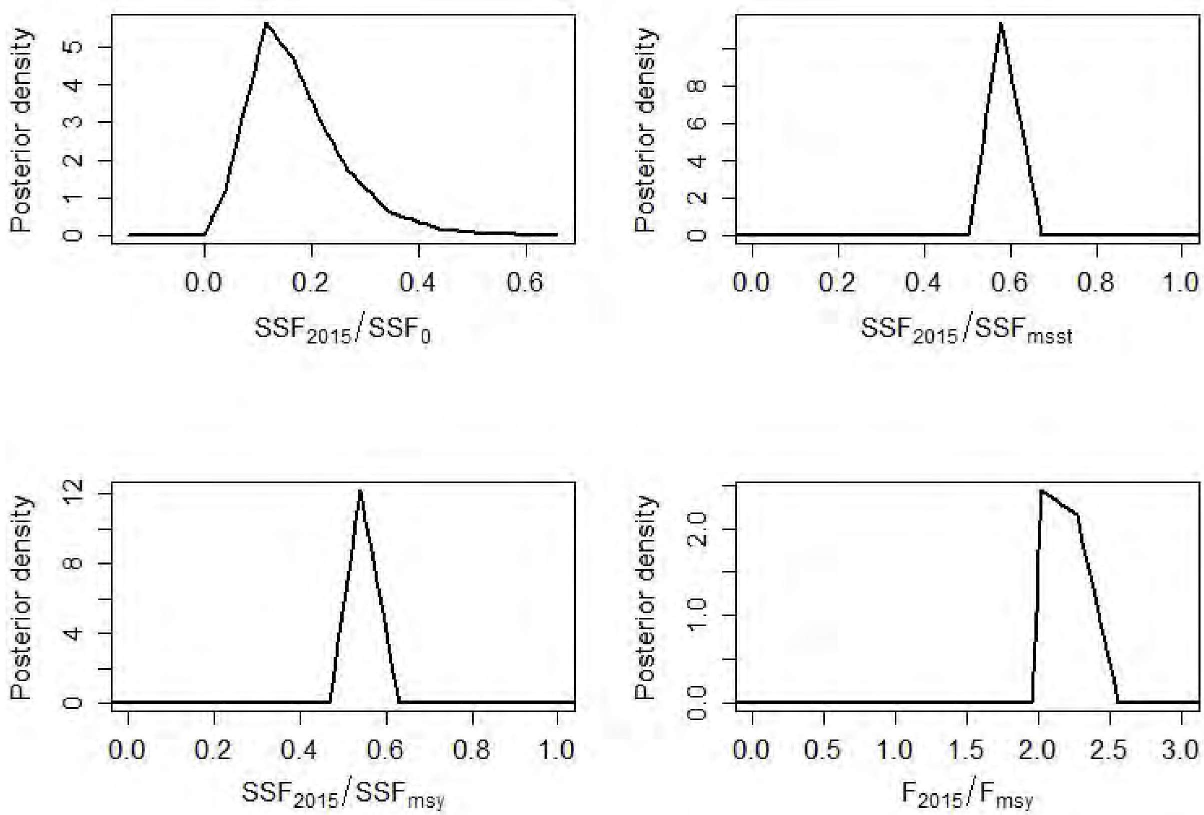


Figure 3.7. Estimated posterior distributions for stock status relative to management benchmarks obtained from the base run of the updated dusky shark ASCFM. Relative spawning stock fecundity (SSF_{2015}/SSF_0) is calculated as in Equation 3.3.

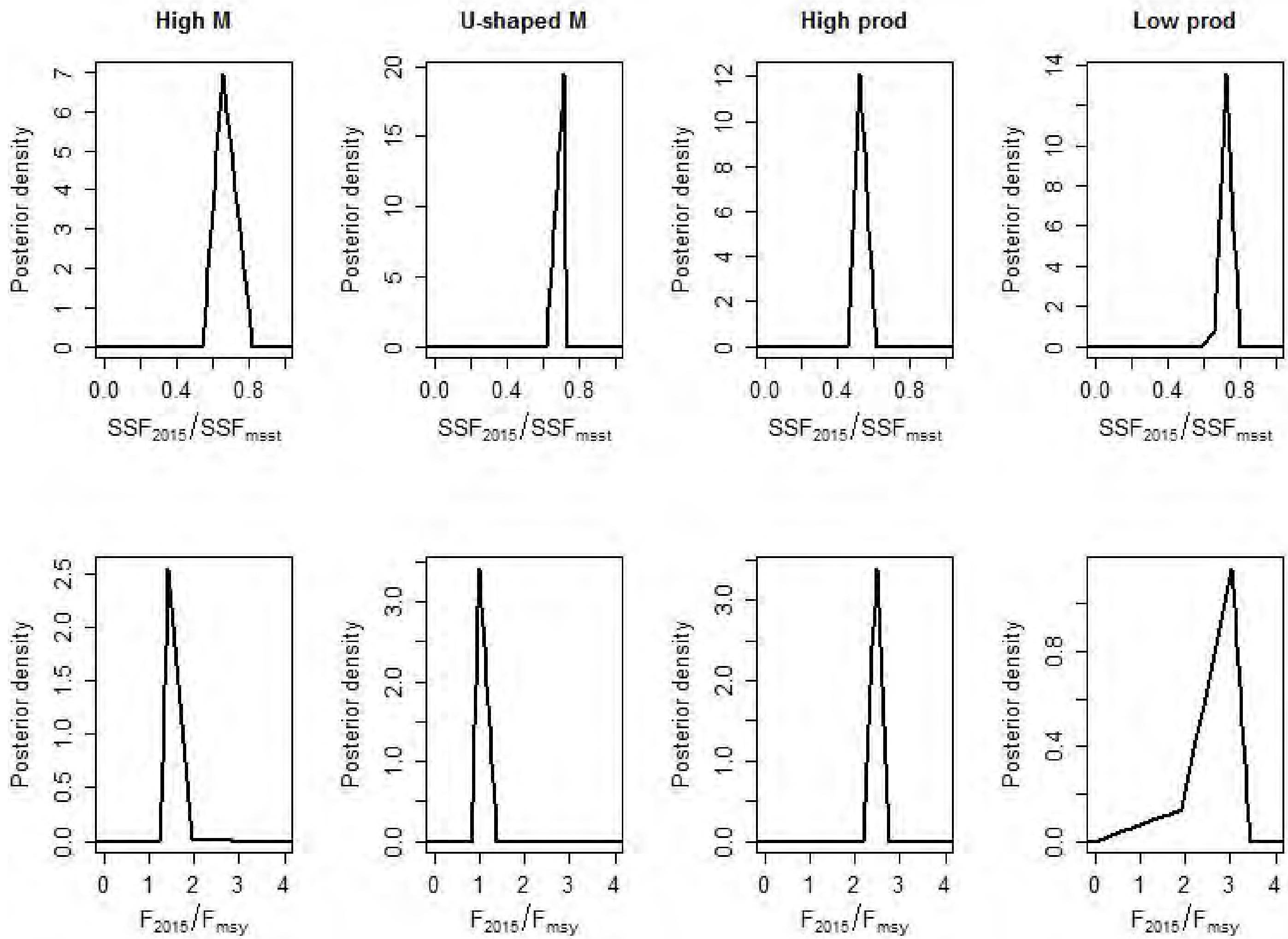


Figure 3.8. Estimated posterior distributions for stock status relative to management benchmarks (top panels: SSF_{2015}/SSF_{MSST}; lower panels: F_{2015}/F_{MSY}) obtained from the updated dusky shark ASCFM for four additional scenarios reflective of plausible states of nature (High *M*, U-Shaped *M,* High Productivity, and Low Productivity; see section 3.1.5 of this report for definitions of each scenario).

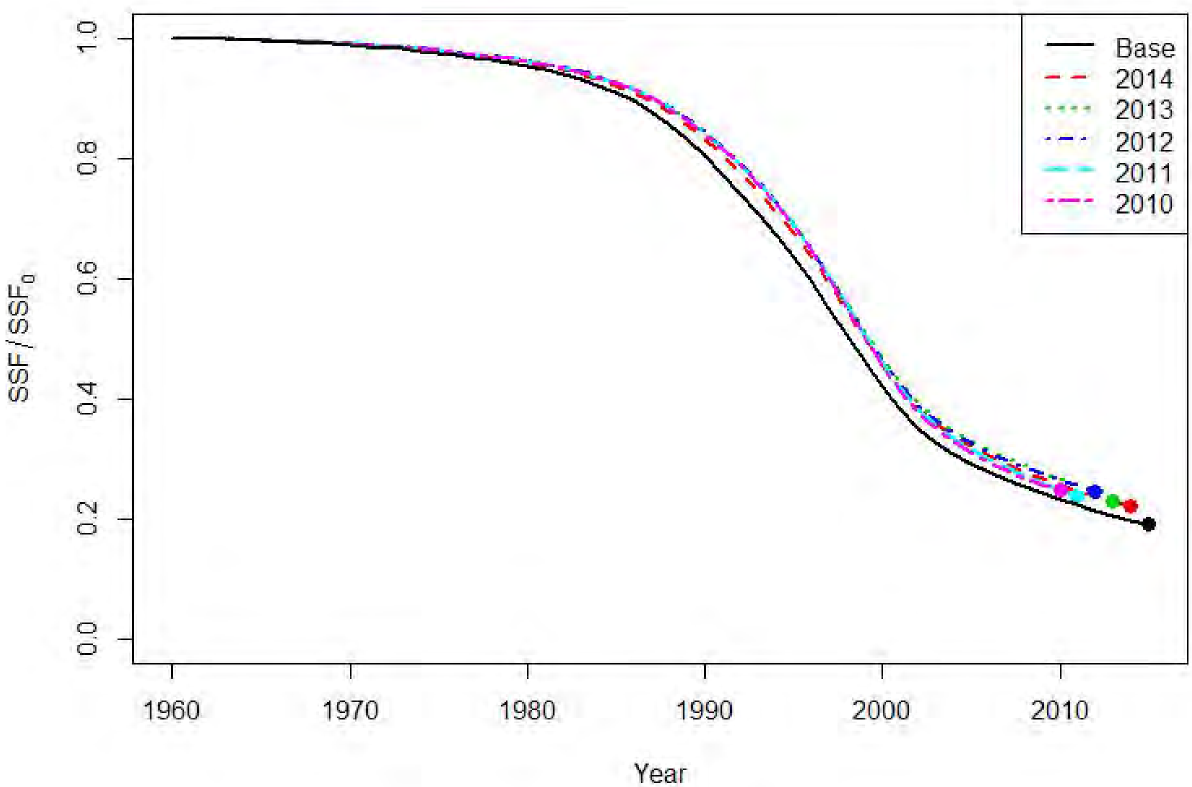


Figure 3.9. Retrospective pattern in spawning stock fecundity (SSF) relative to unfished equilibrium levels (SSF_0) obtained from the base run of the updated dusky shark ASCFM as a function of the last year included in the ASCFM. The base model ended in 2015. Relative spawning stock fecundity (SSF/SSF_0) is calculated as in Equation 3.3.

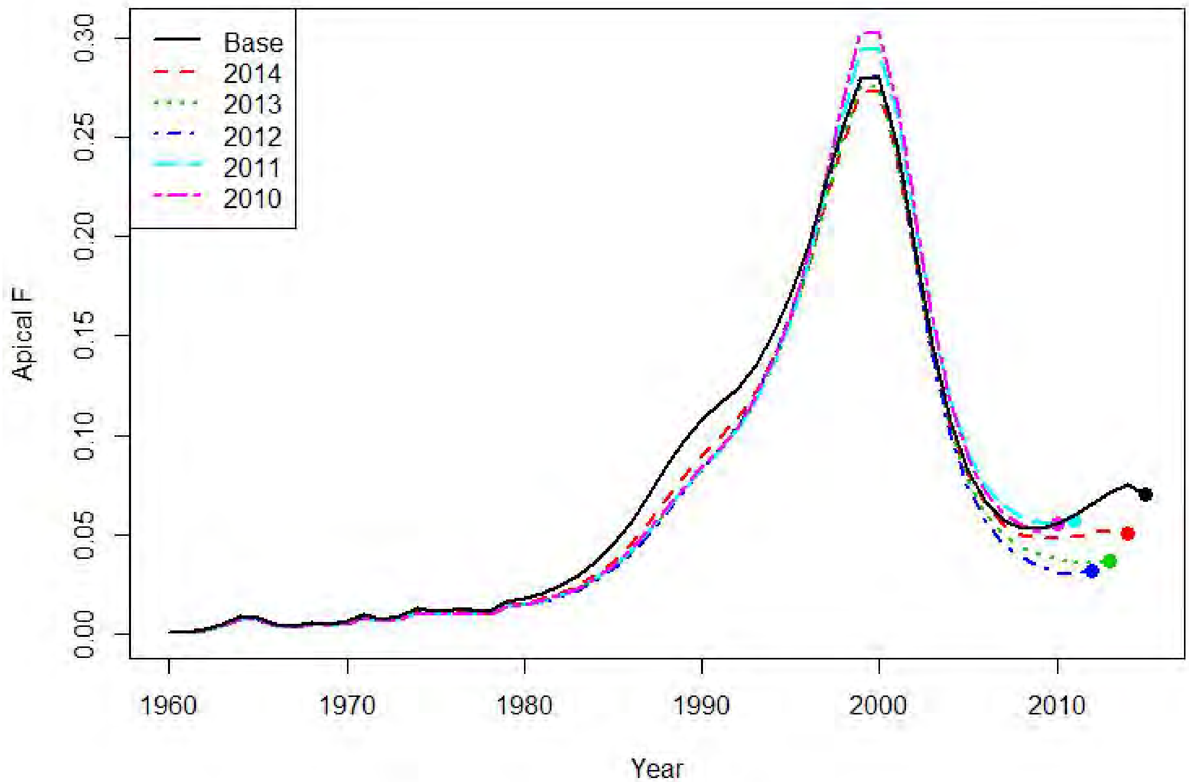


Figure 3.10. Retrospective pattern in estimated terminal year fishing mortality rate (apical *F*) obtained from the base run of the updated dusky shark ASCFM as a function of the last year included in the ASCFM. The base model ended in 2015.

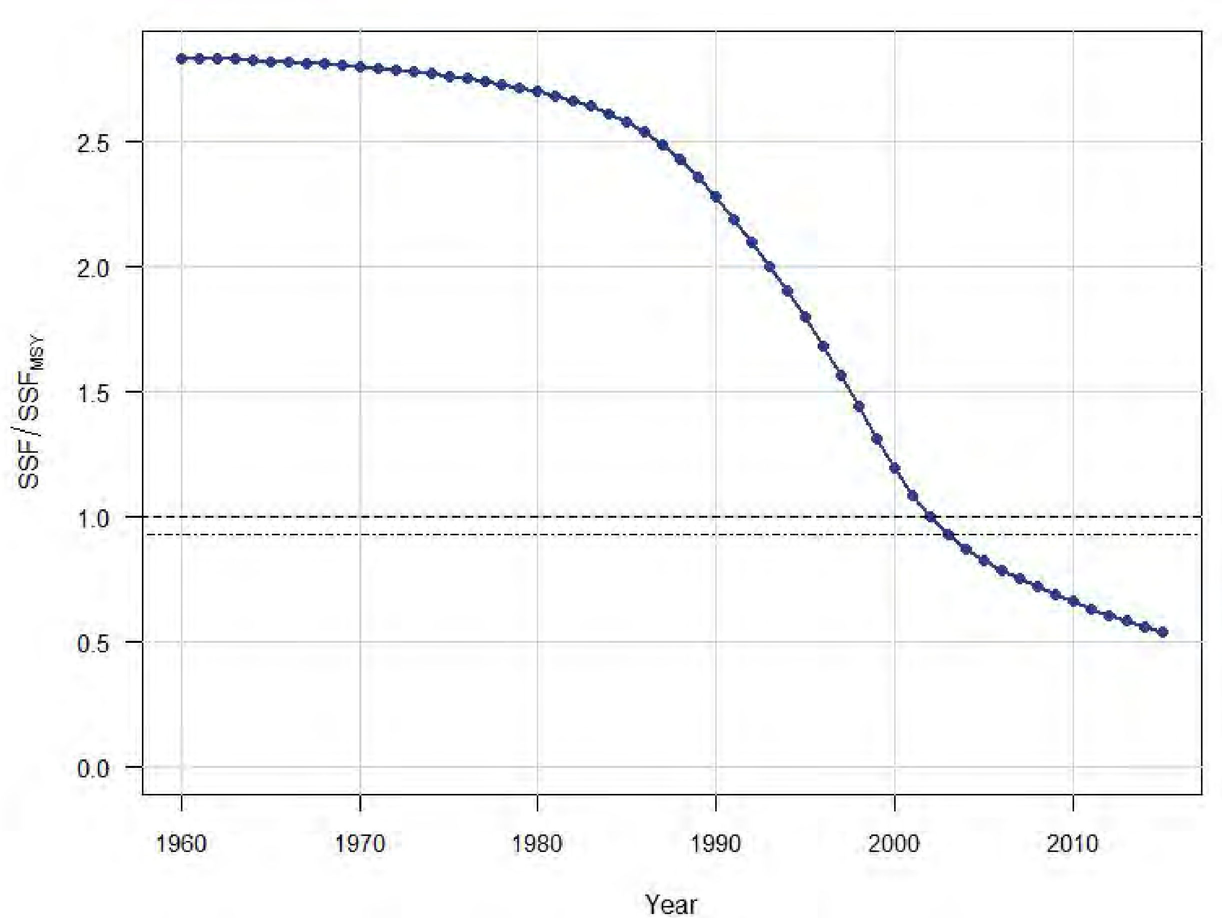


Figure 3.11. Spawning stock fecundity relative to MSY levels (horizontal dashed line) over time obtained from the base run of the updated dusky shark ASCFM. The lower horizontal dot-dash line indicates the MSST level.

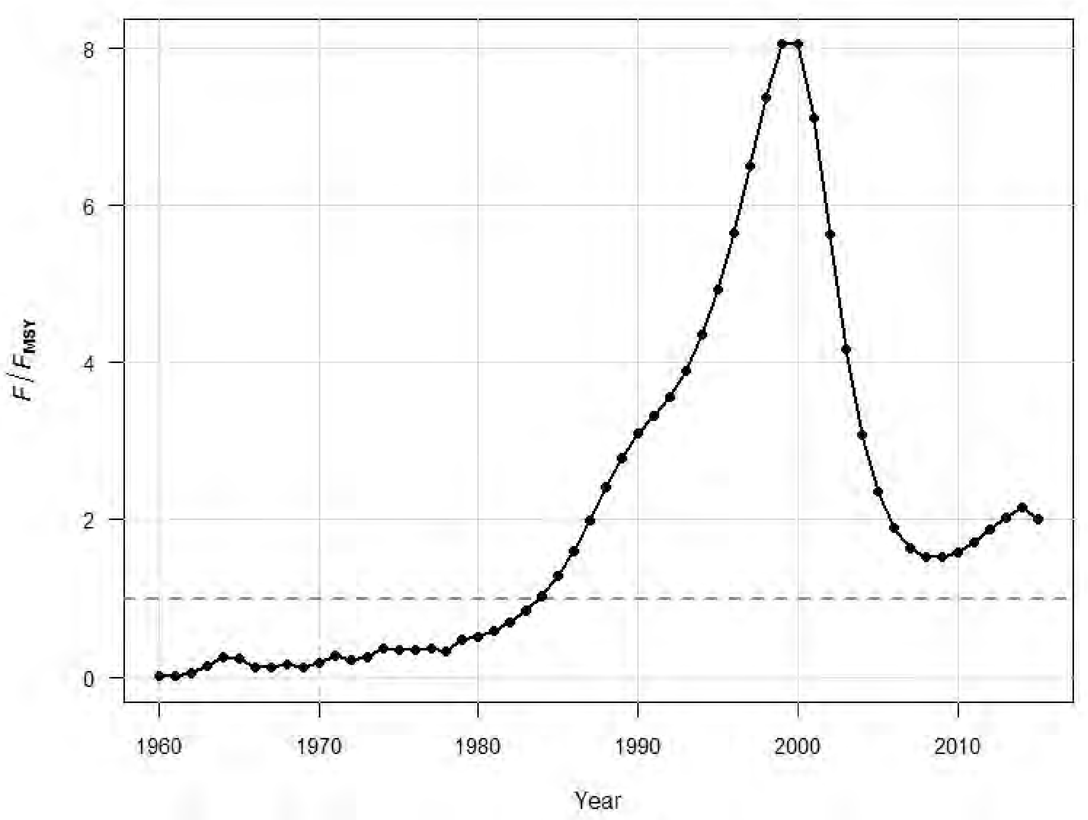


Figure 3.12. Apical fishing mortality relative to MSY levels obtained from the base run of the updated dusky shark ASCFM, 1960 – 2015, indicating that overfishing has been occurring since 1984.

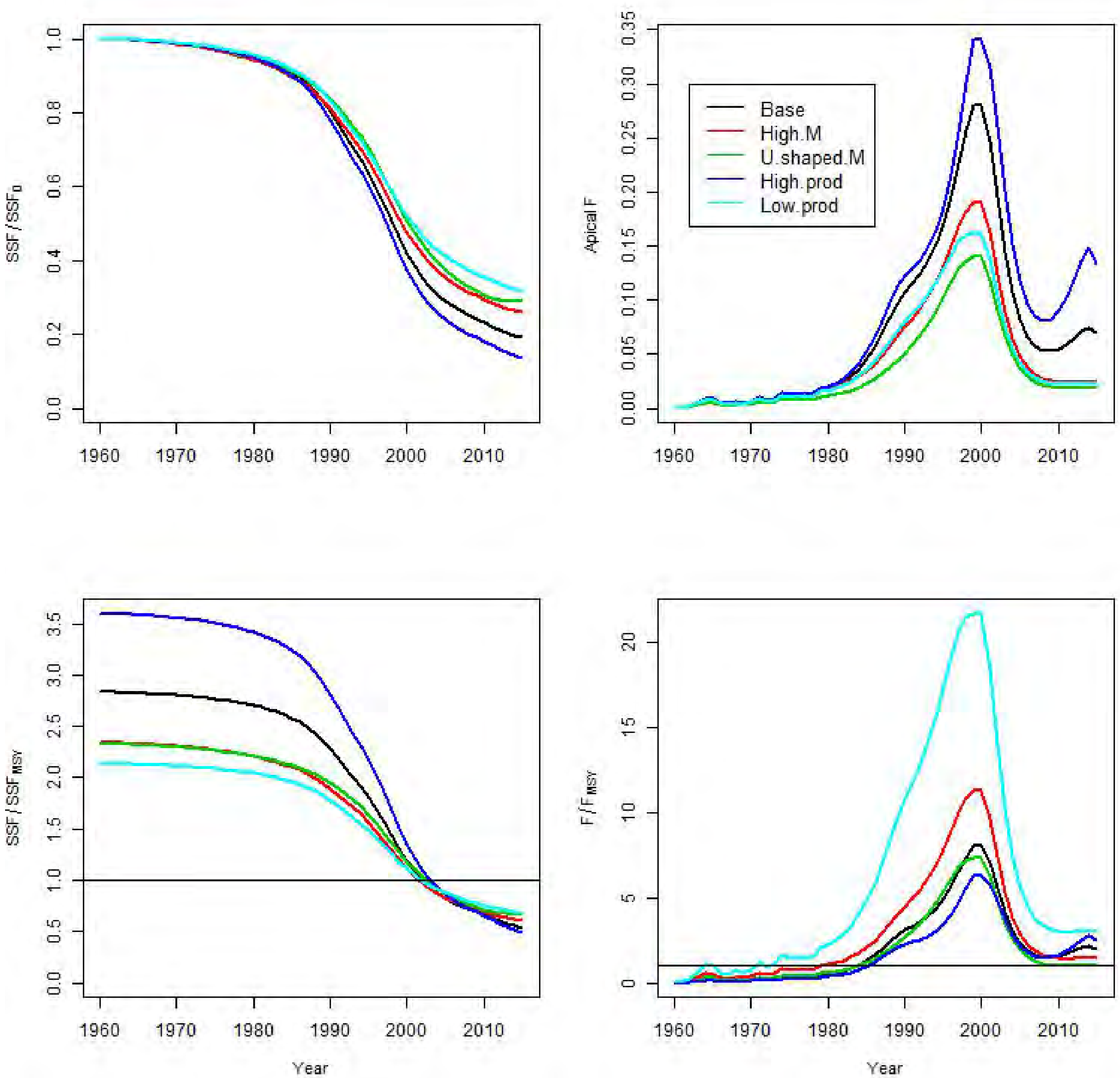


Figure 3.13. Estimated time series of relative spawning stock fecundity, apical fishing mortality rates, spawning stock fecundity in relation to MSY levels, and fishing mortality rates in relation to MSY levels obtained from the updated dusky shark ASCFM for the five scenarios reflective of plausible states of nature (Base, High *M*, U-Shaped *M,* High Productivity, and Low Productivity; see section 3.1.5 of this report for definitions of each scenario)

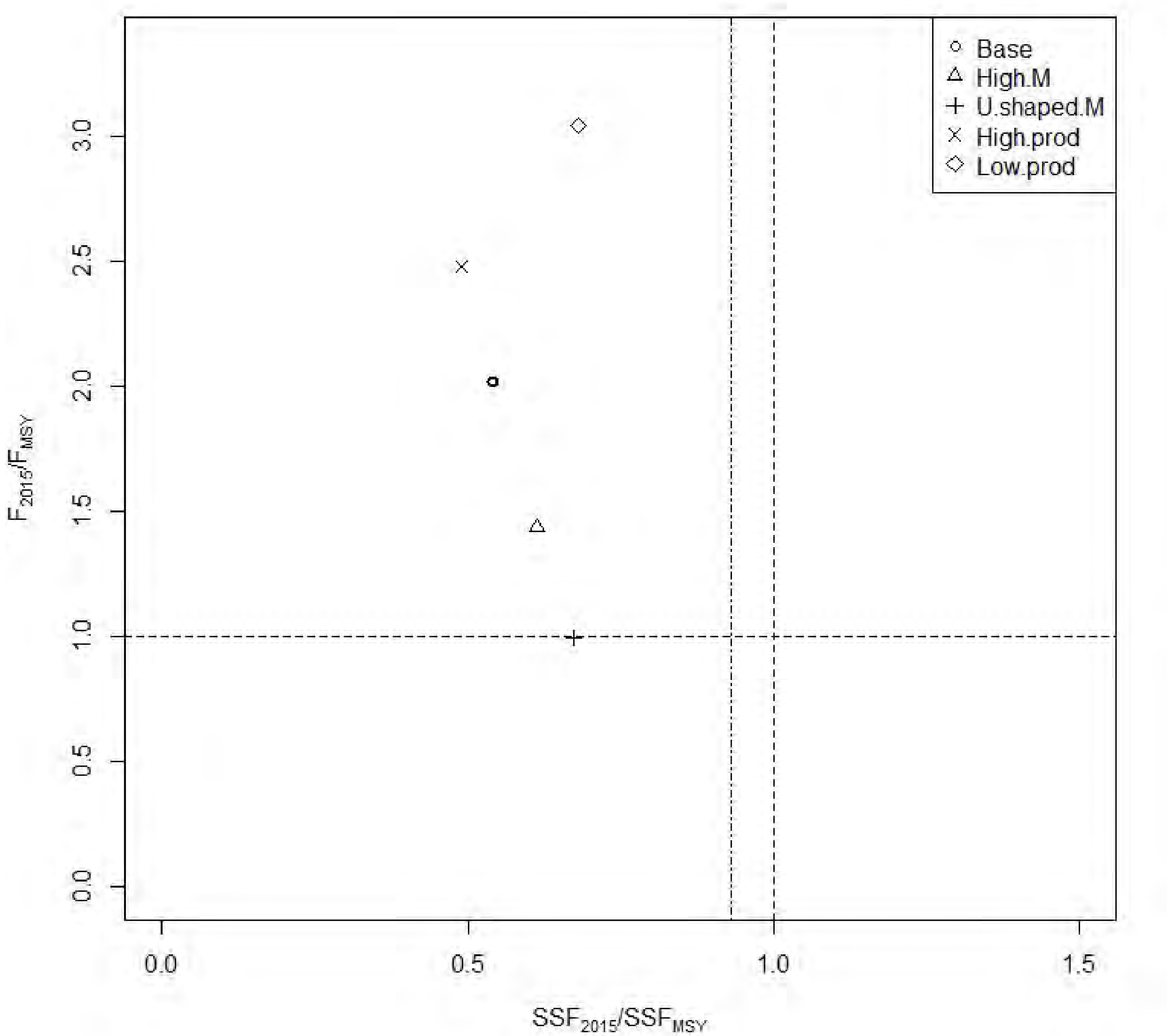
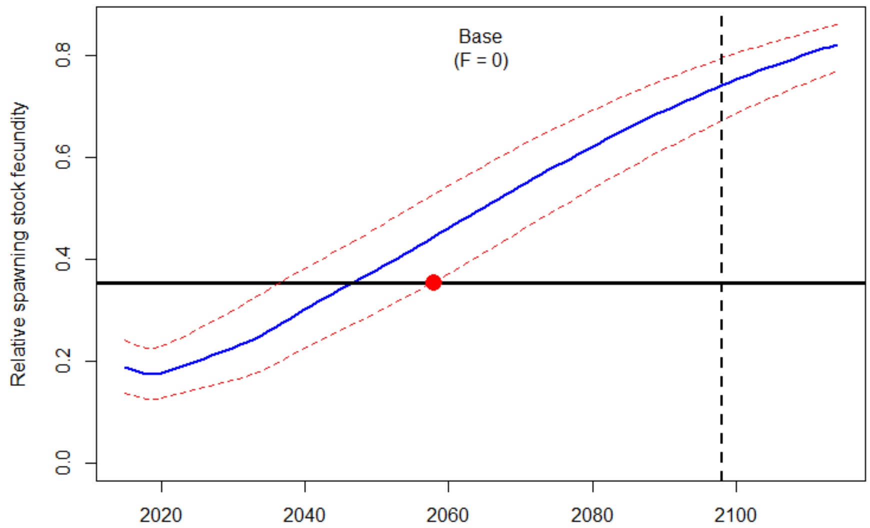


Figure 3.14. A phase plot summarizing stock status of dusky sharks in the terminal year (2015) obtained from the updated ASCFM for the five scenarios reflective of plausible states of nature (Base, High *M*, U-Shaped *M,* High Productivity, and Low Productivity; see section 3.1.5 of this report for definitions of each scenario). For clarity we only show the overfished reference point (relative to SSF_{MSST}) for the updated base run (vertical dot-dashed line), with points to the left of the line indicating the stock was estimated to be overfished ($SSF_{2015} < SSF_{MSST}$). Points above the horizontal black line indicate overfishing is estimated to have occurred ($F_{2015} > F_{MSY}$).



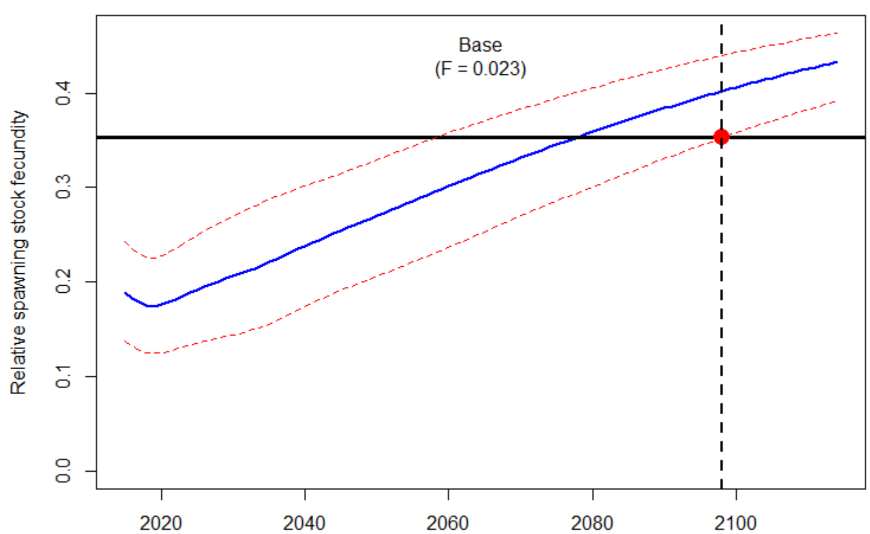
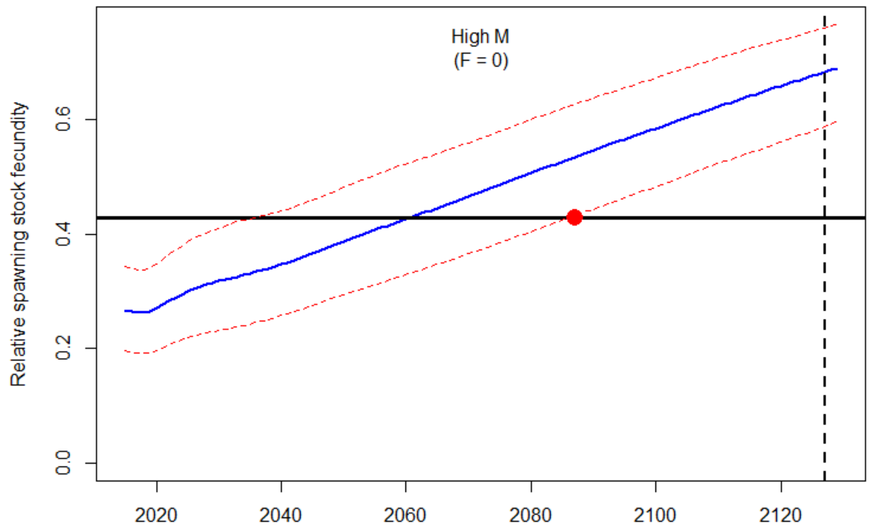


Figure 3.15. Projections for the base scenario; Median (blue line), 30th, and 70th percentiles (red dashed lines) of relative spawning stock fecundity (SSF_t/SSF_0) obtained from 10,000 bootstrap replicates. Rebuilding to relative SSF_{MSY} (SSF_{MSY}/SSF_0; horizontal solid black line) under zero fishing mortality ($F = 0$) is achieved with 70% probability in year 2058 ($YearF{=}0_{p70}$, solid red circle in upper panel). Rebuilding with 70% probability by 2098 ($Year_{rebuild} = YearF{=}0_{p70} + 40$; vertical dashed black line) is achieved with a constant fishing mortality $F = 0.023$ (solid red circle in lower panel).



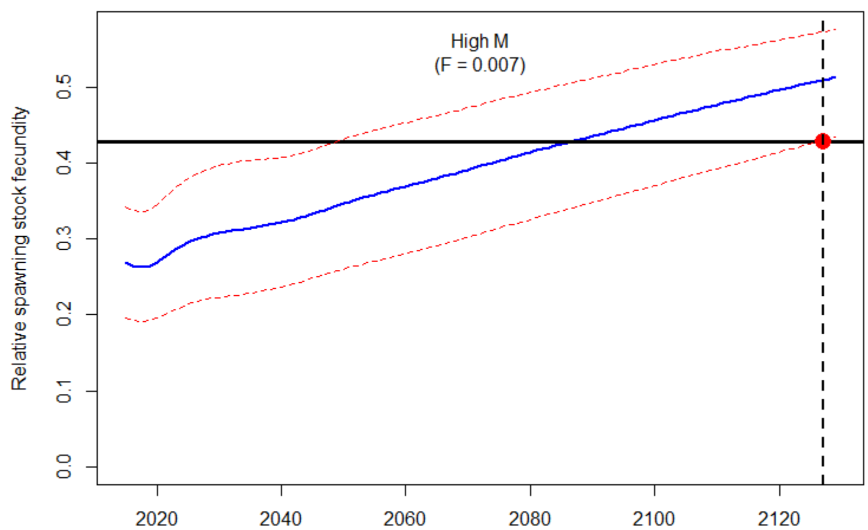


Figure 3.16. Projections for the high natural mortality (High *M*) scenario; Median (blue line), 30th, and 70th percentiles (red dashed lines) of relative spawning stock fecundity (SSF_t/SSF_0) obtained from 10,000 bootstrap replicates. Rebuilding to SSF_{MSY}/SSF_0 (horizontal solid black line) under zero fishing mortality ($F = 0$) is achieved with 70% probability in year 2087 ($YearF{=}0_{p70}$, solid red circle in upper panel). Rebuilding with 70% probability by 2127 ($Year_{rebuild} = YearF{=}0_{p70} + 40$; vertical dashed black line) is achieved with a constant fishing mortality $F = 0.007$ (solid red circle in lower panel).

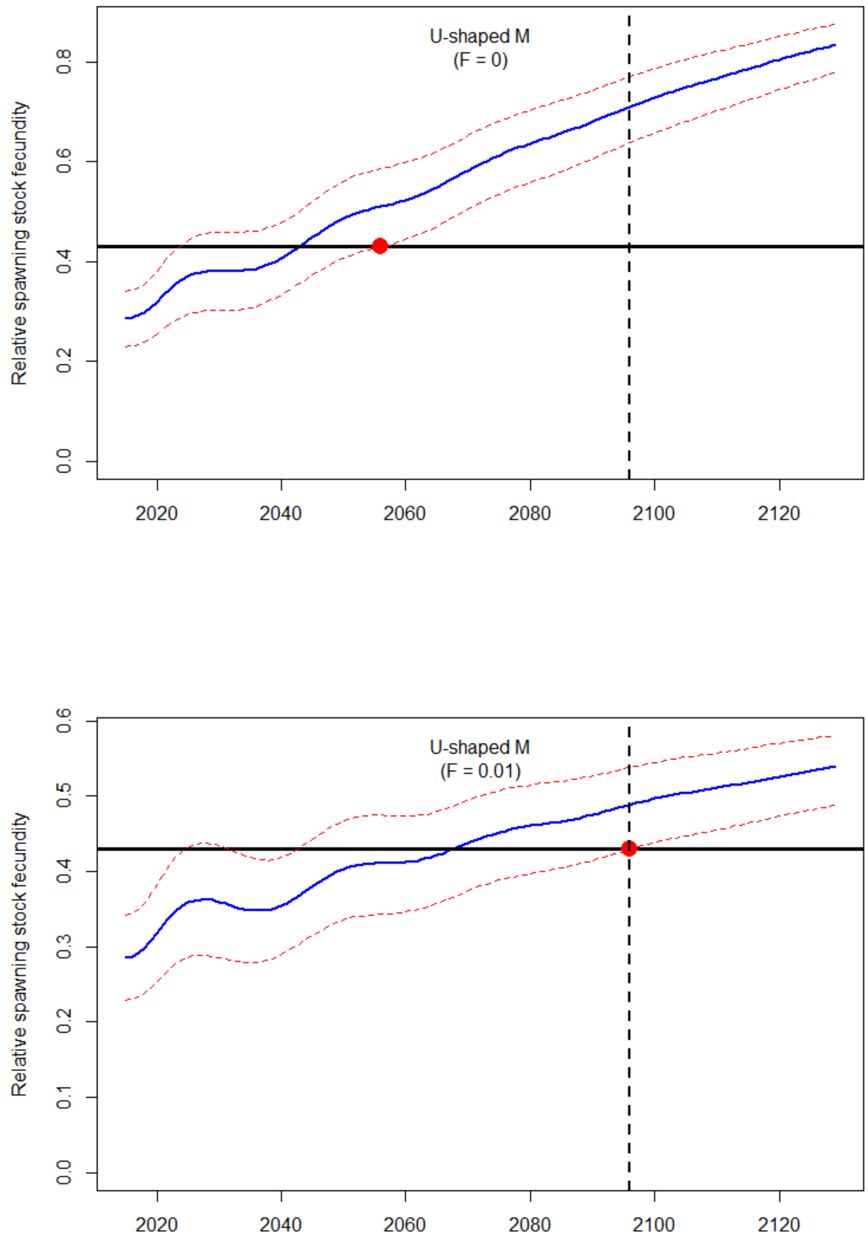


Figure 3.17. Projections for the U-shaped natural mortality (U-shaped *M*) scenario; Median (blue line), 30th, and 70th percentiles (red dashed lines) of relative spawning stock fecundity (SSF_t/SSF_0) obtained from 10,000 bootstrap replicates. Rebuilding to SSF_{MSY}/SSF_0 (horizontal solid black line) under zero fishing mortality ($F = 0$) is achieved with 70% probability in year 2056 ($YearF{=}0_{p70}$, solid red circle in upper panel). Rebuilding with 70% probability by 2096 ($Year_{rebuild} = YearF{=}0_{p70} + 40$; vertical dashed black line) is achieved with a constant fishing mortality $F = 0.010$ (solid red circle in lower panel).

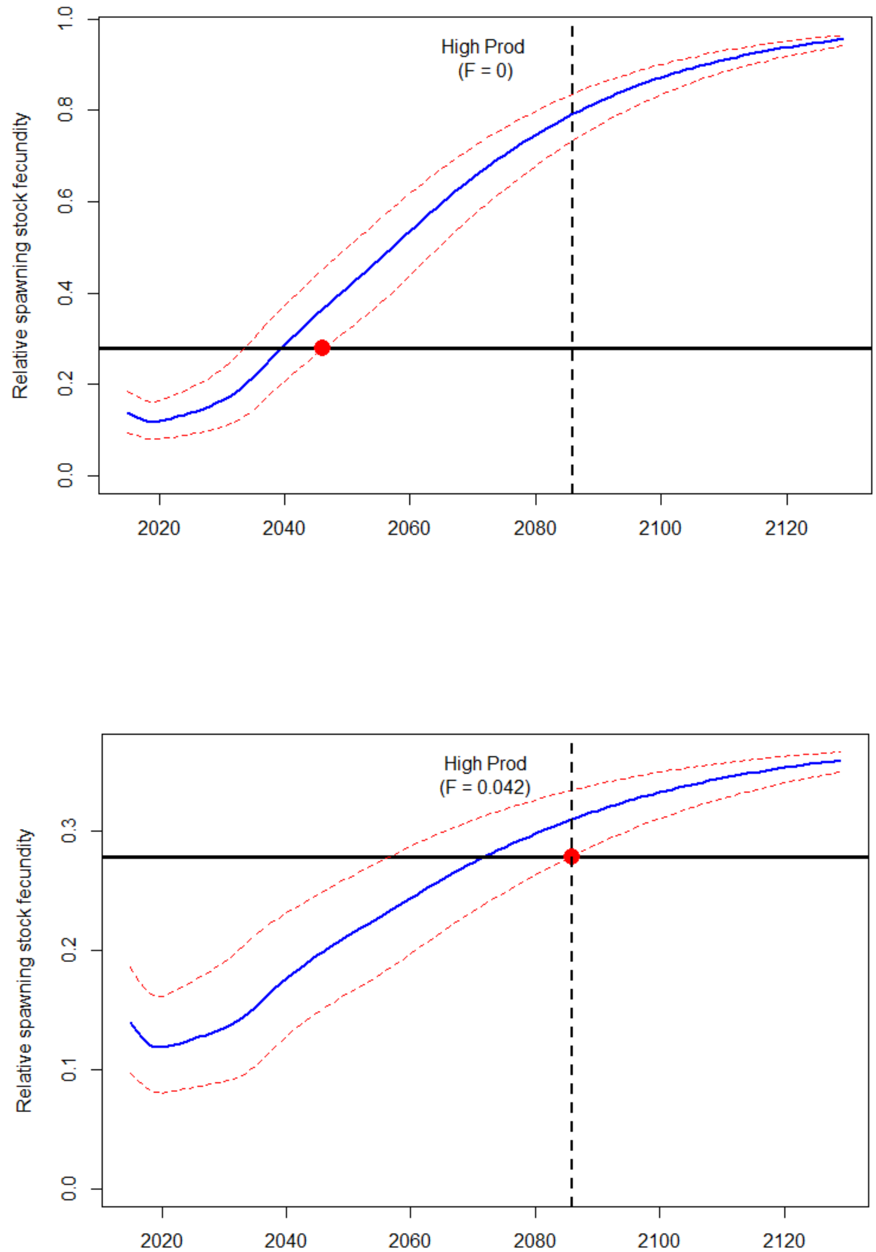


Figure 3.18. Projections for the high productivity (High Prod) scenario; Median (blue line), 30th, and 70th percentiles (red dashed lines) of relative spawning stock fecundity (SSF_t/SSF_0) obtained from 10,000 bootstrap replicates. Rebuilding to SSF_{MSY}/SSF_0 (horizontal solid black line) under zero fishing mortality ($F = 0$) is achieved with 70% probability in year 2046 ($YearF{=}0_{p70}$, solid red circle in upper panel). Rebuilding with 70% probability by 2086 ($Year_{rebuild} = YearF{=}0_{p70} + 40$; vertical dashed black line) is achieved with a constant fishing mortality $F = 0.042$ (solid red circle in lower panel).

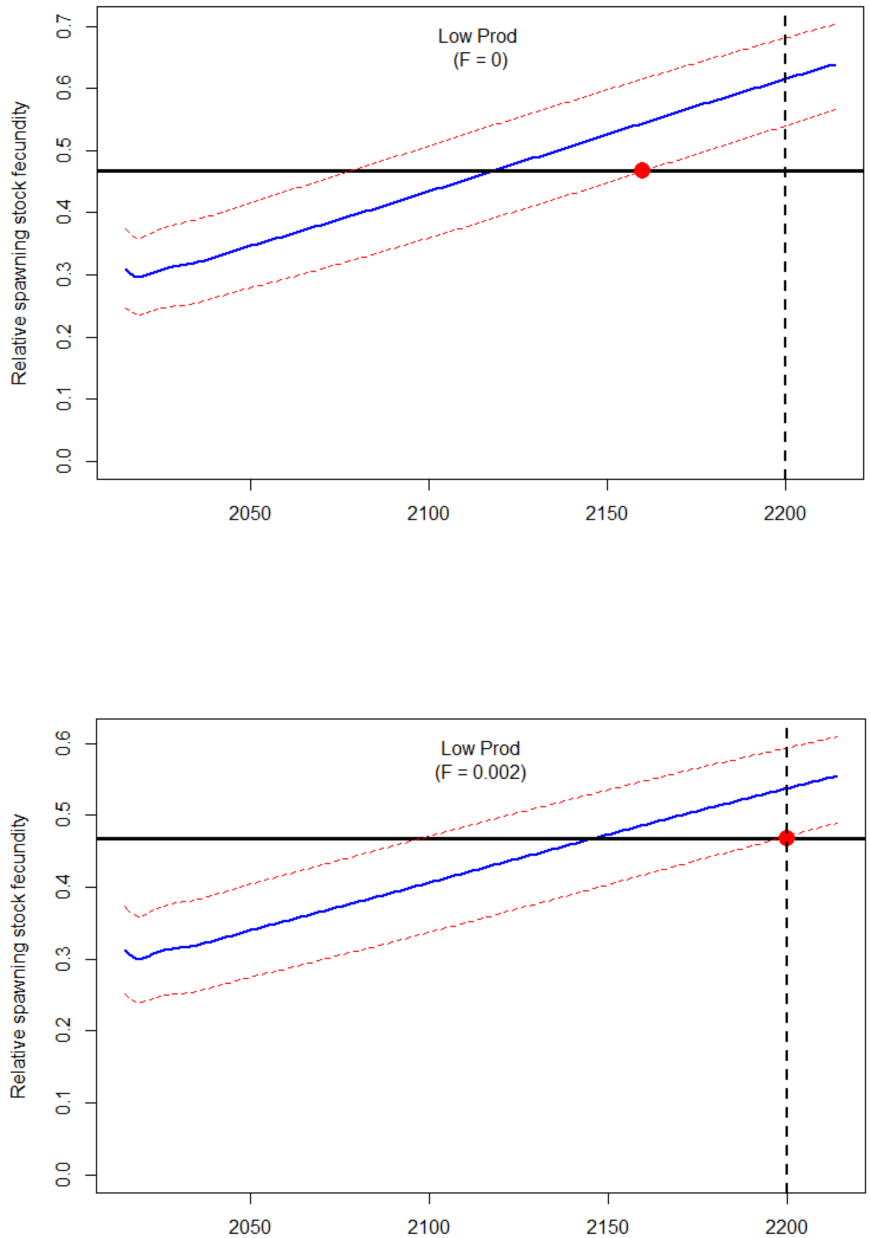


Figure 3.19. Projections for the low productivity (Low Prod) scenario; Median (blue line), 30th, and 70th percentiles (red dashed lines) of relative spawning stock fecundity (SSF_t/SSF_0) obtained from 10,000 bootstrap replicates. Rebuilding to SSF_{MSY}/SSF_0 (horizontal solid black line) under zero fishing mortality (F = 0) is achieved with 70% probability in year 2160 ($YearF{=}0_{p70}$, solid red circle in upper panel). Rebuilding with 70% probability by 2200 ($Year_{rebuild} = YearF{=}0_{p70} + 40$; vertical dashed black line) is achieved with a constant fishing mortality F = 0.002 (solid red circle in lower panel).

Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of a public meeting and hearing.

SUMMARY: The Western Pacific Fishery Management Council (Council) will hold a meeting of its American Samoa Archipelago Fishery Ecosystem Plan (FEP) Advisory Panel (AP) and Hawaii Archipelago FEP AP to discuss and make recommendations on fishery management issues in the Western Pacific Region.

DATES: The American Samoa Archipelago FEP AP will meet on Friday, September 23, 2016, between 4:30 p.m. and 6:30 p.m. and the Hawaii Archipelago FEP AP will meet on Thursday, September 29, 2016, between 9 a.m. and 11 a.m. All times listed are local island times. For specific times and agendas, see **SUPPLEMENTARY INFORMATION**.

ADDRESSES: The American Samoa Archipelago FEP AP will meet at the Pacific Petroleum Conference Room Utulei Village, American Samoa. The Hawaii Archipelago FEP AP will meet at the Council Office, 1164 Bishop St., Suite 1400, Honolulu, HI 96813 and by teleconference. The teleconference will be conducted by telephone. The teleconference numbers are: U.S. toll-free: 1–888–482–3560 or International Access: +1 647 723–3959, and Access Code: 5228220.

FOR FURTHER INFORMATION CONTACT: Kitty M. Simonds, Executive Director, Western Pacific Fishery Management Council; telephone: (808) 522–8220.

SUPPLEMENTARY INFORMATION: Public comment periods will be provided in the agenda. The order in which agenda items are addressed may change. The meetings will run as late as necessary to complete scheduled business.

Schedule and Agenda for the American Samoa Archipelago FEP AP Meeting

Friday, September 23, 2016, 4:30 p.m.–6:30 p.m.

1. Welcome and Introductions
2. Outstanding Council Action Items
3. Council Issues
   A. 2017 U.S. Territory Bigeye Tuna Limits
   B. Council Coral Reef Projects
4. Update on Council Projects in American Samoa
   A. Data Collection Projects
   B. Fishery Development Projects
5. American Samoa FEP Community Activities
6. American Samoa FEP AP Issues
   A. Report of the Subpanels
   i. Island Fisheries Subpanel
   ii. Pelagic Fisheries Subpanel
   iii. Ecosystems and Habitat Subpanel
   iv. Indigenous Fishing Rights Subpanel
   B. Other Issues
7. Public Comment
8. Discussion and Recommendations
9. Other Business

Schedule and Agenda for the Hawaii Archipelago FEP AP Meeting

Thursday, September 29, 2016, 9 a.m.–11 a.m.

1. Welcome and Introductions
2. Outstanding Council Action Items
3. Council Issues
   A. 2017 U.S. Territory Bigeye Tuna Limits
   B. Council Coral Reef Projects
   C. Implementing the NWHI Monument Expansion
5. Hawaii FEP Community Activities
6. Hawaii FEP AP Issues
   A. Report of the Subpanels
   i. Island Fisheries Subpanel
   ii. Pelagic Fisheries Subpanel
   iii. Ecosystems and Habitat Subpanel
   iv. Indigenous Fishing Rights Subpanel
   B. Other Issues
7. Public Comment
8. Discussion and Recommendations
9. Other Business

Special Accommodations

These meetings are physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to Kitty M. Simonds, (808) 522–8220 (voice) or (808) 522–8226 (fax), at least 5 days prior to the meeting date.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: September 2, 2016.

Jeffrey N. Lonergan,

Acting Deputy Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 2016–21613 Filed 9–7–16; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XD990

Atlantic Highly Migratory Species; Essential Fish Habitat

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of availability of Draft Environmental Assessment; request for comments.

SUMMARY: NMFS announces the availability of a Draft Environmental Assessment for Amendment 10 to the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP).

NMFS finalized the most recent Atlantic HMS Essential Fish Habitat (EFH) 5-Year Review on July 1, 2015 and determined that updates to Atlantic HMS EFH were warranted. NMFS also determined that modifications to current Habitat Areas of Particular Concern (HAPCs) for bluefin tuna (*Thunnus thynnus*) and sandbar shark (*Carcharhimus plumbeus*) and the consideration of new HAPCs for lemon sharks (*Negaprion brevisostris*) and sand tiger sharks (*Carcharias taurus*) may be warranted.

The purpose of this Draft Amendment is to update Atlantic HMS EFH with recent information following the EFH delineation methodology established in Amendment 1 to the 2006 Consolidated Atlantic HMS FMP (Amendment 1); update and consider new HAPCs for Atlantic HMS based on recent information, as warranted; minimize to the extent practicable the adverse effects of fishing and non-fishing activities on EFH, and identify other actions to encourage the conservation and enhancement of EFH.

DATES: Written comments must be received by December 22, 2016.

ADDRESSES: Electronic copies of Draft Amendment 10 to the 2006 Consolidated HMS FMP may also be obtained on the internet at: *http://www.nmfs.noaa.gov/sfa/hms/documents/fmp/am10/index.html.*

You may submit comments on this document, identified by NOAA–NMFS–2016–0117, by any of the following methods:

- *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov,* enter NOAA–NMFS–2016–0117 into the search box, click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments.
- *Mail:* Submit written comments to Jennifer Cudney, National Marine Fisheries Service, Highly Migratory Species Management Division, 263 13th Ave., Saint Petersburg, FL 33701.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

FOR FURTHER INFORMATION CONTACT: Jennifer Cudney or Randy Blankinship by phone at (727) 824–5399.

SUPPLEMENTARY INFORMATION:

Background

The Magnuson-Stevens Fishery Conservation and Management Act (''Magnuson-Stevens Act'') includes provisions concerning the identification and conservation of EFH (16 U.S.C. 1801 *et seq.*). EFH is defined in 50 CFR 600.10 as ''those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.'' NMFS must identify and describe EFH, minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH (§ 600.815(a)). Federal agencies that authorize, fund, or undertake actions that may adversely affect EFH must consult with NMFS, and NMFS must provide conservation recommendations to Federal and state agencies regarding any such actions. § 600.815(a)(9). Specifically, a consultation is required if a Federal agency has authorized, funded, or undertaken part or all of a proposed activity. For example, if a project proposed by a Federal or state agency or an individual requires a Federal permit, then the Federal agency authorizing the project through the issuance of a permit must consult with NMFS. A consultation is required if the action will ''adversely'' affect EFH. An adverse effect is defined as any impact that reduces quality and/or quantity of EFH. This includes direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to species and their habitat, and other ecosystem components, or reduction of the quality and/or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of EFH. If a federal agency determines that an action will not adversely affect EFH, no consultation is required. Private landowners and state agencies are not required to consult with NMFS.

In addition to identifying and describing EFH for managed fish species, a review of EFH must be completed every 5 years, and EFH provisions must be revised or amended, as warranted, based on the best available scientific information. NMFS announced the initiation of this review and solicited information for this review from the public in a **Federal Register** notice on March 24, 2014 (79 FR 15959). The initial public review/submission period ended on May 23, 2014. The Draft Atlantic HMS EFH 5-Year Review was made available on March 5, 2015 (80 FR 11981), and the public comment period ended on April 6, 2015. NMFS analyzed the information gathered through the EFH review process, and the Notice of Availability for the Final Atlantic HMS EFH 5-Year Review was published on July 1, 2015 (80 FR 37598) (''5-Year Review'').

The 5-Year Review considered data regarding Atlantic HMS and their habitats that have become available since 2009 that were not included in EFH updates finalized in Amendment 1 (June 1, 2010, 75 FR 30484); Final Environmental Impact Statement for Amendment 3 to the 2006 Consolidated HMS FMP (Amendment 3) (June 1, 2010, 75 FR 30484); and the interpretive rule that described EFH for roundscale spearfish (September 22, 2010, 75 FR 57698). NMFS also determined in the 5-Year Review that the methodology used in Amendment 1 to delineate Atlantic HMS EFH was still the best approach to update EFH delineations in Amendment 10 because it infers habitat use and EFH from available point data, allows for the incorporation of multiple complex datasets into the analysis, is transparent, and is easily reproducible.

As a result of this review, NMFS determined that a revision of HMS EFH was warranted, and that an amendment to the 2006 Consolidated Atlantic HMS FMP would be developed as Amendment 10. In addition to the literature informing the 5-year Review and the subsequent proposed amendment, NMFS indicated that it would also incorporate all newly available data collected prior to January 1, 2015, to ensure that the best available data would be analyzed for Draft Amendment 10, and EFH geographic boundaries would be re-evaluated, even for species where there were limited or no new EFH data found in the literature review. Consultation with the Atlantic HMS Advisory Panel and the public did not yield additional suggestions for NMFS to consider on EFH delineation methods for Atlantic HMS during the EFH 5-Year Review process. Therefore, NMFS determined that the current HMS EFH delineation methodology could be used for the analyses in Draft Amendment 10.

Where appropriate, NMFS may designate HAPCs, which are intended to focus conservation efforts on localized areas within EFH that are vulnerable to degradation or are especially important ecologically for managed species. EFH regulatory guidelines encourage the Regional Fishery Management Councils and NMFS to identify HAPCs based on one or more of the following considerations (§ 600.815(a)(8)):

- The importance of the ecological function provided by the habitat;
- the extent to which the habitat is sensitive to human-induced environmental degradation;
- whether, and to what extent, development activities are, or will be, stressing the habitat type; and/or,
- the rarity of the habitat type.

After reviewing the new information that has become available for Atlantic HMS since the last updates to EFH were completed, and based on analyses of new data, NMFS is considering modifications to current HAPCs for bluefin tuna and sandbar sharks, and the creation of new HAPCs for lemon sharks and sand tiger sharks.

The purpose of the amendment would be to update EFH for Atlantic HMS with recent information following the EFH delineation methodology established in Amendment 1; minimize to the extent practicable the adverse effects of fishing and non-fishing activities on EFH; and identify other actions to encourage the conservation and enhancement of EFH. Specific actions would include the update and revision of existing HMS EFH, as necessary; modification of existing HAPCs or designation of new HAPCs for bluefin tuna, and sandbar, lemon, and sand tiger sharks, as necessary; and analysis of fishing and non-fishing impacts on EFH by considering environmental and management changes and new information since 2009.

Essential Fish Habitat Updates

Preferred Alternative 2 would update all Atlantic HMS EFH designations with new data collected since 2009, using the methodology established under Amendment 1. The incorporation of new information and data into EFH analyses, and subsequent adjustment of Atlantic HMS EFH, is expected to result in neutral cumulative and direct and indirect, short-term ecological, social, and economic impacts on the natural and human environment. This alternative is also expected to result in neutral long-term direct ecological, social, and economic impacts on the natural and human environment. The primary effect of updating Atlantic HMS EFH would be a change in the areas that are subject to consultation with NMFS under the EFH regulations. Updating

Atlantic HMS EFH ensures that any management consultations subsequently completed by the NMFS Office of Habitat Conservation, and resulting conservation recommendations, are based on the best available scientific information considering EFH designation. These future consultations through the Habitat Consultation process could, among other things, focus conservation efforts and avoid potential adverse impacts from Federal actions in areas designated as EFH. Thus, NMFS expects that long-term cumulative and indirect impacts of Alternative 2 would be minor and beneficial, as the consultation process and resulting conservation recommendations could reduce any potential adverse impacts to EFH from future federal actions. This could result in an overall positive conservation benefit.

Habitat Areas of Particular Concern (HAPCs)

The preferred alternatives concerning HAPCs would modify or create new HAPCs for several HMS.

Preferred alternative 3b would modify the current HAPC for the spawning, eggs, and larvae life stages for bluefin tuna. Specifically, NMFS would change the boundary of the existing bluefin tuna HAPC to encompass a larger area within the Gulf of Mexico. Recent literature suggests the potential for spawning bluefin tuna, eggs, and larvae to be concentrated in areas of the eastern Gulf of Mexico not encompassed by the current HAPC in response to variability in oceanographic conditions associated with the Loop Current, which moves through regions that are to the east of the current HAPC. NMFS would extend the HAPC in the Gulf of Mexico from its current extent eastward to the 82° West longitude line. The seaward boundary of the HAPC would continue to be the U.S. EEZ, while the shoreward extent of the HAPC would be restricted at the 100m bathymetric line per recommendations from the NMFS scientists.

Preferred alternative 4b would modify the current HAPC for sandbar shark along the Atlantic coast (specifically off the coast of the Outer Banks (NC), in Chesapeake Bay (VA), Delaware Bay (DE) and in the Mullica River-Great Bay system (NJ)). Modification would include changing the boundary of the existing HAPC to encompass different areas, consistent with the updated Atlantic HMS EFH designations. The current sandbar shark HAPC does not overlap with the currently-designated sandbar shark EFH as required by the Magnuson-Stevens Act implementing regulations, which specify FMPs ''identify specific types or areas of habitat *within* EFH as habitat areas of particular concern'' (emphasis added) (§ 600.815(a)(8)). Thus, NMFS is proposing to adjust the boundaries of the HAPC so that it is contained within the updated sandbar shark EFH. These changes include incorporation of additional area in Delaware Bay and Chesapeake Bay to reflect updated EFH designations, and adjustment of the HAPC around the Outer Banks of North Carolina. The updated areas identified as HAPCs are still considered to be important pupping and nursery grounds for sandbar shark. Delaware Bay and Chesapeake Bay are the largest nursery grounds for sandbar shark in the mid-Atlantic, and there is evidence of high inter-annual site fidelity for up to five years following birth to these nursery grounds.

Preferred Alternative 5b would designate a new HAPC for lemon sharks between Jupiter Inlet, FL, and Cape Canaveral, FL. Information analyzed in the 5-year review suggests that areas off south central and south eastern Florida may provide important nursery grounds and aggregation sites for multiple life stages. Aggregations of juvenile lemon sharks have appeared annually since 2003 within sheltered alongshore troughs and shallow open surf zones adjacent to Cape Canaveral from November through February. Adult lemon sharks have also been observed to annually form large aggregations off Jupiter Inlet between December and April. Geophysical and oceanographic conditions in the Cape Canaveral and Jupiter inlet regions may generate a climatic transition zone that may create a temperature barrier to northward and southward migration. A new HAPC would be created to encompass both areas and presumed migratory corridors between them and extend from shore to 12 km from the beach. These habitats occur near a heavily populated area of southeastern Florida, are subjected to military use and/or are easily accessible to the public, and both appear to be discrete aggregation areas for lemon sharks.

Preferred Alternative 6b would designate two new HAPCs for sand tiger sharks in Delaware Bay and in coastal Massachusetts. Recently, new research and information has become available which suggests that Delaware Bay might provide important seasonal (summertime) habitat for all life stages of sand tiger shark. The first HAPC would reflect the distribution of known data points in Delaware Bay. The second HAPC would be established in the Plymouth, Kingston, Duxbury (PKD) Bay system in coastal Massachusetts for juveniles and neonate sand tiger in the Cape Cod region. Tagging data suggest that tagged neonates and juveniles are seasonally distributed within the estuary (June through October); consistently used habitats for extended periods of time; and exhibited inter-annual site fidelity for the PKD Bay system.

NMFS expects that the short-term direct and indirect ecological, social and economic effects of revising current HAPCs for bluefin tuna spawning, eggs, and larvae in the Gulf of Mexico and for sandbar shark in the Mid-Atlantic, and creating new HAPCs for lemon sharks off southeastern Florida and for sand tiger sharks in Delaware Bay and in the PKD Bay system of Massachusetts would be neutral, as this process only designates habitat and there are no additional associated management measures under evaluation in Draft Amendment 10 for these HAPCs. Similarly, NMFS expects that the long-term direct ecological, social and economic effects of modifying and creating these HAPCs would be neutral. However, NMFS expects that the long-term indirect ecological, social, and economic effects of Alternatives 3b, 4b, 5b, and 6b would be minor and beneficial as a result of any future consultations as the Habitat Consultation process and resulting conservation recommendations could reduce any potential adverse impacts to HAPCs from future federal actions. This could result in an overall positive conservation benefit. These preferred alternatives would permit the incorporation and consideration of the best available scientific information in considering an HAPC designation for, among other things, purposes of focusing conservation efforts and avoiding adverse impacts through the Habitat Consultation process, inform the public of areas that could receive additional scrutiny from NMFS with regards to EFH impacts, and/or promote additional area-based research, as necessary.

Fishing and Non-Fishing Impacts and Conservation Recommendations

As analyzed in Amendment 1, since nearly all HMS EFH is comprised of open water habitat, all HMS fishing gears but bottom longline and shrimp trawl do not have an effect on EFH. For some shark species, EFH includes benthic habitat types such as mud or sandy bottom that might be affected by fishing gears. NMFS has determined that bottom tending gears such as bottom longline and shrimp trawls, which are the two gears most likely to impact EFH, have a minimal and only temporary effect on EFH. There is no new information that has become available since Amendment 1 to the 2006 Consolidated HMS FMP that would alter this conclusion. As a result, NMFS is not proposing any measures or alternatives to minimize fishing impacts on these habitats.

However, although adverse effects are not anticipated, NMFS has provided an example list of conservation recommendations in Chapter 5 of Draft Amendment 10 that could address shark bottom longline fishing impacts; these recommendations could apply to all areas designated as either EFH or HAPCs. This section is included to satisfy the EFH provisions concerning mandatory contents of FMPs, specifically the Conservation and Enhancement requirements at § 600.815(a)(6). This amendment similarly evaluates the potential adverse effects of fishing with all HMS gear types on designated and proposed EFH and HAPCs in Chapter 5 and provides conservation recommendations, as necessary.

Opportunities for Public Comment

NMFS will conduct public hearing conference calls and webinars to allow for opportunities for interested members of the public from all geographic areas to submit verbal comments on Draft Amendment 10. These will be announced at a later date and in the **Federal Register**. NMFS has also requested time on the meeting agendas of the relevant Regional Fishery Management Councils (*i.e.,* the Caribbean, Gulf of Mexico, South Atlantic, Mid-Atlantic, and New England Fishery Management Councils) to present information on Draft Amendment 10. Information on the date and time of those presentations will be provided on the appropriate council agendas.

The webinar presentation and conference call transcripts will be made available at this Web site: *http://www.nmfs.noaa.gov/sfa/hms/documents/fmp/am10/index.html.* Transcripts from Council meetings may be provided by the Councils on respective Web sites.

Public Hearing Code of Conduct

The public is reminded that NMFS expects participants at public hearings and council meetings to conduct themselves appropriately. At the beginning of each meeting, a representative of NMFS will explain the ground rules (*e.g.,* all comments are to be directed to the agency on the proposed action; attendees will be called to give their comments in the order in which they registered to speak; each attendee will have an equal amount of time to speak; attendees may not interrupt one another; etc.). NMFS representative(s) will structure the meeting so that all attending members of the public will be able to comment, if they so choose, regardless of the controversial nature of the subject(s). Attendees are expected to respect the ground rules, and those that do not may be asked to leave the meeting.

Authority: 16 U.S.C. 971 *et seq.,* and 1801 *et seq.*

Dated: September 2, 2016,

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 2016–21621 Filed 9–7–16; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF DEFENSE

Department of the Air Force

Board of Visitors of the U.S. Air Force Academy Notice of Meeting; Cancellation

AGENCY: U.S. Air Force Academy Board of Visitors, Department of Defense.

ACTION: Quarterly meeting notice; cancellation.

SUMMARY: On Friday, August 19, 2016, (81 FR 55454), the Department of Defense published in the **Federal Register**, a notice to announce the quarterly meeting of the United States Air Force Academy Board of Visitors on September 7 & 8, 2016. The meeting was cancelled due to last-minute circumstances indicating there would not be a quorum for the meeting.

FOR FURTHER INFORMATION CONTACT: The next scheduled USAFA BoV meeting has not been established, but will be published in the **Federal Register** at least 15 days prior to the meeting.

For additional information or to attend this BoV meeting, contact Major James Kuchta, Accessions and Training Division, AF/A1PT, 1040 Air Force Pentagon, Washington, DC 20330, (703) 695–4066, *James.L.Kuchta.mil@mail.mil.*

Meeting Announcement: The Department of Defense had to cancel the United States Air Force Academy Board of Visitors meeting on September 7 & 8, 2016 because last-minute circumstances indicated there would not be a quorum for the meeting. Due to circumstances beyond the control of the Designated Federal Officer and the Department of Defense, the Board of Visitors U.S. Air Force Academy was unable to provide public notification of its cancellation of its previously announced meeting on September 7th and 8th, 2016, as required by 41 CFR 102–3.150(a). Accordingly, the Advisory Committee Management Officer for the Department of Defense, pursuant to 41 CFR 102–3.150(b), waives the 15-calendar day notification requirement.

Henry Williams,

Acting Air Force Federal Register Officer.

[FR Doc. 2016–21624 Filed 9–7–16; 8:45 am]

BILLING CODE 5001–10–P

DEPARTMENT OF DEFENSE

Office of the Secretary

Vietnam War Commemoration Advisory Committee; Notice of Federal Advisory Committee Meeting

AGENCY: DoD.

ACTION: Meeting notice.

SUMMARY: The Department of Defense is publishing this notice to announce the following Federal advisory committee meeting of the Vietnam War Commemoration Advisory Committee. This meeting is open to the public.

DATES: The public meeting of the Vietnam War Commemoration Advisory Committee (hereafter referred to as ''the Committee'') will be held on Monday, September 19, 2016. The meeting will begin at 1:00 p.m. and end at 4:30 p.m.

ADDRESSES: U.S. Access Board Conference Room, 1331 F Street NW., Suite 800, Washington, DC 20004.

FOR FURTHER INFORMATION CONTACT: *Committee's Designated Federal Officer:* The committee's Designated Federal Officer is Mr. Michael Gable, Vietnam War Commemoration Advisory Committee, 241 18th Street South, Arlington, VA 22202, *michael.l.gable.civ@mail.mil,* 703–697–4811. For meeting information please contact Mr. Michael Gable, *michael.l.gable.civ@mail.mil,* 703–697–4811; Mr. Mark Franklin, *mark.r.franklin.civ@mail.mil,* 703–697–4849; or Ms. Scherry Chewning, *scherry.l.chewning.civ@mail.mil,* 703–697–4908.

SUPPLEMENTARY INFORMATION: Due to circumstances beyond the control of the Designated Federal Officer and the Department of Defense, the Vietnam War Commemoration Advisory Committee was unable to provide public notification of its meeting of September 19, 2016, as required by 41 CFR 102–3.150(a). Accordingly, the Advisory

NOAA
FISHERIES

Atlantic Highly Migratory Species

Draft Amendment 10
Essential Fish Habitat

Atlantic Region Only

ASMFC
October 2016

HMS EFH… What Is It?

Magnuson-Stevens Act (MSA) identifies EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity”

- Sustainable Fisheries Act of 1996
- Federally managed species only
- May or may not include state waters
- Must be periodically reviewed and revised
- Cannot be designated in international waters

Timeline of HMS EFH Actions

1999: EFH is first designated for Atlantic HMS

2003: EFH updated for some species

2009: Amendment 1 – 5-year review and update of EFH

2010: Amendment 3 – Designated smoothhound EFH

Interpretive rule – Recognized roundscale spearfish, added it to the management unit, designated EFH

2014: Atlantic HMS EFH 5-Year Review - Initiated

2015: Atlantic HMS EFH 5-Year Review – Finalized; Notice Of Intent to prepare Amendment 10

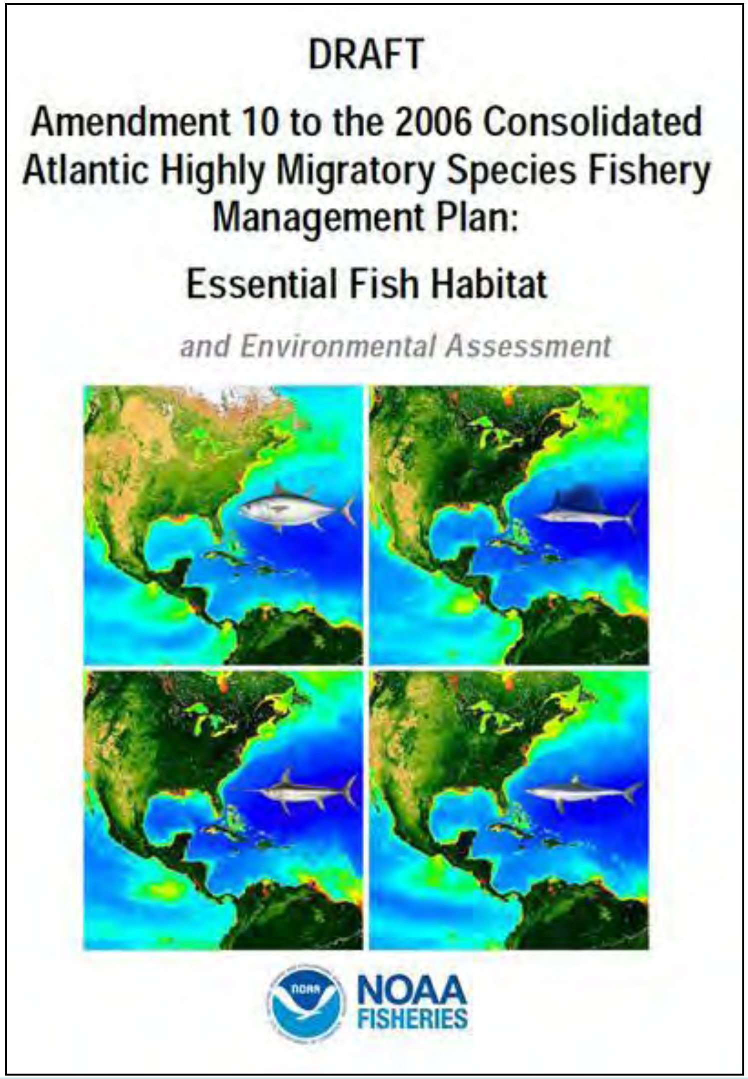
Sept 2016: Draft Amendment 10 released

Draft Amendment 10 (EFH)

- Purpose:
  - Update EFH with recent information
  - Minimize to the extent practicable the adverse effects of fishing and non-fishing activities on EFH
  - Identify other actions to encourage the conservation and enhancement of EFH
- Need:
  - 5 Year Review Process and Public Consultation → new information
  - Revision of EFH is consistent with MSA requirements and National Standard 2 Guidelines

Draft Amendment 10 Alternatives

Atlantic Region Only



DRAFT

Amendment 10 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan:

Essential Fish Habitat

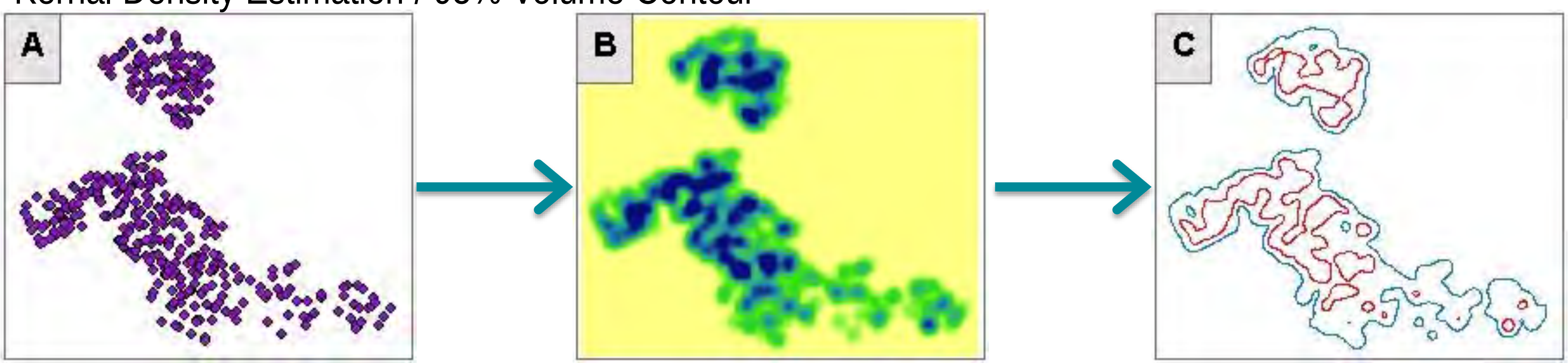
and Environmental Assessment

NOAA FISHERIES

Draft Amendment Alternatives: EFH Delineation

- Alternative 1: No Action. Retain current EFH designations
- Alternative 2 (*preferred*): Update Atlantic HMS EFH with new data collected since 2009, using the protocols established under Amendment 1 (maps in Appendix D).

Kernal Density Estimation / 95% Volume Contour



www.spatialecology.com

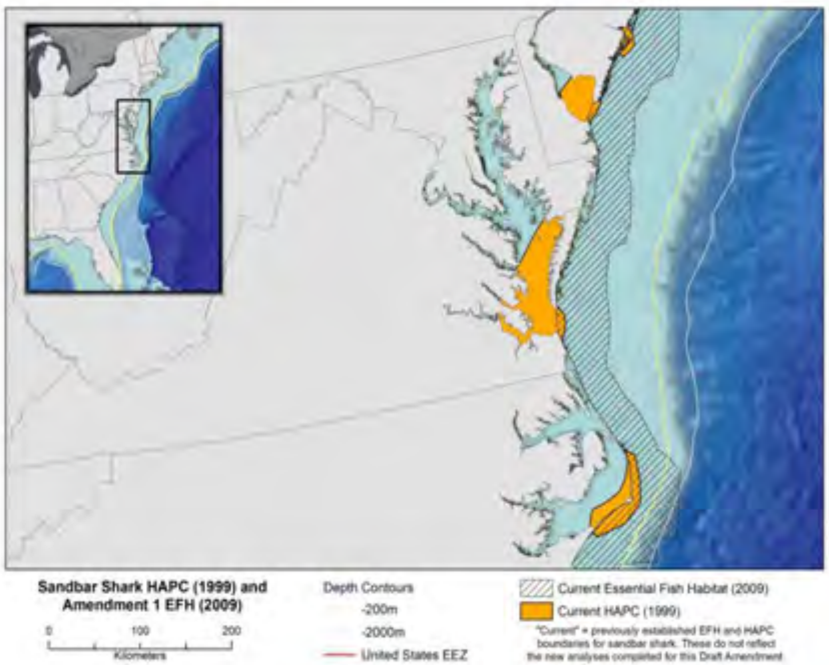
HAPC Alternatives

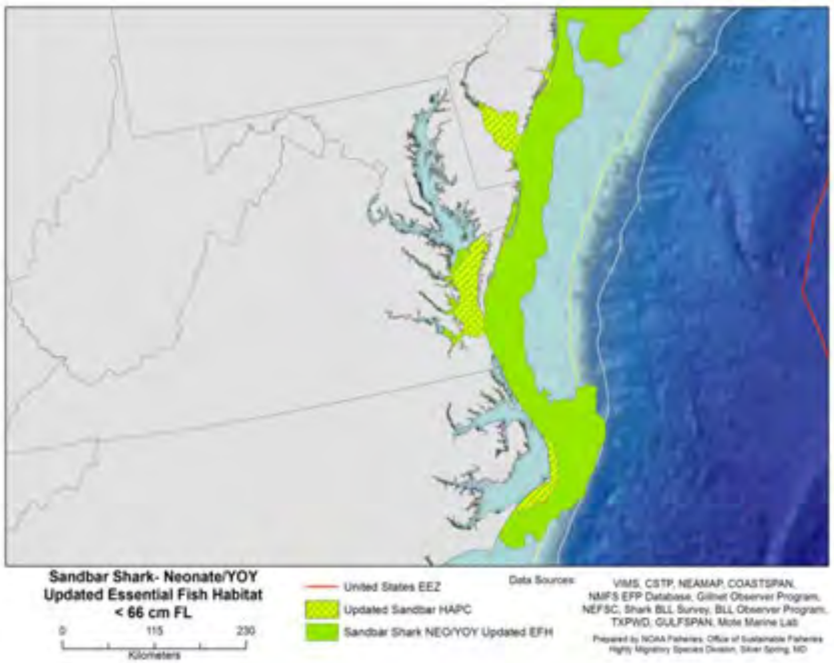
Habitat Areas of Particular Concern (HAPCs) are subsets of EFH that are one or more of the following:

- Rare
- Has particular ecological importance to a federally managed stock
- Is particularly susceptible to human-induced degradation
- Is located in an environmentally stressed area

Draft Amendment Alternatives: HAPCs

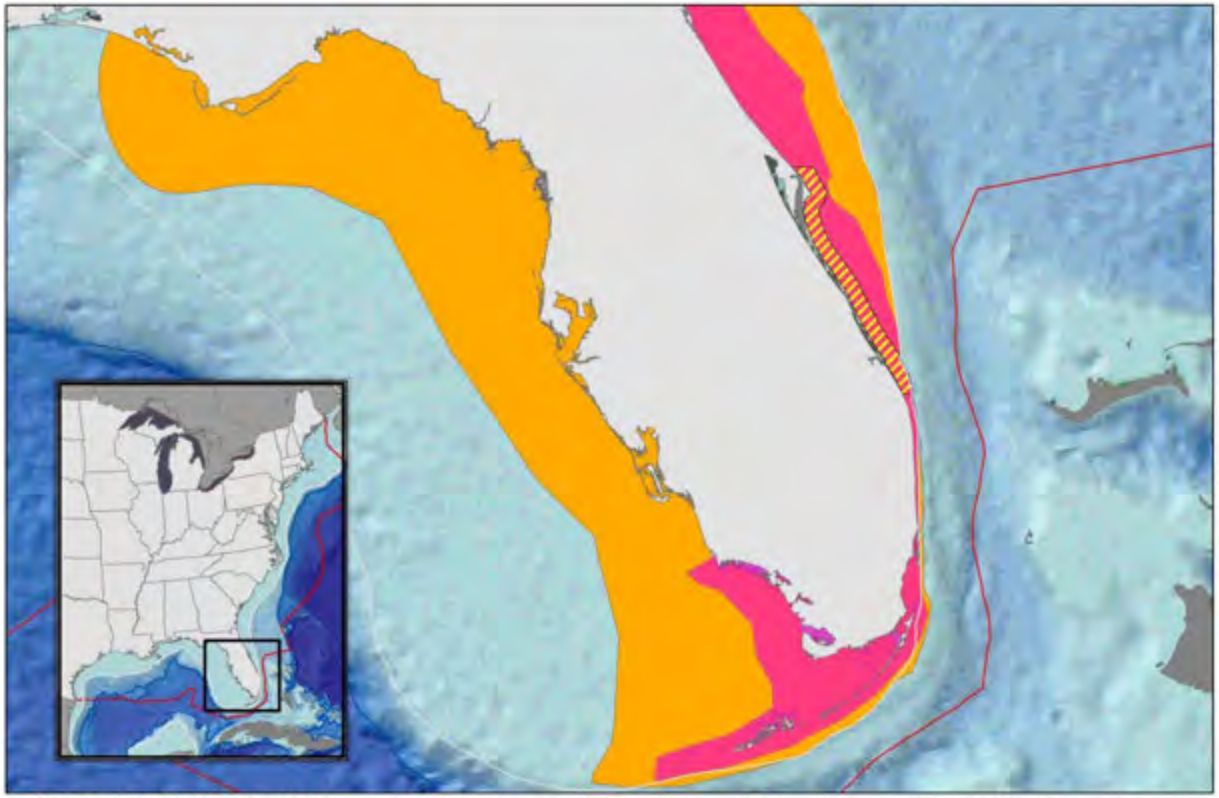
- Alternative 4b
  (*preferred*): Modify current HAPC for sandbar shark





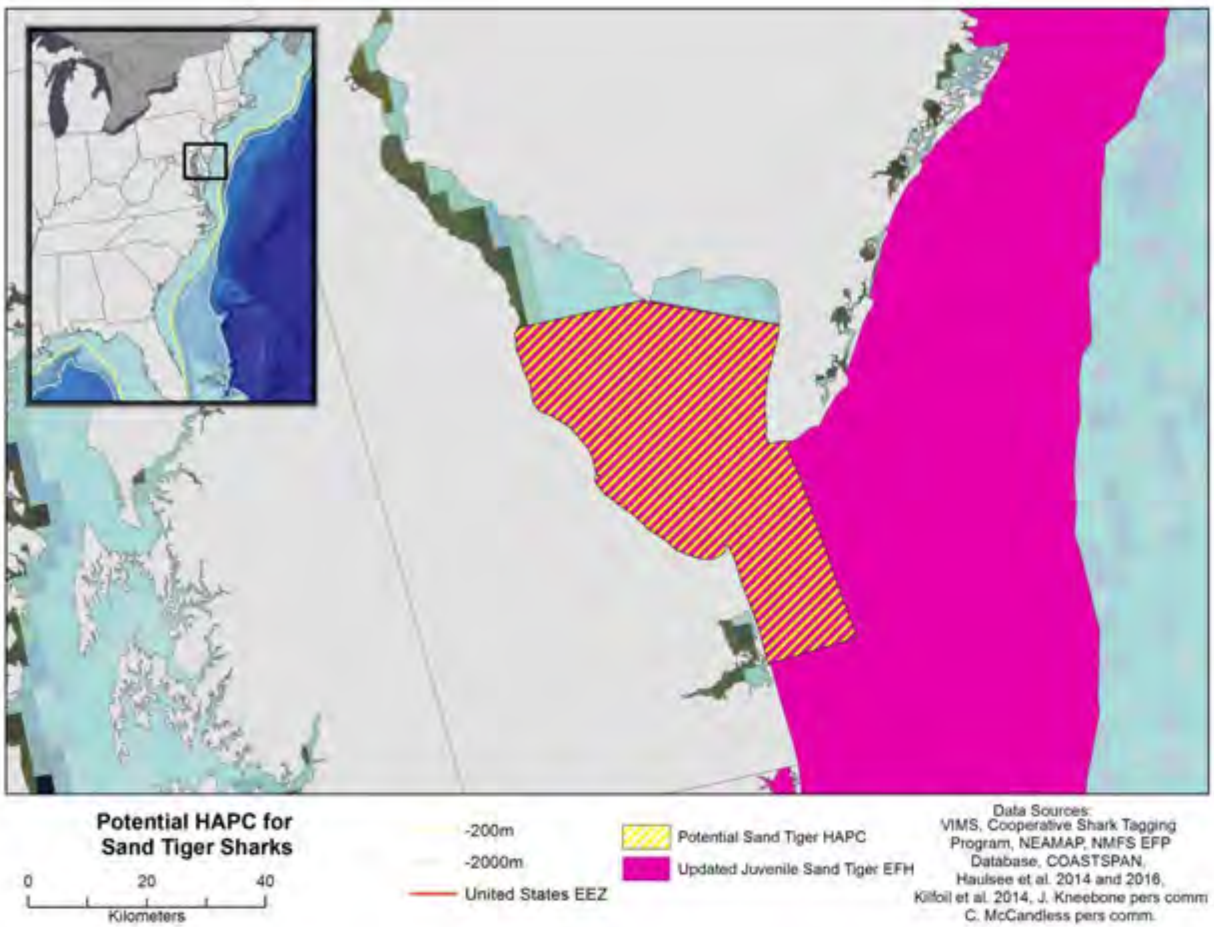
Draft Amendment Alternatives: HAPCs

- Alternative 5b (*preferred*): Create a new HAPC for lemon sharks



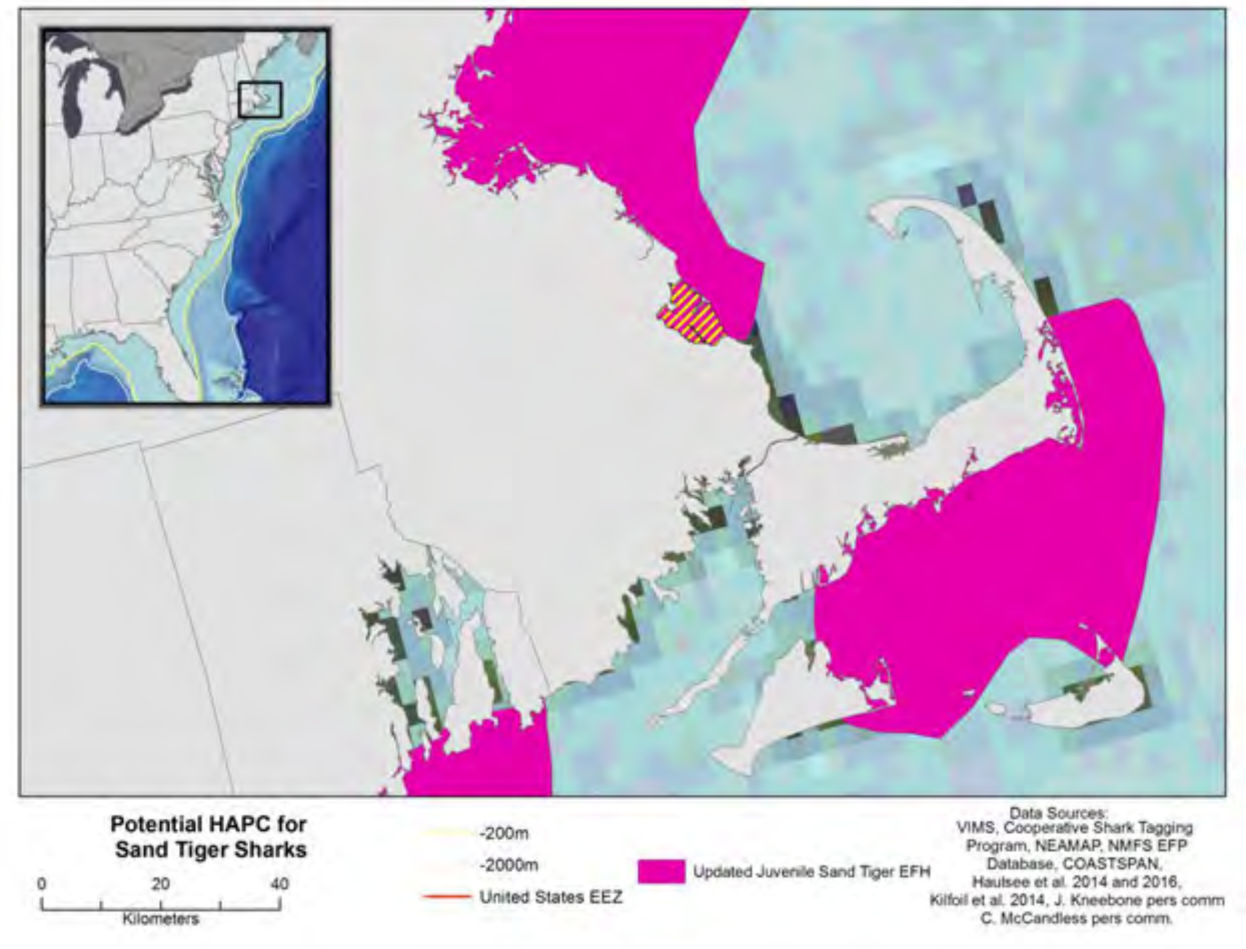
Draft Amendment Alternatives: HAPCs

- Alternative 6b (*preferred*): Create new HAPCs for sand tiger shark



Draft Amendment Alternatives: HAPCs

- Alternative 6b (Continued) (*preferred*): Create new HAPCs for sand tiger shark



Important to Note:

- EFH designations and Habitat Areas of Particular Concern (HAPCs) are <u>NOT</u> time/area closures

- Updating EFH boundaries in conjunction with implementing time/area closures would require notice and comment rulemaking and detailed ecological, economic, and social analyses.

- *There are no implementing regulations (i.e., restrictions on fishing and non-fishing activities) in the Draft Amendment.*

Timeline

- Draft Amendment released September 2016
- Webinar/Public Conference Calls:
  - November and December 2016
- Additional Opportunities for Public Input:
  - Council and Commission meetings (September, October, December)
- Comment Period Ends – **December 22, 2016**

(2) That either:

(i) The complaining shipper has used or would use the through route or through rate to meet a significant portion of its current or future railroad transportation needs between the origin and destination; or

(ii) The complaining carrier has used or would use the affected through route or through rate for a significant amount of traffic.

(b) * * *.

(3) When prescription of a through route or a through rate is necessary to remedy or prevent an act contrary to the competitive standards of this section, the overall revenue inadequacy of the defendant railroad(s) will not be a basis for denying the prescription.

* * * * *

■ 4. Add part 1145 to read as follows:

PART 1145—RECIPROCAL SWITCHING

Sec.
1145.1 Negotiation
1145.2 Establishment of Reciprocal Switching Arrangement
1145.3 General

Authority: 49 U.S.C. 1321 and 11102.

§ 1145.1 Negotiation.

(a) *Timing.* At least 5 days prior to seeking the establishment of a switching arrangement, the party intending to initiate such action must first seek to engage in negotiations to resolve its dispute with the prospective defendant(s).

(b) *Participation.* Participation or failure to participate in negotiations does not waive a party's right to file a timely request for the establishment of a switching arrangement.

(c) *Arbitration.* The parties may use arbitration as part of the negotiation process, or in lieu of litigation before the Board.

§ 1145.2 Establishment of reciprocal switching arrangement.

(a) *General.* A reciprocal switching arrangement shall be established under 49 U.S.C. 11102(c) if the Board determines that such arrangement is either practicable and in the public interest, or necessary to provide competitive rail service, except as provided in paragraph(a)(2)(iv) of this section.

(1) The Board will find a switching arrangement to be practicable and in the public interest when:

(i) The party seeking such switching shows that the facilities of the shipper(s) and/or receiver(s) for whom such switching is sought are served by Class I rail carrier(s);

(ii) The party seeking such switching shows that there is or can be a working interchange between the Class I carrier servicing the party seeking switching and another Class I rail carrier within a reasonable distance of the facilities of the party seeking switching; and

(iii) The party seeking such switching shows that the potential benefits from the proposed switching arrangement outweigh the potential detriments. In making this determination, the Board may consider any relevant factor, including but not limited to:

(A) Whether the proposed switching arrangement furthers the rail transportation policy of 49 U.S.C. 10101;

(B) The efficiency of the route under the proposed switching arrangement;

(C) Whether the proposed switching arrangement allows access to new markets;

(D) The impact of the proposed switching arrangement, if any, on capital investment;

(E) The impact of the proposed switching arrangement on service quality;

(F) The impact of the proposed switching arrangement, if any, on employees;

(G) The amount of traffic the party seeking switching would use pursuant to the proposed switching arrangement; and

(H) The impact of the proposed switching arrangement, if any, on the rail transportation network.

(iv) Notwithstanding the provisions of (a)(1)(i)–(iii) of this section, the Board shall not find a switching arrangement to be practicable and in the public interest under this section if either rail carrier between which such switching is sought to be established shows that the proposed switching is not feasible or is unsafe, or that the presence of such switching will unduly hamper the ability of that carrier to serve its shippers.

(2) The Board will find a switching arrangement to be necessary to provide competitive rail service when:

(i) The party seeking such switching shows that the facilities of the shipper(s) and/or receiver(s) for whom such switching is sought are served by a single Class I rail carrier;

(ii) The party seeking such switching shows that intermodal and intramodal competition is not effective with respect to the movements of the shipper(s) and/or receivers(s) for whom switching is sought; and

(iii) The party seeking such switching shows that there is or can be a working interchange between the Class I carrier servicing the party seeking switching and another Class I rail carrier within a reasonable distance of the facilities of the party seeking switching.

(iv) Notwithstanding the provisions of (a)(2)(i)–(iii) of this section, a switching arrangement will not be established under this section if either rail carrier between which such switching is sought to be established shows that the proposed switching is not feasible or is unsafe, or that the presence of such switching will unduly hamper the ability of that carrier to serve its shippers.

(b) *Other considerations.*

(1) In considering requests for reciprocal switching under (a)(2) of this section, the Board will not consider product or geographic competition.

(2) In considering requests for reciprocal switching under (a)(2) of this section, the overall revenue inadequacy of the defendant railroad will not be a basis for denying the establishment of a switching arrangement.

(3) Any proceeding under the terms of this section will be conducted and concluded by the Board on an expedited basis.

§ 1145.3 General

(a) *Effective date.* These rules will govern the Board's adjudication of individual cases pending on or after [EFFECTIVE DATE OF FINAL RULE].

(b) *Discovery.* Discovery under these rules is governed by the Board's general rules of discovery at 49 CFR part 1114.

[FR Doc. 2016–17980 Filed 8–2–16; 8:45 am]

BILLING CODE 4915–01–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 635

[Docket No. 160129062–6643–01]

RIN 0648–BF49

Atlantic Highly Migratory Species; Commercial Retention Limit for Blacknose Sharks and Non-Blacknose Small Coastal Sharks in the Atlantic Region

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS is proposing modifications to the commercial retention limits for blacknose sharks and non-blacknose small coastal sharks

(SCS) in the Atlantic region. The action would reduce discards of non-blacknose SCS while increasing the utilization of available Atlantic non-blacknose SCS quota and rebuilding and ending overfishing of Atlantic blacknose sharks. The Agency is proposing a measure that would establish a commercial retention limit of eight blacknose sharks for all Atlantic shark limited access permit holders in the Atlantic region south of 34°00′ N. latitude. In addition, NMFS is proposing to make two small, unrelated administrative changes to existing regulatory text to remove cross-references to an unrelated section and a section that does not exist. These two changes are administrative in nature, and no impacts to the environment or current fishing operations are expected. The proposed action could affect fishermen in the south Atlantic management area who hold commercial shark limited access permits.

DATES: Written comments must be received by September 20, 2016. NMFS will hold an operator-assisted public hearing via conference call and webinar for the draft Environmental Assessment (EA) and this proposed rule on August 16, 2016, from 2 p.m. to 4 p.m. NMFS will also hold one public hearing for this proposed rule on August 24, 2016. For specific locations, dates and times, see the **SUPPLEMENTARY INFORMATION** section of this document.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2016–0095, by any of the following methods:

- *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2016-0095,* click the ‘‘Comment Now!’’ icon, complete the required fields, and enter or attach your comments.
- *Mail:* Submit written comments to Margo Schulze-Haugen, Chief, Atlantic HMS Management Division at 1315 East-West Highway, Silver Spring, MD 20910.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ‘‘N/A’’ in the required fields if you wish to remain anonymous).

NMFS will hold one public hearing in Cocoa Beach, FL and one conference call on this proposed rule. For specific locations, dates and times, see the **SUPPLEMENTARY INFORMATION** section of this document.

Copies of the supporting documents, including the draft EA, Regulatory Impact Review (RIR), Initial Regulatory Flexibility Analysis (IRFA), and the 2006 Consolidated Atlantic HMS FMP are available from the HMS Web site at *http://www.nmfs.noaa.gov/sfa/hms/* or by contacting Guý DuBeck at 301–427–8503.

FOR FUTHER INFORMATION CONTACT: Guý DuBeck, Larry Redd, Cliff Hutt, or Karyl Brewster-Geisz by phone at 301–427–8503.

SUPPLEMENTARY INFORMATION: Atlantic sharks are directly managed under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and the authority to issue regulations has been delegated from the Secretary to the Assistant Administrator (AA) for Fisheries, NOAA. NMFS published in the **Federal Register** (71 FR 59058) final regulations, effective November 1, 2006 implementing the 2006 Consolidated Highly Migratory Species (HMS) Fishery Management Plan (FMP), which details management measures for Atlantic HMS fisheries. The implementing regulations for the 2006 Consolidated HMS FMP and its amendments are at 50 CFR part 635. This proposed rule considers modifying the commercial retention limits for blacknose sharks and non-blacknose SCS in the Atlantic region south of 34°00′ N. latitude.

Background

A brief summary of the background of this proposed action is provided below. Additional information regarding Atlantic HMS management can be found in the Draft EA for this proposed action, the 2006 Consolidated HMS FMP and its amendments, the annual HMS Stock Assessment and Fishery Evaluation (SAFE) Reports, and online at *http://www.nmfs.noaa.gov/sfa/hms/.*

NMFS manages four SCS species: Blacknose, Atlantic sharpnose, finetooth, and bonnethead. All of these species except blacknose sharks are managed in a management group called the ‘‘non-blacknose SCS.’’ Blacknose sharks were assessed separately and declared overfished with overfishing occurring and thus are managed separately, subject to a rebuilding plan. Nevertheless, gillnet fishermen in the South Atlantic area typically fish for and land all four of the SCS species. Thus, any management measure changes to either the blacknose shark or non-blacknose SCS management groups could impact all of these fishermen. Thus, while NMFS analyzed the stock impacts separately, NMFS discussed the economic impacts cumulatively at times and refer to the ‘‘overall SCS fishery,’’ which means the fishery for all four species in the South Atlantic management area.

This proposed rule considers modifying the commercial retention limits for blacknose sharks and non-blacknose SCS in the Atlantic region. This rulemaking only focuses on the Atlantic region since NMFS prohibited the retention and landings of blacknose sharks in the Gulf of Mexico in 2015. The action will reduce discards of non-blacknose SCS while increasing the utilization of available Atlantic non-blacknose SCS quota and rebuilding and ending overfishing of Atlantic blacknose sharks.

Since the completion of the 2007 blacknose shark stock assessment, NMFS has conducted numerous rulemakings regarding all SCS, including blacknose sharks, in order to rebuild blacknose sharks and end overfishing, consistent with the 2006 Consolidated HMS FMP. The 2007 stock assessment of blacknose sharks assessed blacknose sharks as one stock, and determined that the stock was overfished and overfishing was occurring.

On June 1, 2010 (75 FR 30484), NMFS published a final rule for Amendment 3 to the 2006 Consolidated HMS FMP that, among other things, established blacknose shark and non-blacknose SCS quotas. In the proposed rule, because of the blacknose stock status, NMFS proposed prohibiting the use of gillnet gear in waters south of North Carolina. However, based on comments received during that rulemaking that fishermen could catch non-blacknose SCS while avoiding blacknose sharks when using gillnet gear, the final rule continued to allow landings of SCS sharks with gillnet gear, but linked the quotas for the non-blacknose SCS and blacknose shark fisheries to create an incentive to avoid the incidental catch of blacknose sharks. After that rulemaking, in monthly landings updates and other documents, NMFS encouraged fishermen to avoid blacknose sharks in order to extend the non-blacknose SCS season. For the first two years under this quota linkage, fishermen successfully avoided landing blacknose sharks. This avoidance meant that both the non-blacknose SCS fishery remained open most of the year and the blacknose shark quota was not exceeded.

In 2011, a new stock assessment for blacknose sharks was completed. This assessment concluded that there are two stocks of blacknose sharks—one in the Atlantic and one in the Gulf of Mexico and assessed them separately. The assessment for the Atlantic blacknose shark stock was accepted by the peer reviewers, and NMFS determined that the Atlantic blacknose shark stock is overfished and overfishing is occurring (76 FR 62331, October 7, 2011). The assessment for the Gulf of Mexico stock was not accepted by the peer reviewers. As such, NMFS declared the stock status to be unknown. On July 3, 2013 (78 FR 40318), NMFS published a final rule for Amendment 5a to the 2006 Consolidated HMS FMP which, among other things, divided the blacknose quota into separate regional quotas (Atlantic and Gulf of Mexico) consistent with the assessment determination that there are two separate stocks. NMFS continued to link the regional blacknose and non-blacknose SCS quotas and therefore divided the non-blacknose SCS quota into separate regional quotas as well, to parallel the division of the blacknose shark stocks. While NMFS established quotas for the two regions, those quotas were not further broken down into commercial retention limits because the quota linkages between the blacknose shark fishery and the non-blacknose SCS fishery alone were expected to create adequate incentive to avoid blacknose sharks.

More recently, NMFS has seen signs that fishermen using gillnet gear in the Atlantic region are no longer avoiding blacknose sharks. In 2012, the overall blacknose shark quota for the Atlantic and Gulf of Mexico regions was exceeded, and the blacknose shark quota in the Atlantic region was exceeded again in 2015. Additionally, the blacknose and non-blacknose SCS fisheries have been closing earlier each year (September 30, 2013 (blacknose sharks and non-blacknose SCS in the Atlantic and Gulf of Mexico regions); July 28, 2014 (blacknose sharks and non-blacknose SCS in the Atlantic region); June 7, 2015 (blacknose sharks and non-blacknose SCS in the Atlantic region)). A review of the landings data indicate the early closures are a result of some fishermen who have been landing large numbers of blacknose sharks relative to other fishermen. These early closures mean that the non-blacknose SCS quota remains underutilized (less than 40 percent was harvested in 2013 and less than 60 percent harvested in both 2014 and 2015). These closures also mean that non-blacknose SCS are discarded even if quota is available because all SCS species must be discarded once the fisheries are closed.

To reduce the discards of non-blacknose SCS while not increasing landings of blacknose sharks, on August 18, 2015 (80 FR 50074), NMFS published a final rule for Amendment 6 to the 2006 Consolidated HMS FMP. This final rule, among other things, prohibited the retention and landings of blacknose sharks in the Gulf of Mexico region. In the Atlantic region, NMFS established a management boundary along 34° N. latitude for the non-blacknose SCS fishery, removed the quota linkage between non-blacknose SCS and blacknose shark quotas north of the boundary, and prohibited the retention and landings of blacknose sharks north of that boundary since blacknose sharks are rarely caught there. South of the new management boundary, NMFS maintained the non-blacknose SCS and blacknose shark quota linkage and reduced the blacknose shark quota to account for the potential dead discards north of the boundary. Thus, in August 2015, after implementation of Amendment 6, the non-blacknose SCS fishery re-opened north of 34° N. latitude (August 18, 2015, 80 FR 50074) upon publication of the final rule. From August through December, fishermen were able to land an additional 40.5 mt dw, or 15 percent of the non-blacknose SCS quota, after the fishery reopened. However, the non-blacknose SCS fishery remained closed south of 34° N. latitude and fishermen in that area were still required to discard all non-blacknose SCS caught after June 7, 2015.

NMFS recently took action again to close the commercial blacknose shark and non-blacknose SCS fisheries in the Atlantic region south of 34° N. latitude because the commercial landings of Atlantic blacknose sharks for the 2016 fishing season were projected to exceed 80 percent of the available commercial quota (81 FR 33604; May 29, 2016). This indicates that some fishermen south of 34° N. latitude are continuing to land large numbers of blacknose sharks relative to other fishermen even though this results in earlier closures and the potential loss of access to the available non-blacknose SCS quota because of the linkage.

Additionally, since publishing Amendment 6, NMFS has received comments from fishermen and the South Atlantic Fishery Management Council stating that fishermen in the Spanish mackerel gillnet fishery with HMS permits are having to discard otherwise marketable non-blacknose SCS south of the 34° N. latitude management boundary due to the quota linkage, even though non-blacknose SCS quota remains available. Thus, in preparing this proposed rule NMFS considered alternatives to prevent the overharvest and discard of blacknose sharks, maximize the utilization of available non-blacknose SCS quota, extend the season for non-blacknose SCS fisheries, and improve economic opportunities. Specifically, NMFS considered establishing commercial retention limits within the existing quotas for either the blacknose sharks or non-blacknose SCS in the Atlantic region south of 34° N. latitude.

NMFS prepared a draft EA, RIR, and an IRFA, which present and analyze the anticipated environmental, social, and economic impacts of each alternative considered for this proposed rule. The complete list of alternatives and related analyses is provided in the draft EA/RIR/IRFA, and is not repeated here in its entirety. A copy of the draft EA/RIR/IRFA prepared for this proposed rulemaking is available from NMFS (see **ADDRESSES**).

NMFS considered three alternatives for this proposed action. All three alternatives would apply only in the SCS fishery south of 34°00′ N. latitude in the Atlantic region. Alternative 1, the No Action alternative, would maintain the status quo and the current regulations and practices in the blacknose and non-blacknose SCS fishery. Alternative 2 would establish a commercial retention limit for non-blacknose SCS that would be in effect once the blacknose shark quota is reached for directed shark limited access permit holders. Alternative 3 would establish a commercial retention limit for blacknose sharks for all Atlantic HMS limited access permit holders that would be in effect while the blacknose shark quota is available; once the blacknose shark quota is reached, retention of blacknose would be prohibited. Under both Alternatives 2 and 3, NMFS considered a range of three sub-alternatives.

Under Alternative 1, the No Action alternative, NMFS would not implement any new commercial retention limits for blacknose sharks or non-blacknose SCS in the Atlantic region for Atlantic shark directed limited access permit holders (shark incidental limited access permit holders are already limited to a retention limit of 16 combined SCS and pelagic sharks per trip). Instead, the blacknose and non-blacknose SCS quotas would continue to be linked by region and, south of 34°00′ N. latitude, access to both quotas would be closed when the blacknose shark quota (17.2

mt dw; 37,921 lb dw) is reached. Logbook data from 2010 through 2015 indicates that on average fishermen take 207 trips per year to land the blacknose shark quota and land approximately 212 lb dw of blacknose sharks per trip. However, the average landings per trip are increasing, and correspondingly, the number of trips needed to land the quota is decreasing. In 2015, the average blacknose shark landings were 402 lb dw per trip, and logbook data indicate that fishermen took approximately 94 trips to harvest the baseline blacknose shark quota. Given that the fishing season has been closing earlier each year for the last several years, NMFS expects the trend of decreasing number of trips and increasing weight per trip to continue if no further action is taken. Under this alternative, available non-blacknose SCS quota would continue to go unharvested, likely in increasingly large amounts. Because this alternative would maintain the status quo, this alternative would have minor adverse ecological impacts on blacknose sharks as the overharvests may continue to occur and blacknose sharks may continue to be subject to overfishing. However, this alternative would likely have positive ecological benefits for non-blacknose SCS because the early closure of the fishery leaves the non-blacknose SCS quota underutilized. Overall, maintaining the status quo for both the blacknose shark and non-blacknose SCS management groups would have neutral to positive ecological impacts.

With regard to socioeconomic impacts, Alternative 1 would likely continue to result in underutilization of the non-blacknose SCS quota as a result of the early closure of both blacknose and non-blacknose SCS management groups. Between 2014 and 2015, the Atlantic non-blacknose SCS quota has been underutilized by an average of 314,625 lb dw (54 percent of the quota). This represents foregone revenues of $298,583 assuming an average value of $0.74/lb dw for meat and $4.18/lb dw for fins. NMFS expects that Alternative 1, the No Action alternative, would have minor adverse socioeconomic impacts on the non-blacknose SCS fisheries as it would continue to allow for underutilization of the Atlantic non-blacknose SCS quota.

Under Alternative 2, NMFS would implement a commercial retention limit for non-blacknose SCS and remove the quota linkage to blacknose sharks south of 34°00′ N. latitude. In Amendment 3 to the 2006 Consolidated HMS FMP (75 FR 30484; June 1, 2010), NMFS linked the blacknose shark and non-blacknose SCS quotas to address the blacknose shark stock determination and implement measures to rebuild and end overfishing of blacknose sharks. Without the quota linkage, fishermen would be able to continue to harvest non-blacknose SCS after the blacknose shark quota was fully harvested but would need to discard blacknose sharks once that fishery closed. While many fishermen are able to avoid blacknose sharks when fishing for non-blacknose SCS, in order to allow for any non-blacknose SCS landings after a blacknose shark closure, NMFS estimated how many blacknose sharks could potentially be discarded dead by vessels harvesting non-blacknose SCS once the blacknose shark quota (17.2 mt dw; 37,921 lb dw) has been harvested and the fishery is closed. This additional mortality would be counted against the total allowable catch of blacknose sharks upfront, and the overall commercial retention limit for blacknose shark quota would be reduced accordingly.

Under Alternative 2a, NMFS would implement a commercial retention limit of 50 non-blacknose SCS per trip once the blacknose shark quota is reached and remove the quota linkage to blacknose sharks for shark directed limited access permit holders fishing south of 34°00′ N. latitude. Under this alternative, NMFS would also reduce the baseline blacknose shark quota to 15.0 mt dw (33,069 lb dw) due to the estimated number of blacknose sharks that would be discarded dead while harvesting non-blacknose SCS (985 sharks). NMFS expects that this alternative would have minor adverse ecological impacts on blacknose sharks in the Atlantic region as this alternative would likely not change the current fishing practices and the commercial quota for blacknose sharks would still likely be landed quickly, potentially resulting in overharvests due to data reporting lags. Additionally, this alternative would have neutral ecological impacts on non-blacknose SCS in the region as fishermen could land 50 non-blacknose SCS per trip until reaching the quota, thus utilizing the non-blacknose SCS quota, without exceeding it. Overall, the commercial retention limit for non-blacknose SCS would have minor adverse ecological impacts for the SCS fishery, which means the fishery for all four SCS species in the South Atlantic management area. The reduction in blacknose shark quota could cause the closure of blacknose shark fishery even earlier in the year but this closure would no longer close the non-blacknose SCS fishery. This reduction in the blacknose shark quota would result in estimated lost revenues of $5,193 compared to the current baseline quota under Alternative 1, assuming an average value of $0.87 lb dw for meat and $4.00 lb dw for fins of blacknose sharks. However, this alternative would generate an estimated 286 additional trips landing non-blacknose SCS at 50 non-blacknose SCS per trip, generating $34,470 in revenue from for non-blacknose SCS. As such, this alternative should have minor beneficial economic impacts on the overall SCS fishery.

NMFS also analyzed two other alternatives that would implement commercial retention limits when the blacknose shark quota is reached and remove the quota linkage to blacknose sharks for shark directed limited access permit holders. Alternative 2b would establish a commercial retention limit of 150 non-blacknose SCS, and Alternative 2c would establish a commercial retention limit of 250 for non-blacknose SCS. Under Alternative 2b, the baseline blacknose shark quota would be adjusted to 10.5 mt dw (23,148 lb dw) due to the estimated number of dead discard blacknose sharks (2,956 sharks) which likely would occur in the non-blacknose SCS fishery. Similar to Alternative 2a, NMFS expects that this alternative would have minor adverse ecological impacts on the blacknose sharks in the Atlantic region as some directed permit holders could continue to land large numbers of blacknose sharks relative to other fishermen until the blacknose shark quota is landed, which could increase the amount of blacknose shark dead discards after the blacknose fishing season is closed because the quota linkage would be removed. Similar to Alternative 2a, this alternative would have neutral ecological impacts on the non-blacknose sharks in the region as fishermen could land 150 non-blacknose SCS per trip until reaching the quota, thus utilizing the non-blacknose SCS quota without exceeding it. However, this alternative would have minor adverse ecological impacts for the overall SCS fishery because dead discards would continue after the blacknose shark quota is reached. The reduction in blacknose shark quota would result in estimated lost revenues of $15,808, assuming an average value of $0.87 lb dw for meat and $4.00 lb dw for fins of blacknose sharks. This alternative would generate an estimated 286 additional trips landing non-blacknose SCS at 150 non-blacknose SCS per trip, resulting in a revenue gain of $65,139 for non-blacknose SCS. As such, this alternative should have minor beneficial economic impacts on the overall SCS fishery.

Under Alternative 2c, the baseline blacknose shark quota would be reduced to 6.1 mt dw (13,448 lb dw) due to the estimated number of dead discard blacknose sharks (4,927 sharks) which likely would occur in the non-blacknose SCS fishery under this scenario. NMFS expects that this alternative would have minor adverse ecological impacts on the blacknose sharks in the Atlantic region as some directed permit holders would continue to land large numbers of blacknose sharks relative to other fishermen until the blacknose shark quota is landed, increasing the amount of blacknose dead discards after the blacknose fishing season is closed due to the elimination of the quota linkage. This alternative would have neutral ecological impacts on the non-blacknose sharks in the region as fishermen could land 250 non-blacknose SCS per trip until reaching the quota, thus utilizing the non-blacknose SCS quota without exceeding it. Similar to Alternative 2a, the commercial retention limit for non-blacknose SCS would have minor adverse ecological impacts for the overall SCS fishery because dead discards would continue after the blacknose shark quota is reached. This alternative would result in estimated lost revenues of $26,217 assuming an average value of $0.87 lb dw for meat and $4.00 lb dw for fins of blacknose sharks. This alternative would generate an estimated 286 additional trips landing non-blacknose SCS at 250 non-blacknose SCS per trip, resulting in a revenue gain of $80,339 for non-blacknose SCS. As such, this alternative should have moderate beneficial economic impacts on the overall SCS fishery.

Under Alternative 3, NMFS would establish a commercial retention limit for blacknose sharks per trip for all Atlantic HMS limited access permit holders in the Atlantic region south of 34°00′ N. latitude when the blacknose shark quota is available; when the blacknose shark quota is reached, retention of blacknose sharks would be prohibited. To determine the number of trips that would harvest the blacknose shark quota, NMFS divided the current baseline shark quota (17.2 mt dw or 37,921 lb dw) by the product of the retention limit of the sub-alternative and 5 lb dw (which is the average weight of each blacknose shark, based on observer data). For example, under Alternative 3c, the preferred alternative, NMFS would establish a commercial retention limit of eight blacknose sharks per trip for Atlantic HMS directed and incidental limited access permit holders. This retention limit would allow an average of 40 lb dw blacknose sharks per trip (8 sharks * 5 lb dw) and would result in an estimated 948 trips to land the baseline blacknose shark quota (37,919 lb dw/40 lb dw). This retention limit is be much lower when compared to the blacknose sharks landed per trip and number of trips that harvested the quota in previous years. In 2014 and 2015, between 243 and 402 lb dw of blacknose sharks were harvested per trip, and the quota was fully harvested in approximately 156 and 94 trips, respectively. Since most fishermen prefer not to discard any fish, NMFS believes this alternative has the potential to influence fishermen to revert to the fishing practices observed in 2010 and 2011 when blacknose sharks were actively avoided when fishing for non-blacknose SCS. NMFS expects that this alternative would have moderate beneficial ecological impacts on the blacknose sharks in the Atlantic region since the lower blacknose shark landings per trip would reduce the rate of landings such that the quota is not exceeded and might result in underharvests. Thus, this alternative could aid in the rebuilding of blacknose sharks and help prevent quota exceedances. This alternative would also have neutral ecological impacts for non-blacknose SCS as NMFS expects that that quota would be fully utilized without being exceeded. Overall, the commercial retention limit for blacknose sharks would have moderate beneficial ecological impacts for the overall SCS fishery. Additionally, this alternative would also have minor beneficial socioeconomic impacts as the fishermen could still land blacknose sharks and the fishery would remain open for a longer period of time, increasing SCS revenues by as much as $98,664 a year on average if the non-blacknose SCS quota is fully utilized. Any financial losses due to underutilization of the blacknose shark quota would be minimal by comparison.

NMFS also analyzed two other blacknose shark retention limit alternatives that are not preferred at this time. Alternative 3a would establish a retention limit of 50 blacknose sharks per trip for directed limited access permit holders (shark incidental limited access permit holders would continue to be limited to a total of 16 pelagic and SCS sharks per trip). This retention limit would allow an average of 250 lb dw blacknose sharks per trip and would result in an estimated 152 trips to land the blacknose shark quota. The retention limit of 50 blacknose sharks could potentially cause the SCS fisheries to close as early as June or July if every trip landing blacknose sharks lands the full retention limit, although this is highly unlikely. Under Alternative 3b, NMFS would establish a commercial retention limit of 16 blacknose sharks per trip for directed limited access permit holders. This retention limit would allow an average of 80 lb dw blacknose sharks per trip and would result in an estimated 474 trips to land the full blacknose shark quota. NMFS expects that both of these alternatives would have minor to moderate beneficial ecological impacts on Atlantic blacknose sharks as all Atlantic shark limited access permit holders would be expected to revert to how they had been fishing in 2010 and 2011 and actively avoiding blacknose sharks when fishing for non-blacknose SCS. For non-blacknose SCS, these alternatives would have neutral impacts as the stock would be fished under the level established, resulting in a fishery that would be underutilized. Overall, establishing the commercial retention limit would have beneficial impacts for Alternatives 3a and 3b for the SCS fishery. Additionally, these alternatives would also have minor beneficial socioeconomic impacts to the Atlantic SCS fishery as they would allow for the potential full-utilization of the non-blacknose SCS quota, and potentially increase average revenues by $98,664 per year. Any foregone revenue due to under-utilization of the blacknose shark quota would be minimal in comparison.

Currently, NMFS prefers to establish a commercial retention limit of eight blacknose sharks per trip (Alternative 3c) since the retention limit would have moderate beneficial ecological impacts on blacknose sharks, neutral ecological impacts on non-blacknose SCS, and minor beneficial socioeconomic impacts for SCS fishermen because they should be able to fully utilize the non-blacknose SCS quota. NMFS does not prefer Alternative 1 (No Action alternative) since this alternative does not meet the objectives of the rule, could result in continued overharvests of the blacknose shark quota, and would continue to underutilize the non-blacknose shark SCS quota. NMFS does not prefer Alternatives 2a, 2b, and 2c establishing a commercial retention limit for non-blacknose SCS, because that could lead to an increase in dead discards of blacknose sharks while targeting non-HMS species and non-blacknose SCS depending on the commercial retention limit. In addition, the reduced blacknose shark quotas due to the estimated dead discards of blacknose sharks when the quota linkage is removed, would implement a commercial retention limit for non-blacknose SCS south of 34°00′ N. latitude earlier in the fishing season when the blacknose shark fishery is closed than the preferred alternative. Thus, the non-blacknose SCS quota may not be fully utilized under the alternatives. Furthermore, NMFS does not expect the economic benefits of Alternatives 2a, 2b, or 2c to be as high as the benefits expected under any of the sub-alternatives under Alternative 3. NMFS does not prefer Alternative 3a which would set a retention limit of 50 blacknose sharks per trip could cause the blacknose shark quota to be filled relatively quickly result in and the closure of the non-blacknose SCS fishery before the end of the fishing season. Regarding Alternative 3b, which would set a retention limit of 16 blacknose sharks per trip, at the HMS Advisory Panel meeting in March 2016, NMFS received comments from Panel members who supported maximizing the number of trips per year to land blacknose sharks as would be done in Alternative 3c rather than Alternative 3b. Panel members were concerned that Alternative 3b would not guarantee a year-round fishery for SCS because some fishermen would land the maximum number per trip (16 blacknose sharks per trip) and close the fishery and NMFS agreed with this statement.

Administrative Changes

In addition to the preferred alternative described above, NMFS is proposing to make two small, unrelated administrative changes to existing regulatory text. Specifically, in two locations in § 635.24(a), the regulations make reference to paragraphs (a)(4)(iv) through (vi); those cross-references are unnecessary because the Commercial Caribbean Small Boat permit under (a)(4)(iv) is a separate permit from the limited access permits and there is no (a)(4)(v) regulation. Because NMFS is already proposing changes to § 635.24(a) through this rulemaking, NMFS has decided to use this opportunity to propose removal of those cross-references. This action is administrative in nature, reflects current practice, and would not have environmental impacts or effects on current fishing operations.

Public Hearings

Comments on this proposed rule may be submitted via *http://www.regulations.gov,* mail, or fax and comments may also be submitted at a public hearing. NMFS solicits comments on this proposed rule through September 20, 2016. During the comment period, NMFS will hold one public hearing and one conference call for this proposed rule. The hearing locations will be physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to Guý DuBeck at 301–427–8503, at least 7 days prior to the meeting. NMFS has also asked to present information on the proposed rule and draft EA to the South Atlantic Fishery Management Councils at their meetings during the public comment period. Please see their meeting notices for dates, times, and locations.

TABLE 1—DATES, TIMES, AND LOCATIONS OF UPCOMING PUBLIC HEARING AND CONFERENCE CALL.

Venue	Date/time	Meeting locations	Location contact information
Conference call	August 16, 2016, 2 p.m.–4 p.m.		To participate in conference call, call: (888) 635–5002, Passcode: 6429428. To participate in webinar, RSVP at: *https://noaaevents2.webex.com/noaaevents2/onstage/g.php?MTID=e2a3c0722f8a4bee1c303445a56b6a065,* A confirmation email with webinar log-in information will be sent after RSVP is registered.
Public Hearing	August 24, 2016, 5 p.m.–8 p.m.	Cocoa Beach, FL	Cocoa Beach Public Library, 550 North Brevard Avenue, Cocoa Beach, FL 32931, (321) 868–1104.

The public is reminded that NMFS expects participants at the public hearings to conduct themselves appropriately. At the beginning of each public hearing, a representative of NMFS will explain the ground rules (*e.g.,* alcohol is prohibited from the hearing room; attendees will be called in the order in which they registered to speak; each attendee will have an equal amount of time to speak; and attendees should not interrupt one another). At the beginning of the conference call, the moderator will explain how the conference call will be conducted and how and when attendees can provide comments. The NMFS representative will attempt to structure the meeting so that all the attending members of the public will be able to comment, if they so choose, regardless of the controversial nature of the subject(s). Attendees are expected to respect the ground rules, and, if they do not they may be asked to leave the hearing or may not be allowed to speak during the conference call.

Classification

Pursuant to the Magnuson-Stevens Act, the NMFS Assistant Administrator has determined that the proposed rule is consistent with the 2006 Consolidated HMS FMP and its amendments, other provisions of the Magnuson-Stevens Act, and other applicable law, subject to further consideration after public comment.

This proposed rule has been determined to be not significant for purposes of Executive Order 12866.

An IRFA was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule would have on small entities if adopted. A description of the action, why it is being considered, and the legal basis for this action are contained below. A summary of the analysis follows. A copy of this analysis is available from NMFS (see **ADDRESSES**).

Section 603(b)(1) requires Agencies to describe reasons why the action is being considered. This proposed action is designed to implement management measures for the blacknose and non-blacknose SCS fisheries that will reduce dead discards of non-blacknose SCS while increasing the utilization of the Atlantic non-blacknose SCS quota and rebuilding and ending overfishing of Atlantic blacknose sharks.

Section 603(b)(2) requires Agencies to describe the objectives of the proposed rule. NMFS has identified the following objectives, which are consistent with existing statutes such as the Magnuson-Stevens Act and its objectives, with regard to this proposed action:

- Obtaining optimum yield from the blacknose and non-blacknose-SCS fisheries;

• Reducing dead discards of sharks, particularly small coastal sharks;
• Continuing to rebuild the Atlantic blacknose shark stock; and
• Ending overfishing of the Atlantic blacknose shark stock.

Section 603(b)(3) of the Regulatory Flexibility Act requires Agencies to provide an estimate of the number of small entities to which the rule would apply. The Small Business Administration (SBA) has established size criteria for all major industry sectors in the United States, including fish harvesters. Provision is made under the SBA's regulations for an agency to develop its own industry-specific size standards after consultation with Advocacy and an opportunity for public comment (see 13 CFR 121.903(c)). Under this provision, NMFS may establish size standards that differ from those established by the SBA Office of Size Standards, but only for use by NMFS and only for the purpose of conducting an analysis of economic effects in fulfillment of the agency's obligations under the RFA. To utilize this provision, NMFS must publish such size standards in the **Federal Register** (FR), which NMFS did on December 29, 2015 (80 FR 81194). In this final rule effective on July 1, 2016, NMFS established a small business size standard of $11 million in annual gross receipts for all businesses in the commercial fishing industry (NAICS 11411) for RFA compliance purposes. NMFS considers all HMS permit holders to be small entities because they all had average annual receipts of less than $11 million for commercial fishing.

As of 2015, the proposed rule would apply to the approximately 224 directed commercial shark permit holders and 275 incidental commercial shark permit holders. Not all permit holders are active in the shark fishery in any given year. Active directed permit holders are defined as those with valid permits that landed one shark based on HMS electronic dealer reports. Of the 499 permit holders, only 27 permit holders landed SCS in the Atlantic region and, of those, only 13 landed blacknose sharks. NMFS has determined that the proposed rule would not likely affect any small governmental jurisdictions.

Section 603(b)(4) of the RFA requires Agencies to describe any new reporting, record-keeping and other compliance requirements. The action does not contain any new collection of information, reporting, or record-keeping requirements. The alternatives considered would adjust the commercial retention limits for the SCS fisheries, which would be a new compliance requirement for the shark fishery participants in the Atlantic region south of 34°00′ N. latitude but is similar to other compliance requirements the fishermen already follow.

Under section 603(b)(5) of the RFA, agencies must identify, to the extent practicable, relevant Federal rules which duplicate, overlap, or conflict with the proposed rule. Fishermen, dealers, and managers in these fisheries must comply with a number of international agreements, domestic laws, and other FMPs. These include the Magnuson-Stevens Act, the Atlantic Tunas Convention Act (ATCA), the High Seas Fishing Compliance Act, the Marine Mammal Protection Act, the Endangered Species Act (ESA), the National Environmental Policy Act, the Paperwork Reduction Act, and the Coastal Zone Management Act. This proposed rule has been determined not to duplicate, overlap, or conflict with any Federal rules.

One of the requirements of an IRFA is to describe any alternatives to the proposed rule which accomplish the stated objectives and which minimize any significant economic impacts. These impacts are discussed below. Additionally, the RFA (5 U.S.C. 603(c)(1)–(4)) lists four general categories of ''significant'' alternatives that would assist an agency in the development of significant alternatives. These categories of alternatives are: (1) Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) use of performance rather than design standards; and (4) exemptions from coverage of the rule, or any part thereof, for small entities.

In order to meet the objectives of this proposed rule, consistent with the Magnuson-Stevens Act, NMFS cannot establish differing compliance requirements for small entities or exempt small entities from compliance requirements. Thus, there are no alternatives discussed that fall under the first and fourth categories described above. NMFS does not know of any performance or design standards that would satisfy the objectives of this rulemaking while, concurrently, complying with the Magnuson-Stevens Act. As described below, NMFS analyzed several different alternatives in this proposed rulemaking and provides rationales for identifying the preferred alternatives to achieve the desired objectives.

The alternatives considered and analyzed are described below. The IRFA assumes that each vessel will have similar catch and gross revenues to show the relative impact of the proposed action on vessels.

Alternative 1, the No Action alternative, would not implement any new commercial retention limits for blacknose sharks and non-blacknose SCS in the Atlantic region south of 34°00′ N. latitude beyond those already in effect for current Atlantic shark limited access permit holders. NMFS would continue to allow fishermen with a direct limited access permit to land unlimited sharks per trip (within available quotas), and allow fishermen with an incidental permit to land 16 combined SCS and pelagic sharks per vessel per trip. Amendment 3 to the 2006 Consolidated HMS FMP established, among other things, a quota for blacknose shark separate from the SCS quota. The 2011 blacknose shark stock assessment determined that separate stocks of blacknose sharks existed in the Gulf of Mexico and the Atlantic Ocean. Amendment 5a to the 2006 Consolidated HMS FMP established, among other things, regional quotas for non-blacknose SCS and blacknose sharks in the Gulf of Mexico and the Atlantic Ocean in 2013. These blacknose shark and non-blacknose SCS quotas are linked by region and the regional SCS fishery is closed when the blacknose shark quota is reached. These linkages have resulted in the early closure of the entire SCS fishery due to high blacknose shark landings. Closure of the fishery as a result of Atlantic blacknose rapid harvest leaves the non-blacknose shark SCS quota underutilized. Between 2014 and 2015, the Atlantic non-blacknose SCS quota has been underutilized by an average of 314,625 lb dw or 54 percent of the quota. This represents an average ex-vessel loss of $298,583, assuming an average value of $0.74/lb dw for meat and $4.18/lb dw for fins. Based on the 27 vessels that landed SCS in the Atlantic, the per-vessel impact would be an approximate loss of $11,059 per year.

Alternative 2a would implement a commercial retention limit of 50 non-blacknose SCS per trip and remove the quota linkage to blacknose sharks for shark directed limited access permit holders in the Atlantic region south 34°00′ N. latitude once the blacknose shark quota is reached. Additionally, this alternative would adjust the blacknose shark quota to 15.0 mt dw (33,069 lb dw). Reduction of the blacknose shark quota would result in an average ex-vessel revenue loss of $5,193 for the fishery, while increased landings of non-blacknose SCS would result in an overall estimated average ex-vessel revenue gain of $34,470 for the fishery. NMFS estimates that this bycatch retention limit would result in a net gain of $29,277 in average ex-vessel revenue for the fishery, or $1,084 per vessel for the 27 vessels that targeted non-blacknose SCS in 2015.

Alternative 2b would implement a commercial retention limit of 150 non-blacknose SCS per trip and remove the quota linkage to blacknose sharks for shark directed limited access permit holders in the Atlantic region south 34°00′ N. latitude once the blacknose shark quota is reached. Additionally, this alternative would adjust the blacknose shark quota to 10.5 mt dw (23,148 lb dw). Reduction of the blacknose shark quota would result in an average ex-vessel revenue loss of $15,808 for the fishery, while increased landings of non-blacknose SCS would result in an overall estimated average ex-vessel revenue gain of $65,139 for the fishery. NMFS estimates that this bycatch retention limit would result in a net gain of $49,331 in average ex-vessel revenue for the fishery, or approximately $1,827 per vessel for the 27 vessels that targeted non-blacknose SCS in 2015.

Alternative 2c would implement a commercial retention limit of 250 non-blacknose SCS per trip and remove the quota linkage to blacknose sharks for shark directed limited access permit holders in the Atlantic region south 34°00′ N. latitude once the blacknose shark quota is reached. This alternative would also adjust the blacknose shark quota to 6.1 mt dw (13,448 lb dw). Reduction of the blacknose shark quota would result in an average ex-vessel revenue loss of $26,217 for the fishery, while increased landings of non-blacknose SCS would result in an estimated average ex-vessel revenue gain of $80,339 for the fishery. NMFS estimates that this bycatch retention limit would result in a net gain of $54,122 in average ex-vessel revenue for the fishery, or approximately $2,004 per vessel for the 27 vessels that targeted non-blacknose SCS in 2015.

Alternative 3a would establish a commercial retention limit of 50 blacknose sharks per trip for shark directed limited access permit holders in the Atlantic region south 34°00′ N. latitude. This alternative would most likely convert the blacknose shark fishery to an incidental fishery as the per-trip value of 50 blacknose sharks would only be $270 ($218 for meat and $52 for fins) for the estimated 13 vessels that land blacknose sharks in the Atlantic. Based on 2015 HMS electronic reporting system (eDealer) reports, 49 trips, or 32% of the overall number of trips, landed blacknose sharks in excess of a commercial retention limit of 50 blacknose sharks (250 lb dw). This alternative would likely increase the number of trips needed to fill the blacknose shark quota when compared to the average from 2010 through 2015 under Alternative 1. A retention limit of 50 blacknose sharks could potentially cause the SCS fisheries to close as early as June or July if every trip landing blacknose sharks landed the full retention limit, but this is highly unlikely.

Alternative 3b would establish a commercial retention limit of 16 blacknose sharks per trip all Atlantic shark limited access permit holders in the Atlantic region south 34°00′ N. latitude. This alternative would have minor beneficial economic impacts as a retention limit of this size would allow an average of 80 lb dw blacknose sharks per trip and would take approximately 474 trips for fishermen to land the full blacknose shark quota. Based on 2015 eDealer reports, 83 trips, or 55% of the overall number of trips, landed blacknose sharks in excess of a commercial retention limit of 16 blacknose sharks (80 lb dw). This alternative would dramatically increase the number of trips needed to fill the blacknose shark quota when compared to the yearly averages under Alternative 1. Currently, the linkage between the blacknose shark quota and the non-blacknose SCS quota causes the closure of both fisheries once the smaller blacknose shark quota is attained. NMFS expects that, under this alternative, the blacknose shark quota would not be filled and therefore would not close the SCS fisheries in the South Atlantic region. Thus, this alternative would have minor beneficial economic impacts to the Atlantic SCS fisheries as it would allow for the potential full-utilization of the non-blacknose SCS quota, and potentially increase total ex-vessel revenue by as much as $298,583 a year. However, given monthly trip rates in the Atlantic, the non-blacknose SCS quota is likely to remain under-utilized. Using calculations based on observed trip and landings rates of non-blacknose SCS in 2015, a more likely result of this alternative would be additional landings of 104,962 lb dw of non-blacknose SCS valued at $98,664, or approximately $3,654 per vessel for the 27 vessels that participated in the fishery in 2015. Any financial losses due to under-utilization of the blacknose shark quota would be minimal in comparison.

Alternative 3c, the preferred alternative, would establish a commercial retention limit of eight blacknose sharks per trip all Atlantic shark limited access permit holders in the Atlantic region south 34°00′ N. latitude. This alternative would have moderate beneficial economic impacts as a retention limit of this size would allow an average of 40 lb dw blacknose sharks per trip and would take approximately 948 trips to land the full blacknose shark quota. Based on 2015 eDealer reports, 105 trips, or 69% of the overall number of trips, landed blacknose sharks in excess of the commercial retention limit of eight blacknose sharks (40 lb dw). This alternative would dramatically increase the number of trips needed to fill the blacknose shark quota when compared to the yearly averages under Alternative 1. Currently, the linkage between the blacknose shark quota and the non-blacknose SCS quota causes the closure of both fisheries once the smaller blacknose shark quota is attained. NMFS expects that, under this alternative, the blacknose shark quota would not be filled and would not close the SCS fisheries in the Atlantic region south 34°00′ N. latitude. Thus, this would have moderate beneficial economic impacts as the fishermen would still be allowed to land blacknose sharks and the fishery would remain open for a longer period of time, significantly increasing non-blacknose SCS revenues by as much as $298,583 a year on average if the non-blacknose SCS quota is fully utilized. However, given monthly trip rates in the Atlantic, the non-blacknose SCS quota is likely to remain under-utilized. Using calculations based on observed trip and landings rates of non-blacknose SCS in 2015, a more likely result of this alternative would be additional landings of 104,962 lb dw of non-blacknose SCS valued at $98,664, or approximately $3,654 per vessel for the 27 vessels that participated in the fishery in 2015. Any financial losses due to under-utilization of the blacknose shark quota would be minimal in comparison.

List of Subjects in 50 CFR Part 635

Fisheries, Fishing, Fishing vessels, Foreign relations, Imports, Penalties, Reporting and recordkeeping requirements, Treaties.

Dated: July 28, 2016.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 635 is proposed to be amended as follows:

PART 635 – ATLANTIC HIGHLY MIGRATORY SPECIES

■ 1. The authority citation for part 635 continues to read as follows:

Authority: 16 U.S.C. 971 *et seq.;* 16 U.S.C. 1801 *et seq.*

■ 2. In § 635.24, revise paragraphs (a)(2), (a)(3), (a)(4)(ii), and (a)(4)(iii) to read as follows:

§ 635.24 Commercial retention limits for sharks, swordfish, and BAYS tunas.

* * * * *

(a) * * *

(2) The commercial retention limit for LCS other than sandbar sharks for a person who owns or operates a vessel that has been issued a directed LAP for sharks and does not have a valid shark research permit, or a person who owns or operates a vessel that has been issued a directed LAP for sharks and that has been issued a shark research permit but does not have a NMFS-approved observer on board, may range between zero and 55 LCS other than sandbar sharks per vessel per trip if the respective LCS management group(s) is open per §§ 635.27 and 635.28. Such persons may not retain, possess, or land sandbar sharks. At the start of each fishing year, the default commercial retention limit is 45 LCS other than sandbar sharks per vessel per trip unless NMFS determines otherwise and files with the Office of the Federal Register for publication notification of an inseason adjustment. During the fishing year, NMFS may adjust the retention limit per the inseason trip limit adjustment criteria listed in § 635.24(a)(8).

(3) A person who owns or operates a vessel that has been issued an incidental LAP for sharks and does not have a valid shark research permit, or a person who owns or operates a vessel that has been issued an incidental LAP for sharks and that has been issued a valid shark research permit but does not have a NMFS-approved observer on board, may retain, possess, or land no more than 3 LCS other than sandbar sharks per vessel per trip if the respective LCS management group(s) is open per §§ 635.27 and 635.28. Such persons may not retain, possess, or land sandbar sharks.

(4) * * *

(ii) A person who owns or operates a vessel that has been issued a shark LAP and is operating south of 34°00′ N. lat. in the Atlantic region, as defined at § 635.27(b)(1), may retain, possess, land, or sell blacknose and non-blacknose SCS if the respective blacknose and non-blacknose SCS management groups are open per §§ 635.27 and 635.28. Such persons may retain, possess, land, or sell no more than 8 blacknose sharks per vessel per trip. A person who owns or operates a vessel that has been issued a shark LAP and is operating north of 34°00′ N. lat. in the Atlantic region, as defined at § 635.27(b)(1), or a person who owns or operates a vessel that has been issued a shark LAP and is operating in the Gulf of Mexico region, as defined at § 635.27(b)(1), may not retain, possess, land, or sell any blacknose sharks, but may retain, possess, land, or sell non-blacknose SCS if the respective non-blacknose SCS management group is open per §§ 635.27 and 635.28.

(iii) Consistent with paragraph (a)(4)(ii) of this section, a person who owns or operates a vessel that has been issued an incidental shark LAP may retain, possess, land, or sell no more than 16 SCS and pelagic sharks, combined, per vessel per trip, if the respective fishery is open per §§ 635.27 and 635.28. Of those 16 SCS and pelagic sharks per vessel per trip, no more than 8 shall be blacknose sharks.

* * * * *

[FR Doc. 2016–18253 Filed 8–2–16; 8:45 am]

BILLING CODE 3510–22–P

Atlantic Highly Migratory Species Management

NOAA FISHERIES

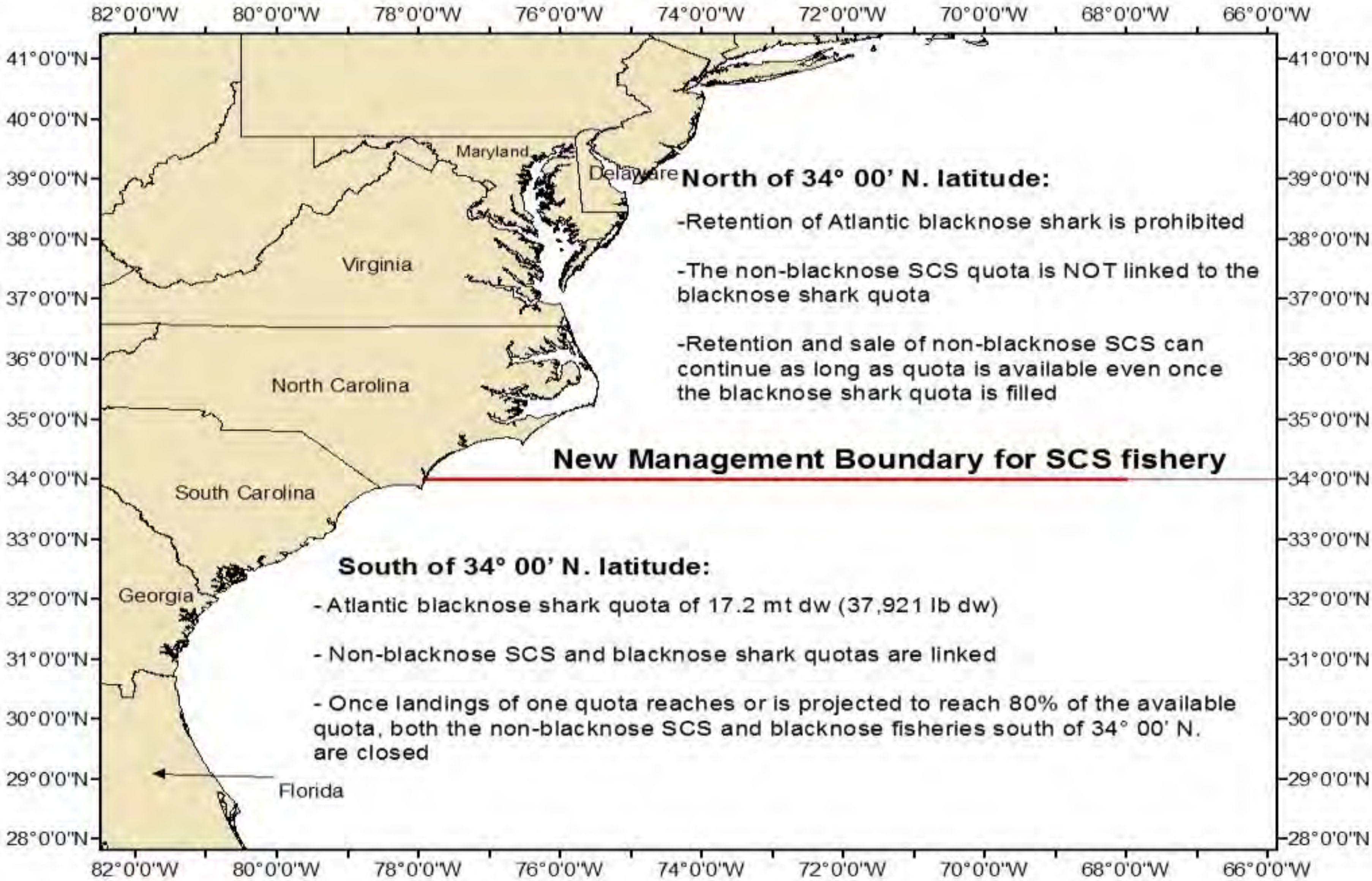
Modifying the Commercial Retention Limit For Blacknose Sharks and Non-Blacknose SCS in the Atlantic Region

Presentation to the ASMFC
October 2016

Background

- 2007 Stock Assessment (SEDAR 13) – one stock; overfished/overfishing
- Amendment 3 Final Rule (June 1, 2010)
  - Established separate blacknose shark and non-blacknose SCS quotas, and linked the quotas
  - Encouraged all shark fishermen to avoid blacknose sharks
  - Stated that if fishermen continue to target blacknose sharks, NMFS would implement more management measures to ensure the rebuilding of the stock
- 2011 Stock Assessments (SEDAR 21) – two stocks; Atlantic: overfished/overfishing
- Amendment 5a Final Rule (July 3, 2013) – continued quota linkage
- Amendment 6 Final Rule (August 18, 2015)
  - Established management boundary at 34 N. lat.
  - Blacknose can only be landed south of that boundary
  - Quota linkage continues

Amendment 6 (August 18, 2015)



Current Issues

- Some fishermen have been landing large numbers of blacknose sharks
- Non-blacknose SCS fishery has closed early due to the quota linkage (e.g., September 2013, July 2014, June 2015, and May 2016)
- The non-blacknose SCS quota has been underutilized, as all SCS must be discarded once the fisheries are closed
- Blacknose shark quota exceeded in 2012 and 2015

These issues have resulted in comments from fishermen and a request from the SAFMC to address discards of non-blacknose SCS in the Spanish mackerel gillnet fishery

Alternatives

- Alternative 1: No Action. Do not implement any new commercial retention limit for small coastal sharks in the Atlantic region south of 34°00'N. latitude. Do not adjust the blacknose shark baseline quota

- Alternative 2: Establish a commercial retention limit of non-blacknose SCS for shark directed limited access permit holders in the Atlantic region south of 34°00'N. latitude once the blacknose shark quota is reached and adjust the blacknose shark quota to account for dead discards
  - 3 Sub-alternatives with retention limit ranging from 50 to 250 non-blacknose SCS; resulting blacknose quota ranging from 15 to 6.1 mt dw, respectively

- Alternative 3: Establish a commercial retention limit for blacknose sharks for all Atlantic shark limited access permit holders in the Atlantic region south of 34°00'N. latitude
  - 3 Sub-alternatives with retention limit ranging from 50 to 8 blacknose sharks
  - Preferred alternative = 8 blacknose sharks per trip

Alternative 3 in detail

Retention limits and number of trips per year for Atlantic blacknose sharks under the different potential alternatives.

Alternatives	(A) Retention Limit	(B) Average Weight of Blacknose Shark Landings per Trip (A x 5 lb dw = B)[1]	(C) Number of Trips per Year That Could Land the Blacknose Shark Quota[2] (number) (37,921 / B = C)
3a	50	250 lb dw	113
3b	16	80 lb dw	354
3c	8	40 lb dw	707
Average (2010-2015)	-	212 lb dw	207

[1] Column B: Average weight of blacknose sharks with gillnet gear = 5 lb dw
[2] Assuming each trip lands the full retention limit

Timeline

1) Proposed rule published on August 3, 2016
2) Proposed rule public hearing/webinar in August 2016
3) Discussions at the HMS AP Meeting (Sept 7-8) and SAFMC (Sept 14-15)
4) Comment Period Ended – September 20, 2016
5) Target effective for 2017 commercial shark fishing season

12014, 2 T.W., Alexander Drive, Research Triangle Park, NC 27709, requests to establish a tolerance in 40 CFR part 180.626 for residues of the fungicide, prothioconazole in or on cotton, gin by-products at 4.0 parts per million (ppm). The liquid chromatography/mass spectrometry (LC/MS/MS) is used to measure and evaluate the chemical prothioconazole. *Contact:* RD.

5. *PP* 6F8461. (EPA–HQ–OPP–2016–0255). Bayer CropScience, P.O. Box 12014, Research Triangle Park, NC 27709, requests to establish a tolerance in 40 CFR part 180 for residues of the insecticide spirotetramat in or on sugar beet, root at 0.15 ppm; and sugar beet, molasses at 0.20 ppm. The high pressure liquid chromatography/triple stage quadrupole mass spectrometry (LC/MS/MS) analytical method is used to measure and evaluate the chemical spirotetramat. *Contact:* RD.

Amended Tolerances

1. *PP* 5F8400. (EPA–HQ–OPP–2015–0695). Isagro S.P.A. (d/b/a Isagro USA, Inc.), 430 Davis Drive, Suite 240, Morrisville, NC 27560, requests to amend the tolerances in 40 CFR 180.557 for residues of the fungicide tetraconazole in or on beet sugar, dried pulp at 0.20 parts per million (ppm), beet sugar, molasses at 0.25 ppm, and beet sugar, root at 0.15 ppm. The capillary gas chromatography with electron capture detector (GC/ECD)) as well as a QuEChERS multi-residue method (LC/MS–MS detection) is used to measure and evaluate the chemical tetraconazole. *Contact:* RD.

2. *PP* 6F8465. (EPA–HQ–OPP–2016–0307). Nichino America, Inc., 4550 New Linden Hill Road, Suite 501, Wilmington, DE 19808, requests to amend the tolerances in 40 CFR 180.566 for residues of the insecticide fenpyroximate in or on fruit, citrus, Group 10–10 at 1.0 parts per million (ppm), citrus dried pulp at 4.0 ppm, and citrus oil at 14 ppm. The high performance liquid chromatography using tandem mass spectrometric detection (LC/MS/MS) is used to measure and evaluate the chemical fenpyroximate and the M–1 Metabolite. *Contact:* RD.

New Tolerance Exemptions

1. *PP* 6F8444. (EPA–HQ–OPP–2016–0348). Marrone Bio Innovations, 1540 Drew Ave., Davis, CA 95618, requests to establish an exemption from the requirement of a tolerance in 40 CFR part 180 for residues of the bactericide and fungicide *Bacillus amyloliquefaciens* strain F727 in or on all food commodities. The petitioner believes no analytical method is needed because when used as proposed, *Bacillus amyloliquefaciens* strain F727 would not result in residues that are of toxicological concern. *Contact:* BPPD.

2. *PP* 6F8459. (EPA–HQ–OPP–2016–0259). Spring Trading Co., 203 Dogwood Trl., Magnolia, TX 77354 (on behalf of CH Biotech R&D Co. Ltd., No. 121 Xian An Rd., Xianxi Township, Changhua County 50741 Taiwan R.O.C.), requests to establish an exemption from the requirement of a tolerance in 40 CFR part 180 for residues of the plant regulator 1-Triacontanol in or on raw agricultural commodity growing crops on in products to treat animals. The petitioner believes no analytical method is needed because the 10X standard safety factor is unnecessary for 1-Triacontanol since it is a compound found in plant cuticle waxes and beeswax. *Contact:* BPPD.

3. *PP* IN–10851. (EPA–HQ–OPP–2016–0378). Technology Sciences Group, 1150 18th Street, Suite 1000, Washington, DC 20036, on behalf of Jeneil Biosurfactant Company, 400 N. Dekora Woods Blvd., Saukville, WI 53080, requests to establish an exemption from the requirement of a tolerance for residues of isoamyl acetate (CAS Reg. No. 123–92–2) when used as an inert ingredient (solvent) in pesticide formulations applied to growing crops and raw agricultural commodities after harvest under 40 CFR 180.910. The petitioner believes no analytical method is needed because the request is for an exemption from the requirements of a pesticide tolerance. *Contact:* RD.

Authority: 21 U.S.C. 346*a.*

Dated: August 16, 2016.

Michael Goodis,

Acting Director, Registration Division, Office of Pesticide Programs.

[FR Doc. 2016–20653 Filed 8–26–16; 8:45 am]

BILLING CODE 6560–50–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 635

[Docket No. 160620545–6545–01]

RIN 0648–XE696

Atlantic Highly Migratory Species; 2017 Atlantic Shark Commercial Fishing Season

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: This proposed rule would establish quotas, opening dates, and retention limits for the 2017 fishing season for the Atlantic commercial shark fisheries. Quotas would be adjusted as required or allowable based on any over- and/or underharvests experienced during 2016 and previous fishing seasons. In addition, NMFS proposes season opening dates and commercial retention limits based on adaptive management measures to provide, to the extent practicable, fishing opportunities for commercial shark fishermen in all regions and areas. The proposed measures could affect fishing opportunities for commercial shark fishermen in the northwestern Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea.

DATES: Written comments must be received by September 28, 2016. An operator-assisted, public conference call and webinar will be held on September 22, 2016, from 2 p.m. to 4 p.m., EST.

ADDRESSES: The conference call information is phone number (888) 635–5002; participant passcode 5315520. NMFS will show a brief presentation via webinar followed by public comment. To join the webinar, go to: *https://noaaevents2.webex.com/noaaevents2/onstage/g.php?MTID=ea9172a6c1907b6efc462ce9117952e21,* event password: NOAA. Participants are strongly encouraged to log/dial in 15 minutes prior to the meeting. Participants that have not used WebEx before will be prompted to download and run a plug-in program that will enable them to view the webinar.

You may submit comments on this document, identified by NOAA–NMFS–2016–0096, by any of the following methods:

- *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2016-0096,* click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments.
- *Mail:* Submit written comments to Margo Schulze-Haugen, NMFS/SF1, 1315 East-West Highway, National Marine Fisheries Service, SSMC3, Silver Spring, MD 20910.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

Presentation materials and copies of the supporting documents are available from the HMS Management Division Web site at *http://www.nmfs.noaa.gov/sfa/hms/* or by contacting Guý DuBeck by phone at 301–427–8503.

FOR FURTHER INFORMATION CONTACT: Guý DuBeck or Karyl Brewster-Geisz at 301–427–8503.

SUPPLEMENTARY INFORMATION:

Background

The Atlantic commercial shark fisheries are managed under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The 2006 Consolidated Highly Migratory Species (HMS) Fishery Management Plan (FMP) and its amendments are implemented by regulations at 50 CFR part 635. For the Atlantic commercial shark fisheries, the 2006 Consolidated HMS FMP and its amendments established, among other things, commercial shark retention limits, commercial quotas for species and management groups, accounting measures for under- and overharvests for the shark fisheries, and adaptive management measures such as flexible opening dates for the fishing season and inseason adjustments to shark trip limits, which provide management flexibility in furtherance of equitable fishing opportunities, to the extent practicable, for commercial shark fishermen in all regions and areas.

2017 Proposed Quotas

This proposed rule would adjust the quota levels for the different shark stocks and management groups for the 2017 Atlantic commercial shark fishing season based on over- and underharvests that occurred during 2016 and previous fishing seasons, consistent with existing regulations at 50 CFR 635.27(b). Over- and underharvests are accounted for in the same region, sub-region, and/or fishery in which they occurred the following year, except that large overharvests may be spread over a number of subsequent fishing years up to a maximum of 5 years. Shark stocks or management groups that contain one or more stocks that are overfished, have overfishing occurring, or have an unknown status, will not have underharvest carried over in the following year. Stocks that are not overfished and have no overfishing occurring may have any underharvest carried over in the following year, up to 50 percent of the base quota.

The quotas in this proposed rule are based on dealer reports received as of July 15, 2016. In the final rule, NMFS will adjust the quotas as needed based on dealer reports received as of a date in mid-October 2016. Thus, all of the 2017 proposed quotas for the respective stocks and management groups will be subject to further adjustment after NMFS considers the mid-October dealer reports. All dealer reports that are received after the October date will be used to adjust the 2018 quotas, as appropriate.

For the sandbar shark, aggregated LCS, hammerhead shark, non-blacknose SCS, blacknose shark, blue shark, porbeagle shark, and pelagic shark (other than porbeagle or blue sharks) management groups, the 2016 underharvests cannot be carried over to the 2017 fishing season because those stocks or management groups have been determined to be overfished, overfished with overfishing occurring, or have an unknown status. Thus, for all of these management groups, the 2017 proposed quotas would be equal to the applicable base quota minus any overharvests that occurred in 2016 and/or previous fishing seasons, as applicable.

Because the Gulf of Mexico blacktip shark management group and smoothhound shark management groups in the Gulf of Mexico and Atlantic regions have been determined not to be overfished and to have no overfishing occurring, available underharvest (up to 50 percent of the base quota) from the 2016 fishing season for these management groups may be applied to the respective 2017 quotas, and NMFS proposes to do so.

The proposed 2017 quotas by species and management group are summarized in Table 1; the description of the calculations for each stock and management group can be found below.

TABLE 1—2017 PROPOSED QUOTAS AND OPENING DATES FOR THE ATLANTIC SHARK MANAGEMENT GROUPS

[All quotas and landings are dressed weight (dw), in metric tons (mt), unless specified otherwise. Table includes landings data as of July 15, 2016; final quotas are subject to change based on landings as of October 2016. 1 mt = 2,204.6 lb.]

Region or sub-region	Management group	2016 annual quota (A)	Preliminary 2016 landings [1] (B)	Adjustments [2] (C)	2017 base annual quota (D)	2017 proposed annual quota (D + C)	Season opening dates
Eastern Gulf of Mexico	Blacktip Sharks	28.9 mt dw (63,189 lb dw).	18.0 mt dw (39,584 lb dw).	10.9 mt dw (23,961 lb dw) [3].	25.1 mt dw (55,439 lb dw).	36.0 mt dw (79,400 lb dw).	January 1, 2017.
	Aggregated Large Coastal Sharks.	85.5 mt dw (188,593 lb dw).	42.9 mt dw (93,593 lb dw).	....	85.5 mt dw (188,593 lb dw).	85.5 mt dw (188,593 lb dw).	
	Hammerhead Sharks.	13.4 mt dw (29,421 lb dw).	6.7 mt dw (14,865 lb dw).	....	13.4 mt dw (29,421 lb dw).	13.4 mt dw (29,421 lb dw).	
Western Gulf of Mexico	Blacktip Sharks	266.5 mt dw (587,396 lb dw).	166.2 mt dw (366497 lb dw).	100.3 mt dw (220,542 lb dw) [3].	231.5 mt dw (510,261 lb dw).	331.8 mt dw (730,803 lb dw).	
	Aggregated Large Coastal Sharks.	72.0 mt dw (158,724 lb dw).	66.1 mt dw (145,624 lb dw).	....	72.0 mt dw (158,724 lb dw).	72.0 mt dw (158,724 lb dw).	
	Hammerhead Sharks.	11.9 mt dw (26,301 lb dw).	16.8 mt dw (37,063 lb dw).	....	11.9 mt dw (23,301 lb dw).	11.9 mt dw (23,301 lb dw).	
Gulf of Mexico	Non-Blacknose Small Coastal Sharks.	107.3 mt dw (236,603 lb dw).	41.0 mt dw (90,320 lb dw).	....	112.6 mt dw (248,215 lb dw).	112.6 mt dw (248,215 lb dw).	
	Smoothhound Sharks.	336.4 mt dw (741,627).	0 mt dw (0 lb dw)	168.2 mt dw (370,814 lb dw).	336.4 mt dw (741,627).	504.6 mt dw (1,112,441 lb dw).	

TABLE 1—2017 PROPOSED QUOTAS AND OPENING DATES FOR THE ATLANTIC SHARK MANAGEMENT GROUPS—Continued

[All quotas and landings are dressed weight (dw), in metric tons (mt), unless specified otherwise. Table includes landings data as of July 15, 2016; final quotas are subject to change based on landings as of October 2016. 1 mt = 2,204.6 lb.]

Region or sub-region	Management group	2016 annual quota (A)	Preliminary 2016 landings [1] (B)	Adjustments [2] (C)	2017 base annual quota (D)	2017 proposed annual quota (D + C)	Season opening dates
Atlantic	Aggregated Large Coastal Sharks.	168.9 mt dw (372,552 lb dw).	42.0 mt dw (92,692 lb dw).		168.9 mt dw (372,552 lb dw).	168.9 mt dw (372,552 lb dw).	January 1, 2017.
	Hammerhead Sharks.	27.1 mt dw (59,736 lb dw).	9.6 mt dw (21,122 lb dw).		27.1 mt dw (59,736 lb dw).	27.1 mt dw (59,736 lb dw).	
	Non-Blacknose Small Coastal Sharks.	264.1 mt dw (582,333 lb dw).	40.4 mt dw (89,048 lb dw).		264.1 mt dw (582,333 lb dw).	264.1 mt dw (582,333 lb dw).	
	Blacknose Sharks (South of 34° N. lat. only).	15.7 mt dw (34,653 lb dw).	12.2 mt dw (26,916 lb dw).		17.2 mt dw (37,921 lb dw).	17.2 mt dw (37,921 lb dw) [4].	
	Smoothhound Sharks.	1,201.7 mt dw (2,647,725 lb dw).	183.2 mt dw (403,795 lb dw).	600.9 mt dw (1,323,862 lb dw).	1,201.7 mt dw (2,647,725 lb dw).	1,802.6 mt dw (3,971,587 lb dw).	
No regional quotas	Non-Sandbar LCS Research.	50.0 mt dw (110,230 lb dw).	7.2 mt dw (15,829 lb dw).		50.0 mt dw (110,230 lb dw).	50.0 mt dw (110,230 lb dw).	January 1, 2017.
	Sandbar Shark Research.	90.7 mt dw (199,943 lb dw).	34.9 mt dw (77,050 lb dw).		90.7 mt dw (199,943 lb dw).	90.7 mt dw (199,943 lb dw).	
	Blue Sharks	273.0 mt dw (601,856 lb dw).	0 mt dw (0 lb dw)		273.0 mt dw (601,856 lb dw).	273.0 mt dw (601,856 lb dw).	
	Porbeagle Sharks.	0 mt dw (0 lb dw)	0 mt dw (0 lb dw)		1.7 mt dw (3,748 lb dw).	1.7 mt dw (3,748 lb dw).	
	Pelagic Sharks Other Than Porbeagle or Blue.	488.0 mt dw (1,075,856 lb dw).	54.1 mt dw (119,336 lb dw).		488.0 mt dw (1,075,856 lb dw).	488.0 mt dw (1,075,856 lb dw).	

[1] Landings are from January 1, 2016, through July 15, 2016, and are subject to change.

[2] Underharvest adjustments can only be applied to stocks or management groups that are not overfished and have no overfishing occurring. Also, the underharvest adjustments cannot exceed 50 percent of the base quota.

[3] This adjustment accounts for underharvest in 2016. This proposed rule would increase the overall Gulf of Mexico blacktip shark quota by 111.2 mt dw (244,504 lb dw). Since any underharvest would be divided based on the sub-regional quota percentage split, the eastern Gulf of Mexico blacktip shark quota would be increased by 10.9 mt dw, or 9.8 percent of the underharvest, while the western Gulf of Mexico blacktip shark quota would be increased by 100.3 mt dw, or 90.2 percent of the underharvest.

[4] Based on overharvest in 2012 and 2015, NMFS had previously reduced the Atlantic blacknose shark base annual quota by 1.5 mt dw (3,268 lb dw) each year through 2018. However, in 2016, the Atlantic blacknose shark quota was underharvested by 3.5 mt dw (7,737 lb dw). NMFS is proposing to use the 2016 underharvest to cover the remaining overharvest amount of 3.0 mt dw (6,536 lb dw) and not to adjust the 2017 Atlantic blacknose shark base annual quota.

1. Proposed 2017 Quotas for the Blacktip Sharks in the Gulf of Mexico Region

The 2017 proposed commercial quota for blacktip sharks in the eastern Gulf of Mexico sub-region is 36.0 mt dw (79,400 lb dw) and the western Gulf of Mexico sub-region is 331.8 mt dw (730,803 lb dw). As of July 15, 2016, preliminary reported landings for blacktip sharks in the eastern Gulf of Mexico sub-region were at 62 percent (18.0 mt dw) of their 2016 quota levels (28.9 mt dw), while the blacktip sharks in the western Gulf of Mexico sub-region were also at 62 percent (166.2 mt dw) of their 2016 quota levels (266.5 mt dw). Reported landings have not exceeded the 2016 quota to date, and the western Gulf of Mexico sub-region fishery was closed on March 12, 2016 (81 FR 12602). Gulf of Mexico blacktip sharks have not been declared to be overfished, to have overfishing occurring, or to have an unknown status. Pursuant to § 635.27(b)(2)(ii), underharvests for blacktip sharks within the Gulf of Mexico region therefore could be applied to the 2017 quotas up to 50 percent of the base quota. Any underharvest would be split based on the sub-regional quota percentages of 9.8 percent for eastern Gulf of Mexico blacktip sharks and 90.2 percent for western Gulf of Mexico blacktip sharks (§ 635.27(b)(1)(ii)). To date, the overall Gulf of Mexico blacktip shark management group was underharvested by 111.2 mt dw (244,504 lb dw). Accordingly, NMFS proposes to increase the 2017 eastern Gulf of Mexico blacktip shark quota by 10.9 mt dw (111.2 mt dw underharvest in 2016 * 9.8 percent = 10.9 mt dw eastern sub-region underharvest) and increase the 2017 western Gulf of Mexico blacktip shark quota by 100.3 mt dw (111.2 mt dw underharvest in 2016 * 90.2 percent = 100.3 mt dw western sub-region underharvest). Thus, the proposed eastern sub-regional Gulf of Mexico blacktip shark commercial quota is 36.0 mt dw and the proposed western sub-regional Gulf of Mexico blacktip shark commercial quota is 331.8 mt dw.

2. Proposed 2017 Quotas for the Aggregated LCS in the Gulf of Mexico Region

The 2017 proposed commercial quota for aggregated LCS in the eastern Gulf of Mexico sub-region is 85.5 mt dw (188,593 lb dw) and the western Gulf of Mexico sub-region is 72.0 mt dw (158,724 lb dw). As of July 15, 2016, preliminary reported landings for aggregated LCS in the eastern Gulf of Mexico sub-region were at 50 percent (42.5 mt dw) of their 2016 quota levels (85.5 mt dw), while the aggregated LCS in the western Gulf of Mexico sub-region were at 92 percent (66.1 mt dw) of their 2016 quota levels (72.0 mt dw). Reported landings have not exceeded the 2016 quota to date, and the western aggregated LCS sub-region fishery was closed on March 12, 2016 (81 FR 12602). Given the unknown status of some of the shark species within the Gulf of Mexico aggregated LCS management group, underharvests cannot be carried over pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quotas for aggregated LCS in the eastern Gulf of Mexico and western Gulf of Mexico sub-regions be equal to their annual base quotas without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

3. Proposed 2017 Quota for the Aggregated LCS in the Atlantic Region

The 2017 proposed commercial quota for aggregated LCS in the Atlantic region is 168.9 mt dw (372,552 lb dw). As of July 15, 2016, the aggregated LCS fishery in the Atlantic region is still open and preliminary landings indicate that only 25 percent of the quota has been harvested. Given the unknown status of some of the shark species within the Atlantic aggregated LCS management group, underharvests cannot be carried over pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quota for aggregated LCS in the Atlantic region be equal to the annual base quota without adjustment, because there have not been any overharvests and underharvests cannot be carried over due to stock status.

4. Proposed 2017 Quotas for Hammerhead Sharks in the Gulf of Mexico Region

In the Gulf of Mexico, hammerhead shark quotas are divided into two sub-regions: Western and eastern. The 2017 proposed commercial quotas for hammerhead sharks in the eastern Gulf of Mexico sub-region and western Gulf of Mexico sub-region are 13.4 mt dw (29,421 lb dw) and 11.9 mt dw (23,301 lb dw), respectively. As of July 15, 2016, preliminary reported landings for hammerhead sharks in the eastern Gulf of Mexico sub-region were at 50 percent (6.7 mt dw) of their 2016 quota levels (13.4 mt dw), while landings of hammerhead sharks in the western Gulf of Mexico sub-region were at 141 percent (16.8 mt dw) of their 2016 quota levels (11.9 mt dw). Even though the reported landings in the western Gulf of Mexico exceed the 2016 sub-regional quota, which was closed on March 12, 2016 (81 FR 12602), the total regional Gulf of Mexico reported landings have not exceeded the 2016 quota to date. Consistent with the regulations implemented through Amendment 6 to the Consolidated HMS FMP, sub-regional quota overages (*e.g.,* western Gulf of Mexico sub-region) are only deducted in the next year if the total regional quota (*e.g.,* Gulf of Mexico region) is also exceeded. Thus, pursuant to § 635.27(b)(2)(i), at this time, because the overall regional quota has not been overharvested, NMFS is not proposing to adjust the western Gulf of Mexico sub-region quota to account for the overharvest. However, because the eastern Gulf of Mexico sub-region is open and quota is still available in that sub-region, NMFS expects that landings will continue to occur. If landings in the eastern Gulf of Mexico sub-region exceed 8.5 mt dw (18,659 lb dw) (*i.e.,* the remainder of the total regional Gulf of Mexico quota), then NMFS would reduce the western Gulf of Mexico sub-region quota to account for overharvests, pursuant to § 635.27(b)(2)(i). If the quota is not fully harvested, given the overfished status of hammerhead sharks, NMFS would not carry forward any underharvests, pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), at this time, NMFS proposes that the 2017 quotas for hammerhead sharks in the eastern Gulf of Mexico and western Gulf of Mexico sub-regions be equal to their annual base quotas without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status. However, as noted above, if landings in the eastern Gulf of Mexico sub-region exceed 8.5 mt dw, NMFS would adjust the western Gulf of Mexico sub-region quota accordingly in the final rule.

5. Proposed 2017 Quotas for Hammerhead Sharks in the Atlantic Region

The 2017 proposed commercial quota for hammerhead sharks in the Atlantic region is 27.1 mt dw (59,736 lb dw). Currently, the hammerhead shark fishery in the Atlantic region is still open and preliminary landings as of July 15, 2016, indicate that only 35 percent of the quota has been harvested. Given the overfished status of hammerhead sharks, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quota for hammerhead sharks in the Atlantic region be equal to the annual base quota without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

6. Proposed 2017 Quotas for Research LCS and Sandbar Sharks Within the Shark Research Fishery

The 2017 proposed commercial quotas within the shark research fishery are 50.0 mt dw (110,230 lb dw) for research LCS and 90.7 mt dw (199,943 lb dw) for sandbar sharks. Within the shark research fishery, as of July 15, 2016, preliminary reported landings of research LCS were at 14 percent (7.2 mt dw) of their 2016 quota levels (50.0 mt dw), and sandbar shark reported landings were at 39 percent (34.9 mt dw) of their 2016 quota levels (27.1 mt dw). Reported landings have not exceeded the 2016 quotas to date. Under § 635.27(b)(2)(ii), because sandbar sharks and scalloped hammerhead sharks within the research LCS management group have been determined to be either overfished or overfished with overfishing occurring, underharvests for these management groups cannot be carried forward to the 2017 quotas. Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quota in the shark research fishery be equal to the annual base quota without adjustment because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

7. Proposed 2017 Quota for the Non-Blacknose SCS in the Gulf of Mexico Region

The 2017 proposed commercial quota for non-blacknose SCS in the Gulf of Mexico region is 112.6 mt dw (248,215 lb dw). As of July 15, 2016, preliminary reported landings of non-blacknose SCS were at 38 percent (41.0 mt dw) of their 2016 quota level (107.3 mt dw) in the Gulf of Mexico region. Reported landings have not exceeded the 2016 quota to date. Given the unknown status of bonnethead sharks within the Gulf of Mexico non-blacknose SCS management group, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quota for non-blacknose SCS in the Gulf of Mexico region be equal to the annual base quota without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

8. Proposed 2016 Quota for the Non-Blacknose SCS in the Atlantic Region

The 2017 proposed commercial quota for non-blacknose SCS in the Atlantic region is 264.1 mt dw (582,333 lb dw). As of July 15, 2016, preliminary reported landings of non-blacknose SCS were at 15 percent (40.4 mt dw) of their 2016 quota level (264.1 mt dw) in the Atlantic region. Though reported landings had not yet reached or exceeded the 2016 quota, the fishery south of 34° N. latitude was closed on May 29, 2016 (81 FR 18541), due to the quota linkage with blacknose sharks in the Atlantic region. The non-blacknose SCS fishery north of 34° N. latitude remains open at this time. Given the unknown status of bonnethead sharks within the Atlantic non-blacknose SCS management group, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quota for non-blacknose SCS in the Atlantic region be equal to the annual base quota without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

9. Proposed 2017 Quota for the Blacknose Sharks in the Atlantic Region

The 2017 proposed commercial quota for blacknose sharks in the Atlantic region is 17.2 mt dw (37,921 lb dw). As of July 15, 2016, preliminary reported landings of blacknose sharks were at 78 percent (12.2 mt dw) of their 2016 quota levels (15.7 mt dw) in the Atlantic region. The fishery was closed on May 29, 2016 (81 FR 18541). In the final rule establishing quotas for the 2014 shark season (78 FR 70500; November 26, 2013), NMFS spread out the 2012 overharvest (2.5 mt dw; 5,555 lb dw) of the blacknose shark quota across 5 years (2014 through 2018) in the Atlantic region by 0.5 mt dw (1,111 lb dw) each year. This approach for spreading large overharvests over several years up to 5 years is consistent with the approach adopted in Amendment 2 to the 2006 Consolidated HMS FMP (see § 635.27(b)(2)(i)), which determined to spread out the pay back over five years depending on the magnitude of the overharvest and the potential impact on the fishery (73 FR 40658; July 15, 2008). In 2015, the blacknose shark quota was overharvested by 3.0 mt dw (6,471 lb dw). In the final rule establishing quotas for the 2016 shark season (80 FR 74999; December 1, 2015), NMFS spread this 2015 overharvest amount over 3 years at 1.0 mt dw (2,157 lb dw) each year from 2016 through 2018. Thus, in the final rule establishing quotas for the 2016 shark season, NMFS decided to reduce the blacknose shark base annual quota by 1.5 mt dw (3,268 lb dw), based on the 2012 and 2015 overharvest amount, in 2016, 2017, and 2018. On May 29, 2016, NMFS closed the Atlantic blacknose shark management group because the quota was projected to exceed 80 percent. However, as of July 15, 2016, the Atlantic blacknose shark quota was underharvested by 3.5 mt dw (7,737 lb dw). This underharvest (3.5 mt dw) is greater than the remaining amount of the 2012 and 2015 overharvests (3.0 mt dw)(6,636 lb dw). As such, NMFS is proposing to use the 2016 underharvest to cover the remaining 2012 and 2015 overharvest. Pursuant to § 635.27(b)(2), because blacknose sharks have been declared to be overfished with overfishing occurring in the Atlantic region, NMFS could not carry forward the remaining underharvest (0.5 mt dw). Therefore, NMFS proposes that the 2017 Atlantic blacknose shark quota be equal to the annual base quota without adjustment. Note, the blacknose shark quota is available in the Atlantic region only for those vessels operating south of 34° N. latitude. North of 34° N. latitude, retention, landing, and sale of blacknose sharks are prohibited.

10. Proposed 2017 Quotas for the Smoothhound Sharks in the Gulf of Mexico Region

The 2017 proposed commercial quota for smoothhound sharks in the Gulf of Mexico region is 504.6 mt dw (1,112,441 lb dw). As of July 15, 2016, there are no preliminary reported landings of smoothhound sharks in the Gulf of Mexico region. Gulf of Mexico smoothhound sharks have not been declared to be overfished, to have overfishing occurring, or to have an unknown status. Pursuant to § 635.27(b)(2)(ii), underharvests for smoothhound sharks within the Gulf of Mexico region therefore could be applied to the 2017 quotas up to 50 percent of the base quota. Accordingly, NMFS proposes to increase the 2017 Gulf of Mexico smoothhound shark quota to adjust for anticipated underharvests in 2016 as allowed. The proposed 2017 adjusted base annual quota for Gulf of Mexico smoothhound sharks is 504.6 mt dw (1,112,441 lb dw) (336.4 mt dw annual base quota + 168.2 mt dw 2016 underharvest = 504.6 mt dw 2017 adjusted annual quota).

11. Proposed 2017 Quotas for the Smoothhound Sharks in the Atlantic Region

The 2017 proposed commercial quota for smoothhound sharks in the Atlantic region is 1,802.6 mt dw (1,323,862 lb dw). As of July 15, 2016, preliminary reported landings of smoothhound sharks were at 15 percent (183.2 mt dw) of their 2016 quota levels (1,201.7 mt dw) in the Atlantic region. Atlantic smoothhound sharks have not been declared to be overfished, to have overfishing occurring, or to have an unknown status. Pursuant to § 635.27(b)(2)(ii), underharvests for smoothhound sharks within the Atlantic region therefore could be applied to the 2017 quotas up to 50 percent of the base quota. Accordingly, NMFS proposes to increase the 2017 Atlantic smoothhound shark quota to adjust for anticipated underharvests in 2016 as allowed. The proposed 2017 adjusted base annual quota for Atlantic smoothhound sharks is 1,802.6 mt dw (1,323,862 lb dw) (1,201.7 mt dw annual base quota + 600.9 mt dw 2016 underharvest = 1,802.6 mt dw 2017 adjusted annual quota).

12. Proposed 2017 Quotas for Pelagic Sharks

The 2017 proposed commercial quotas for blue sharks, porbeagle sharks, and pelagic sharks (other than porbeagle or blue sharks) are 273 mt dw (601,856 lb dw), 1.7 mt dw (3,748 lb dw), and 488 mt dw (1,075,856 lb dw), respectively. As of July 15, 2016, there are no preliminary reported landings of blue sharks and porbeagle sharks, while preliminary reported landings of pelagic sharks (other than porbeagle and blue sharks) were at 11 percent (54.1 mt dw) of their 2016 quota level (488.0 mt dw). Given that these pelagic species are overfished, have overfishing occurring, or have an unknown status, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2017 quotas for blue sharks, porbeagle sharks, and pelagic sharks (other than porbeagle and blue sharks) be equal to their annual base quotas without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

Proposed Opening Dates and Retention Limits for the 2017 Atlantic Commercial Shark Fishing Season

For each fishery, NMFS considered the seven ‘‘Opening Commercial Fishing

Season Criteria'' listed at § 635.27(b)(3). The ''Opening Fishing Season'' criteria consider factors such as the available annual quotas for the current fishing season, estimated season length and average weekly catch rates from previous years, length of the season and fishermen participation in past years, impacts to accomplishing objectives of the 2006 Consolidated HMS FMP and its amendments, temporal variation in behavior or biology target species (*e.g.,* seasonal distribution or abundance), impact of catch rates in one region on another, and effects of delayed season openings.

Specifically, as described above and below, NMFS examined the 2016 and previous fishing years' over- and/or underharvests of the different management groups to determine the effects of the 2017 proposed commercial quotas on the shark stocks and fishermen across regional and sub-regional fishing areas. NMFS also examined the potential season length and previous catch rates to ensure, to the extent practicable, that equitable fishing opportunities be provided to fishermen in all areas. Lastly, NMFS examined the seasonal variation of the different species/management groups and the effects on fishing opportunities.

As described below, NMFS also considered the six ''Inseason trip limit adjustment criteria'' listed at § 635.24(a)(8) for directed shark limited access permit holders intending to land LCS other than sandbar sharks. Those criteria are: The amount of remaining shark quota in the relevant area or region, to date, based on dealer reports; the catch rates of the relevant shark species/complexes, to date, based on dealer reports; estimated date of fishery closure based on when the landings are projected to reach 80 percent of the quota given the realized catch rates; effects of the adjustment on accomplishing the objectives of the 2006 Consolidated HMS FMP and its amendments; variations in seasonal distribution, abundance, or migratory patterns of the relevant shark species based on scientific and fishery-based knowledge; and/or effects of catch rates in one part of a region precluding vessels in another part of that region from having a reasonable opportunity to harvest a portion of the relevant quota.

After considering these criteria, NMFS is proposing that the 2017 Atlantic commercial shark fishing season for all shark management groups in the northwestern Atlantic Ocean, including the Gulf of Mexico and the Caribbean Sea, open on or about January 1, 2017, after the publication of the final rule for this action (Table 2). NMFS is also proposing to start the 2017 commercial shark fishing season with the commercial retention limit of 30 LCS other than sandbar sharks per vessel per trip in the western Gulf of Mexico sub-region, 45 LCS other than sandbar sharks per vessel per trip in the eastern Gulf of Mexico sub-region, and 36 LCS other than sandbar sharks per vessel per trip in the Atlantic region (Table 2). However, at the time of writing this proposed rule, some management groups remain open and, for those management groups that are already closed, landings are still being calculated and checked for quality control and assurance. Thus, NMFS may implement different opening dates and commercial retention limits in the final rule if there are underharvested quotas or quota exceedances in 2016 that are not accounted for in this proposed rule.

TABLE 2—QUOTA LINKAGES, SEASON OPENING DATES, AND COMMERCIAL RETENTION LIMIT BY REGIONAL OR SUB-REGIONAL SHARK MANAGEMENT GROUP

Region or sub-region	Management group	Quota linkages	Season opening dates	Commercial retention limits for directed shark limited access permit holders (inseason adjustments are possible)
Eastern Gulf of Mexico	Blacktip Sharks	Not Linked	January 1, 2017	45 LCS other than sandbar sharks per vessel per trip.
	Aggregated Large Coastal Sharks. Hammerhead Sharks.	Linked		
Western Gulf of Mexico	Blacktip Sharks	Not Linked	January 1, 2017	30 LCS other than sandbar sharks per vessel per trip.
	Aggregated Large Coastal Sharks. Hammerhead Sharks.	Linked		
Gulf of Mexico	Non-Blacknose Small Coastal Sharks.	Not Linked	January 1, 2017	N/A.
	Smoothhound Sharks	Not Linked	January 1, 2017	N/A.
Atlantic	Aggregated Large Coastal Sharks. Hammerhead Sharks.	Linked	January 1, 2017	36 LCS other than sandbar sharks per vessel per trip. If quota is landed quickly (e.g., if approximately 20 percent of quota is caught at the beginning of the year), NMFS anticipates an inseason reduction (e.g., to 3 or fewer LCS other than sandbar sharks per vessel per trip), then an inseason increase to 45 LCS other than sandbar sharks per vessel per trip around July 15, 2017.
	Non-Blacknose Small Coastal Sharks. Blacknose Sharks (South of 34° N. lat. only).	Linked (South of 34° N. lat. only).	January 1, 2017	N/A.
	Smoothhound Sharks	Not Linked	January 1, 2017	N/A.
No regional quotas	Non-Sandbar LCS Research. Sandbar Shark Research.	Linked	January 1, 2017	N/A.
	Blue Sharks Porbeagle Sharks.	Not Linked	January 1, 2017	N/A.

TABLE 2—QUOTA LINKAGES, SEASON OPENING DATES, AND COMMERCIAL RETENTION LIMIT BY REGIONAL OR SUB-REGIONAL SHARK MANAGEMENT GROUP—Continued

Region or sub-region	Management group	Quota linkages	Season opening dates	Commercial retention limits for directed shark limited access permit holders (inseason adjustments are possible)
	Pelagic Sharks Other Than Porbeagle or Blue.			

In the Gulf of Mexico region, we are opening the fishing season on or about January 1, 2017, for the aggregated LCS, blacktip sharks, and hammerhead shark management groups with the commercial retention limits of 30 LCS other than sandbar sharks per vessel per trip for directed shark permit holders in the western sub-region—and 45 LCS other than sandbar sharks per vessel per trip for directed shark permit holders in the eastern sub-region. This would provide, to the extent practicable, equitable opportunities across the fisheries management sub-regions. This opening date takes into account all the season opening criteria listed in § 635.27(b)(3), and particularly the criteria that NMFS consider the length of the season for the different species and/or management group in the previous years (§ 635.27(b)(3)(ii) and (iii)) and whether fishermen were able to participate in the fishery in those years (§ 635.27(b)(3)(v)). The proposed commercial retention limits take into account the criteria listed in § 635.24 (a)(8), and particularly the criterion that NMFS consider the catch rates of the relevant shark species/complexes based on dealer reports to date (§ 635.24(a)(8)(ii)). Similar to the retention limit adjustment process described for the Atlantic region, NMFS may consider adjusting the retention limit in the Gulf of Mexico region throughout the season to ensure fishermen in all parts of the region have an opportunity to harvest aggregated LCS, blacktip sharks, and hammerhead sharks (see the criteria listed at § 635.27(b)(3)(v) and § 635.24(a)(8)(ii), (v), and (vi)). In 2016, the quota in the western Gulf of Mexico sub-region was harvested quickly and NMFS closed these management groups on March 12, 2016 (81 FR 12602) (see the criteria listed at § 635.27(b)(3)(i), (ii), and (iii) and § 635.24(a)(8)(i) and (iii)). As such, in 2017, NMFS is proposing a slightly lower trip limit in order to slow the harvest level and ensure the management group is open until at least April 2017, which is when the State of Louisiana closes state waters to shark fishing and when that State has asked that we close Federal shark fisheries to match state regulations if quotas are limited (see the criteria listed at § 635.27(b)(3)(vii) and 635.24(a)(8)(iii)). In the eastern Gulf of Mexico, NMFS is proposing the same commercial trip limit for these management groups that was set in 2016. Currently, the aggregated LCS, blacktip shark, and hammerhead shark management groups are still open in the eastern Gulf of Mexico sub-region (see the criteria listed at § 635.27(b)(3)(i), (ii), (iii), and (v), and § 635.24(a)(8)(i), (ii), (iii), (v), and (vi)). If those fisheries close, and after the overall preliminary landings for the Gulf of Mexico region are estimated for the 2016 fishing season, NMFS could make changes to the 2017 opening dates and commercial retention limits if necessary to ensure equitable fishing opportunities.

In the Atlantic region, NMFS proposes opening the aggregated LCS and hammerhead shark management groups on or about January 1, 2017. This opening date is the same date that these management groups opened in 2016, although that decision later attracted significant attention and opposition from shark advocates, particularly within the scuba diving community, with respect to what they argue to be a lemon shark aggregation site (see discussion below). As described below, this opening date also takes into account all the criteria listed in § 635.27(b)(3), and particularly the criterion that NMFS consider the effects of catch rates in one part of a region precluding vessels in another part of that region from having a reasonable opportunity to harvest a portion of the different species and/or management quotas (§ 635.27(b)(3)(v)). In 2016, the data indicate that an opening date of January 1 provided a reasonable opportunity for every part of each region to harvest a portion of the available quotas (§ 635.27(b)(3)(i)) while accounting for variations in seasonal distribution of the different species in the management groups (§ 635.27(b)(3)(iv)). Furthermore, in 2016, the fishing season for the aggregated LCS and hammerhead shark management groups remains currently open with 25 percent of the quotas available as of July 15, 2016. Because the quotas in 2017 are proposed to be the same as the quotas in 2016, NMFS expects that the season lengths and therefore the participation of various fishermen throughout the region, would be similar in 2017 (§ 635.27(b)(3)(ii) and (iii)). Based on the recent performance of the fishery, the January 1 opening date appears to be meet the objectives of the 2006 Consolidated HMS FMP and its amendments ((§ 635.27(b)(3)(vi)). Therefore, there is no information that indicates changing the opening date is necessary.

After the final rule for the 2016 shark season published on December 1, 2015 (80 FR 74999), and well outside the close of the public comment period for that rule (September 17, 2015), NMFS received extensive public comments opposing the January 1 opening date (for the aggregated LCS and hammerhead shark management groups) because of their concerns about a lemon shark aggregation site off the east coast of Florida which has become a popular local shark scuba diving site. Commenters requested that NMFS change the opening date to the summer months (*e.g.,* June or July) to protect this lemon shark aggregation. NMFS also received a petition to postpone the opening date in the Atlantic region signed by more than 18,000 people. NMFS responded to the petition as a petition for emergency rulemaking but did not change the January 1 start date in response. Based on these comments and the petition, NMFS held a public conference call on December 11, 2015, to answer public questions regarding the Atlantic commercial shark fishery. NMFS also gave a presentation on the biology and current stock status of lemon sharks at the March 2016 HMS Advisory Panel meeting. Data presented at the Advisory Panel meeting indicated that lemon sharks may be more productive than previously thought, the commercial shark fishery is not having a significant impact on lemon sharks in the aggregation area or elsewhere, and current data on relative abundance suggest population is stable. Landings of lemon sharks to date in the Atlantic region are approximately 4,855 mt dw (2.2 lb dw), which are less than the average landings over the past 6 years (see the criteria at § 635.27(b)(3)(iv), (v), and (vi) and § 635.24(a)(8)(ii), (iv), and (v)). There is no evidence that these landings have negatively impacted the lemon shark population according to the Southeast Fisheries Science Center scientists. Furthermore, NMFS considered information in the comments received on the December 2015 final rule in proposing a start date for 2017 and has determined they presented no new or additional information that was not previously considered by the agency that would warrant a different opening date. Therefore, NMFS is proposing the same opening dates for the 2017 fishing season. This opening date meets the management objectives of the 2006 Consolidated HMS FMP and its amendments (see the criteria at § 635.27(b)(3)(vi)) particularly in regard to ensuring fishermen throughout the region have reasonable opportunities to harvest a portion of the different species and/or management group quotas (see the criteria at § 635.27(b)(3)(v) and (vii)) while also considering important scientific information on the seasonal distribution, abundance, and migratory patterns of the different species within the management group (see the criteria at § 635.27(b)(3)(ii)). As described above, the fishery has performed well, and in accordance with the objectives of the 2006 Consolidated HMS FMP, under the January 1 opening date. Therefore, there is no information suggesting that changing the opening date is necessary. However, NMFS will consider through this rulemaking any comments on the opening date and any new information on lemon sharks (or other species) not previously considered, and may in the final rule, adjust the opening dates if warranted. The Notice of Availability for Amendment 10 to the 2006 Consolidated HMS FMP, which should be publishing soon, will address essential fish habitat and potential habitat areas of particular concern for HMS species, including lemon sharks.

In addition, for the aggregated LCS and hammerhead shark management groups in the Atlantic region, NMFS is proposing that the commercial retention trip limit for directed shark limited access permit holders on the proposed opening date be 36 LCS other than sandbar sharks per vessel per trip. This retention limit should allow fishermen to harvest some of the 2017 quota at the beginning of the year when sharks are more prevalent in the South Atlantic area (see the criteria at § 635.24(a)(3)(i), (ii), (v), and (vi)). As was done in 2016, if it appears that the quota is being harvested too quickly (*i.e.,* about 20 percent) to allow directed fishermen throughout the entire region an opportunity to fish and ensure enough quota remains until later in the year, NMFS would reduce the commercial retention limits to incidental levels (3 LCS other than sandbar sharks per vessel per trip) or another level calculated to reduce the harvest of LCS taking into account § 635.27(b)(3) and the inseason trip limit adjustment criteria listed in § 635.24(a)(8), particularly the consideration of whether catch rates in one part of a region or sub-region are precluding vessels in another part of that region or sub-region from having a reasonable opportunity to harvest a portion of the relevant quota (§ 635.24(a)(8)(vi)). If the quota continues to be harvested quickly, NMFS could reduce the retention limit to 0 LCS other than sandbar sharks per vessel per trip to ensure enough quota remains until later in the year. If either situation occurs, NMFS would publish in the **Federal Register** notification of any inseason adjustments of the retention limit to an appropriate limit of sharks per trip. In 2016, NMFS reduced the retention limit to 3 LCS other than sandbar sharks on April 2, 2016 (81 FR 18541) when hammerhead shark landings reached approximately 24 percent of the hammerhead quota, and did not need to reduce it further.

Also, as was done in 2016, NMFS will consider increasing the commercial retention limits per trip at a later date if necessary to provide fishermen in the northern portion of the Atlantic region an opportunity to retain non-sandbar LCS after considering the appropriate inseason adjustment criteria. Similarly, at some point later in the year (*e.g.,* July 15), potentially equivalent to how the 2016 fishing season operated, NMFS may consider increasing the retention limit to the default level (45 LCS other than sandbar sharks per vessel per trip) or another amount, as deemed appropriate, after considering the inseason trip limit adjustment criteria. If the quota is being harvested too quickly or too slowly, NMFS could adjust the retention limit appropriately to ensure the fishery remains open most of the rest of the year. Since the fishery is still open with majority of the quota available, NMFS will monitor the rest of the fishing season and could make changes to the proposed 2017 opening date if necessary to ensure equitable fishing opportunities.

All of the shark management groups would remain open until December 31, 2017, or until NMFS determines that the fishing season landings for any shark management group have reached, or are projected to reach, 80 percent of the available quota. If NMFS determines that a non-linked shark species or management group must be closed, then, consistent with § 635.28(b)(2) for non-linked quotas (*e.g.,* eastern Gulf of Mexico blacktip, western Gulf of Mexico blacktip, Gulf of Mexico non-blacknose SCS, pelagic sharks, or the Atlantic or Gulf of Mexico smoothhound sharks), NMFS will publish in the **Federal Register** a notice of closure for that shark species, shark management group, region, and/or sub-region that will be effective no fewer than 5 days from date of filing. For the blacktip shark management group, regulations at § 635.28(b)(5)(i) through (v) authorize NMFS to close the management group before landings reach, or are expected to reach, 80 percent of the quota after considering the following criteria and other relevant factors: Season length based on available sub-regional quota and average sub-regional catch rates; variability in regional and/or sub-regional seasonal distribution, abundance, and migratory patterns; effects on accomplishing the objectives of the 2006 Consolidated HMS FMP and its amendments; amount of remaining shark quotas in the relevant sub-region; and regional and/or sub-regional catch rates of the relevant shark species or management groups. From the effective date and time of the closure until NMFS announces, via the publication of a notice in the **Federal Register**, that additional quota is available and the season is reopened, the fisheries for the shark species or management group are closed, even across fishing years.

If NMFS determines that a linked shark species or management group must be closed, then, consistent with § 635.28(b)(3) for linked quotas, NMFS will publish in the **Federal Register** a notice of closure for all of the species and/or management groups in a linked group that will be effective no fewer than 5 days from date of filing. From the effective date and time of the closure until NMFS announces, via the publication of a notice in the **Federal Register**, that additional quota is available and the season is reopened, the fisheries for all linked species and/or management groups are closed, even across fishing years. The linked quotas of the species and/or management groups are Atlantic hammerhead sharks and Atlantic aggregated LCS; eastern Gulf of Mexico hammerhead sharks and eastern Gulf of Mexico aggregated LCS; western Gulf of Mexico hammerhead sharks and western Gulf of Mexico aggregated LCS; and Atlantic blacknose and Atlantic non-blacknose SCS south of 34° N. latitude. NMFS may close the fishery for the Gulf of Mexico blacktip shark before landings reach, or are expected to reach, 80 percent of the quota, after considering the criteria listed at § 635.28(b)(5).

Request for Comments

Comments on this proposed rule may be submitted via *http://www.regulations.gov* by mail, and at a public hearing. NMFS solicits comments on this proposed rule by September 27, 2016 (see **DATES** and **ADDRESSES**).

In addition to comments on the entire proposed rule, NMFS is specifically requesting comments on the proposed accounting of the 2012 and 2015 overharvest of Atlantic blacknose sharks from the 2016 underharvest. As described above, in 2016, NMFS closed the Atlantic blacknose shark management group once the quota was projected to exceed 80 percent. As of July 15, 2016, the Atlantic blacknose shark quota was underharvested by 3.5 mt dw (7,737 lb dw). This underharvest (3.5 mt dw) is greater than the remaining amounts of the 2012 and 2015 overharvests (3.0 mt dw) (6,636 lb dw). As such, NMFS is proposing to use the 2016 underharvest to cover the remaining 2012 and 2015 overharvest. This proposal would reduce potential negative social and economic impacts on the blacknose shark and non-blacknose SCS fisheries, which are linked fisheries in the Atlantic region south of 34° N. latitude while maintaining the ecological benefits of the current blacknose shark rebuilding plan. If NMFS continued to spread the overharvest from 2012 and 2015 through 2018, the Atlantic blacknose shark quota in 2017 would be reduced by 1.5 mt dw (3,268 lb dw) in 2017 and the 2017 adjusted quota would be 15.7 mt dw (34,653 lb dw). However, if NMFS uses the 2016 underharvest to cover the remaining overharvest 2012 and 2015 overharvest, the blacknose shark quota would not be reduced in 2017 or 2018 as a result of the 2012 and 2015 overharvests. As a result of this proposal, the 2017 annual base quota would be 17.2 mt dw (37,921 lb dw), which could result in the fishery remaining open longer in the Atlantic region south of 34° N. latitude and have social and economic beneficial impacts for blacknose and non-blacknose fishermen and dealers.

During the comment period, NMFS will hold one conference call and webinar for this proposed rule. NMFS is requesting comments on any of the measures or analyses described in this proposed rule. The conference call and webinar will be held on September 22, 2016, from 2–4 p.m. EST. Please see the **DATES** and **ADDRESSES** headings for more information.

The public is reminded that NMFS expects participants on phone conferences to conduct themselves appropriately. At the beginning of the conference call, a representative of NMFS will explain the ground rules (*e.g.,* all comments are to be directed to the agency on the proposed action; attendees will be called to give their comments in the order in which they registered to speak; each attendee will have an equal amount of time to speak; attendees may not interrupt one another; etc.). NMFS representative(s) will structure the meeting so that all attending members of the public will be able to comment, if they so choose, regardless of the controversial nature of the subject(s). Attendees are expected to respect the ground rules, and those that do not may be removed from the conference call.

Classification

The NMFS Assistant Administrator has determined that the proposed rule is consistent with the 2006 Consolidated HMS FMP and its amendments, the Magnuson-Stevens Act, and other applicable law, subject to further consideration after public comment.

These proposed specifications are exempt from review under Executive Order 12866.

NMFS determined that the final rules to implement Amendment 2 to the 2006 Consolidated HMS FMP (June 24, 2008, 73 FR 35778; corrected on July 15, 2008, 73 FR 40658), Amendment 5a to the 2006 Consolidated HMS FMP (78 FR 40318; July 3, 2013), Amendment 6 to the 2006 Consolidated HMS FMP (80 FR 50073; August 18, 2015), and Amendment 9 to the 2006 Consolidated HMS FMP (80 FR 73128; November 24, 2015) are consistent to the maximum extent practicable with the enforceable policies of the approved coastal management program of coastal states on the Atlantic including the Gulf of Mexico and the Caribbean Sea as required under the Coastal Zone Management Act. Pursuant to 15 CFR 930.41(a), NMFS provided the Coastal Zone Management Program of each coastal state a 60-day period to review the consistency determination and to advise the Agency of their concurrence. NMFS received concurrence with the consistency determinations from several states and inferred consistency from those states that did not respond within the 60-day time period. This proposed action to establish opening dates and adjust quotas for the 2017 fishing season for the Atlantic commercial shark fisheries does not change the framework previously consulted upon; therefore, no additional consultation is required.

An initial regulatory flexibility analysis (IRFA) was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. The IRFA analysis follows.

Section 603(b)(1) of the RFA requires agencies to explain the purpose of the rule. This rule, consistent with the Magnuson-Stevens Act and the 2006 Consolidated HMS FMP and its amendments, is being proposed to establish the 2017 commercial shark fishing quotas, retention limits, and fishing seasons. Without this rule, the commercial shark fisheries would close on December 31, 2016, and would not open until another action was taken. This proposed rule would be implemented according to the regulations implementing the 2006 Consolidated HMS FMP and its amendments. Thus, NMFS expects few, if any, economic impacts to fishermen other than those already analyzed in the 2006 Consolidated HMS FMP and its amendments, based on the quota adjustments.

Section 603(b)(2) of the RFA requires agencies to explain the rule's objectives. The objectives of this rule are to: Adjust the baseline quotas for all Atlantic shark management groups based on any over- and/or underharvests from the previous fishing year(s); establish the opening dates of the various management groups; and establish the retention limits for the blacktip shark, aggregated large coastal shark, and hammerhead shark management groups in order to provide, to the extent practicable, equitable opportunities across the fishing management regions and/or sub-regions while also considering the ecological needs of the different shark species.

Section 603(b)(3) of the RFA requires agencies to provide an estimate of the number of small entities to which the rule would apply. The Small Business Administration (SBA) has established size criteria for all major industry sectors in the United States, including fish harvesters. Provision is made under SBA's regulations for an agency to develop its own industry-specific size standards after consultation with Advocacy and an opportunity for public comment (see 13 CFR 121.903(c)). Under this provision, NMFS may establish size standards that differ from those established by the SBA Office of Size Standards, but only for use by

NMFS and only for the purpose of conducting an analysis of economic effects in fulfillment of the agency's obligations under the RFA. To utilize this provision, NMFS must publish such size standards in the **Federal Register** (FR), which NMFS did on December 29, 2015 (80 FR 81194, December 29, 2015). In this final rule effective on July 1, 2016, NMFS established a small business size standard of $11 million in annual gross receipts for all businesses in the commercial fishing industry (NAICS 11411) for RFA compliance purposes. NMFS considers all HMS permit holders to be small entities because they had average annual receipts of less than $11 million for commercial fishing.

As of July 2016, the proposed rule would apply to the approximately 224 directed commercial shark permit holders, 272 incidental commercial shark permit holders, 89 smoothhound shark permit holders, and 108 commercial shark dealers. Not all permit holders are active in the fishery in any given year. Active directed commercial shark permit holders are defined as those with valid permits that landed one shark based on HMS electronic dealer reports. Of the 496 directed and incidental commercial shark permit holders, only 23 permit holders landed sharks in the Gulf of Mexico region and only 88 landed sharks in the Atlantic region. Of the 89 smoothhound shark permit holders, only 49 permit holders landed smoothhound sharks in the Atlantic region and none landed smoothhound sharks in the Gulf of Mexico region. NMFS has determined that the proposed rule would not likely affect any small governmental jurisdictions.

This proposed rule does not contain any new reporting, recordkeeping, or other compliance requirements (5 U.S.C. 603(b)(4)). Similarly, this proposed rule would not conflict, duplicate, or overlap with other relevant Federal rules (5 U.S.C. 603(b)(5)). Fishermen, dealers, and managers in these fisheries must comply with a number of international agreements as domestically implemented, domestic laws, and FMPs. These include, but are not limited to, the Magnuson-Stevens Act, the Atlantic Tunas Convention Act, the High Seas Fishing Compliance Act, the Marine Mammal Protection Act, the Endangered Species Act, the National Environmental Policy Act, the Paperwork Reduction Act, and the Coastal Zone Management Act.

Section 603(c) of the RFA requires each IRFA to contain a description of any significant alternatives to the proposed rule which would accomplish the stated objectives of applicable statutes and minimize any significant economic impact of the proposed rule on small entities. Additionally, the RFA (5 U.S.C. 603(c)(1)–(4)) lists four general categories of significant alternatives that would assist an agency in the development of significant alternatives. These categories of alternatives are: (1) Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) use of performance rather than design standards; and, (4) exemptions from coverage of the rule for small entities. In order to meet the objectives of this proposed rule, consistent with the Magnuson-Stevens Act, NMFS cannot exempt small entities or change the reporting requirements only for small entities because all the entities affected are considered small entities; therefore, there are no alternatives discussed that fall under the first and fourth categories described above. NMFS does not know of any performance or design standards that would satisfy the aforementioned objectives of this rulemaking while, concurrently, complying with the Magnuson-Stevens Act; therefore, there are no alternatives considered under the third category.

This rulemaking does not establish management measures to be implemented, but rather implements previously adopted and analyzed measures with adjustments, as specified in the 2006 Consolidated HMS FMP and its amendments and the Environmental Assessment (EA) that accompanied the 2011 shark quota specifications rule (75 FR 76302; December 8, 2010). Thus, NMFS proposes to adjust quotas established and analyzed in the 2006 Consolidated HMS FMP and its amendments by subtracting the underharvest or adding the overharvest as allowable. Thus, NMFS has limited flexibility to modify the quotas in this rule, the impacts of which were analyzed in previous regulatory flexibility analyses.

Based on the 2015 ex-vessel price, fully harvesting the unadjusted 2017 Atlantic shark commercial baseline quotas could result in total fleet revenues of $8,265,467 (see Table 3). For the Gulf of Mexico blacktip shark management group, NMFS is proposing to increase the baseline sub-regional quotas due to the underharvests in 2016. The increase for the eastern Gulf of Mexico blacktip shark management group could result in a $24,141 gain in total revenues for fishermen in that sub-region, while the increase for the western Gulf of Mexico blacktip shark management group could result in a $222,196 gain in total revenues for fishermen in that sub-region. For the Gulf of Mexico and Atlantic smoothhound shark management groups, NMFS is proposing to increase the baseline quotas due to the underharvest in 2016. This would cause a potential gain in revenue of $270,323 for the fleet in the Gulf of Mexico region and a potential gain in revenue of $965,095 for the fleet in the Atlantic region.

All of these changes in gross revenues are similar to the changes in gross revenues analyzed in the 2006 Consolidated HMS FMP and its amendments. The final regulatory flexibility analyses for those amendments concluded that the economic impacts on these small entities are expected to be minimal. In the 2006 Consolidated HMS FMP and its amendments and the EA for the 2011 shark quota specifications rule, NMFS stated it would be conducting annual rulemakings and considering the potential economic impacts of adjusting the quotas for under- and overharvests at that time.

TABLE 3—AVERAGE EX-VESSEL PRICES PER LB DW FOR EACH SHARK MANAGEMENT GROUP, 2015

Region	Species	Average ex-vessel meat price	Average ex-vessel fin price
Gulf of Mexico	Blacktip Shark	$0.51	$9.95
	Aggregated LCS	0.55	9.96
	Hammerhead Shark	0.61	11.98
	Non-Blacknose SCS	0.35	6.72
	Smoothhound Shark *	0.65	1.58

TABLE 3—AVERAGE EX-VESSEL PRICES PER LB DW FOR EACH SHARK MANAGEMENT GROUP, 2015—Continued

Region	Species	Average ex-vessel meat price	Average ex-vessel fin price
Atlantic	Aggregated LCS	0.80	4.73
	Hammerhead Shark	0.65	10.25
	Non-Blacknose SCS	0.73	4.36
	Blacknose Shark	0.97	4.00
	Smoothhound Shark *	0.65	1.58
No Region	Shark Research Fishery (Aggregated LCS)	0.68	9.24
	Shark Research Fishery (Sandbar only)	0.76	10.62
	Blue shark	0.60	2.93
	Porbeagle shark	1.50	2.93
	Other Pelagic sharks	1.50	2.93

* Ex-vessel prices for smoothhound sharks come from HMS dealers who submitted landings data voluntarily before it was a requirement on March 15, 2016.

For this proposed rule, NMFS also reviewed the criteria at § 635.27(b)(3) to determine when opening each fishery would provide equitable opportunities for fishermen, to the extent practicable, while also considering the ecological needs of the different species. The opening dates of the fishing season(s) could vary depending upon the available annual quota, catch rates, and number of fishing participants during the year. For the 2017 fishing season, NMFS is proposing to open all of the shark management groups on the effective date of the final rule for this action (expected to be on or about January 1). The direct and indirect economic impacts would be neutral on a short- and long-term basis because NMFS is not proposing to change the opening dates of these fisheries from the status quo.

Authority: 16 U.S.C. 971 *et seq.;* 16 U.S.C. 1801 *et seq.*

Dated: August 22, 2016.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 2016–20505 Filed 8–26–16; 8:45 am]

BILLING CODE 3510–22–P

Atlantic Highly Migratory Species

Proposed Rule to Establish the Quotas, Opening Dates, and Retention Limits for the 2017 Atlantic Shark Commercial Fishing Season

Atlantic Region Only

Presented to ASMFC

October 2016

Shark 2017 Proposed Shark Season Rule

- Published on 8/29/2016 (81 FR 59167)
- Proposed some adjustments to base quotas due to over- and underharvests
  - the Atlantic smoothhound shark management group quota based on underharvests: 600.9 mt dw (1,323,862 lb dw)
  - No change to the Atlantic blacknose shark quota; underharvest in 2016 accounted for all previous overharvests
- Proposed to open all shark management groups approx. 1/1/2017
- Proposed 36 LCS other than sandbar sharks/vessel/trip commercial retention limits for directed permit holders
  - If quota is landed too quickly (e.g. if approximately 20 percent of quota is caught at the beginning of the year), NMFS anticipates inseason reduction (e.g., to 3 or fewer LCS other than sandbar sharks/vessel/trip). We would consider an inseason increase (for example, to 45 LCS other than sandbar sharks/vessel/trip) after considering the criteria for inseason adjustments around July 15, 2017
- Comment Period Ended September 28, 2016

2017 Proposed Adjusted Quotas, Retention Limits, and Opening Dates

Region or Sub-region	Management Group	2017 Annual Adjusted Quota	Quota Linkage	Commercial Retention Limits for Directed Shark Limited Access Permit Holders (inseason adjustments are possible)	Season Opening Dates
Atlantic	Aggregated Large Coastal Sharks	168.9 mt dw (372,552 lb dw)	Linked	36 large coastal sharks other than sandbar sharks per vessel per trip If quota is landed too quickly (e.g. if approx. 20% of quota is caught at the beginning of the year), NMFS anticipates inseason reduction (e.g. to 3 or fewer large coastal sharks other than sandbar sharks per vessel per trip). We would consider an inseason increase (for example, 45 large coastal sharks other than sandbar sharks per vessel per trip) after considering the criteria for inseason adjustments around July 15, 2017.	Jan 1, 2017
	Hammerhead Sharks	27.1 mt dw (59,736 lb dw)			
	Non-Blacknose Small Coastal Sharks	264.1 mt dw (582,333 lb dw)	Linked (South of 34˚ N. lat. only)	N/A	
	Blacknose Sharks (South of 34˚ N. lat. only)**	17.2 mt dw (37,921 lb dw)			
	Smoothhound Sharks	1,802.6 mt dw (3,971,587 lb dw)*	Not Linked	N/A	
No regional quotas	Non-Sandbar LCS Research	50.0 mt dw (110,230 lb dw)	Linked	N/A	Jan 1, 2017
	Sandbar Shark Research	90.7 mt dw (199,943 lb dw)			
	Blue Sharks	273.0 mt dw (601,856 lb dw)	Not Linked	N/A	
	Porbeagle Sharks	1.7 mt dw (3,748 lb dw)			
	Pelagic Sharks Other Than Porbeagle or Blue	488.0 mt dw (1,075,856 lb dw)			

*Base quota adjusted based on underharvest in 2016.

**NMFS proposes to use the 2016 underharvest to cover the remainder of the 2012 and 2015 overharvests.

Add'l Information Considered Regarding the Opening Date

- In December 2015, NMFS received extensive public comments concerning the lemon shark aggregation off the east coast of Florida and the 1/1/2016 opening date
- 12/8/2015 Petition to postpone January 1 opening date
  - Challenged decision to open commercial fishing for Florida sharks and requested an emergency hearing to delay the start date
  - NMFS denied the request:
    - Provided no new or additional information that was not previously considered by the agency
    - Did not present recent, unforeseen events, recently discovered circumstances, or serious conservation or management problems in the fishery
- NMFS gave a presentation on the biology and current stock status of lemon sharks at the March 2016 HMS Advisory Panel meeting

Atlantic States Marine Fisheries Commission

Atlantic Striped Bass Management Board

October 24, 2016
3:00 – 5:00 p.m.
Bar Harbor, Maine

Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order (*J. Gilmore*)	3:00 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	3:00 p.m.
3.	Public Comment	3:05 p.m.
4.	Review Technical Committee Report (*N. Lengyel*) • Performance Evaluation of Addendum IV Regulatory Measures	3:15 p.m.
5.	Review the 2016 Atlantic Striped Bass Stock Assessment Update (*G. Nelson*)	3:45 p.m.
6.	Consider Approval of the Advisory Panel Request to Submit Comment to the Mid-Atlantic Fishery Management Council on its Draft Squid Capacity Amendment (*J. Gilmore*) **Possible Action**	4:45 p.m.
7.	Other Business/Adjourn	5:00 p.m.

The meeting will be held at the Harborside Hotel; 55 West Street; Bar Harbor, Maine; 207.288.5033

MEETING OVERVIEW

Atlantic Striped Bass Management Board Meeting
October 24, 2016
3:00 p.m. – 5:00 p.m.
Bar Harbor, Maine

Chair: Jim Gilmore (NY) Assumed Chairmanship: 02/16	Technical Committee Chair: Nicole Lengyel (RI)	Law Enforcement Committee Rep: Kurt Blanchard (RI)
Vice Chair: Russ Allan (NJ)	Advisory Panel Chair: Louis Bassano (NJ)	Previous Board Meeting: February 4, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, DC, PRFC, VA, NC, NMFS, USFWS (16 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from February 2016

3. Public Comment – At the beginning of the meeting, public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance, the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Review Technical Committee Report (3:15 – 3:35 p.m.)

Background

- Addendum IV (October 2014) implemented a suite of management measures to reduce harvest and bring fishing mortality (F) back down to the target level. The measures were predicted to reduce harvest in the ocean fisheries by 25% relative to 2013 harvest levels, and to reduce harvest in the Chesapeake Bay (Bay) fisheries by 20.5% relative to 2012 harvest levels. Measures were implemented prior to the 2015 fishing year.
- In August, the PRT conducted a preliminary analysis on the performance of these measures to determine whether the target reductions in harvest had been achieved.
- Results of the analysis indicated that commercial harvest reductions for both the ocean and Bay fisheries were close to the predicted reductions. However, the recreational fisheries in the ocean and the Bay diverged significantly from the predicted values.
- Following review, the Board directed the TC to look at a number of factors to explain the differences between the predicted and realized reductions (**Briefing Materials**).

Presentations

- Performance Evaluation of Addendum IV Regulatory Measures by N. Lengyel

5. Review the 2016 Atlantic Striped Bass Assessment Update (3:45 p.m. – 4:45 p.m.)
Background • The 2016 Atlantic Striped Bass Stock Assessment update was completed in October (**briefing materials)**
Presentations • 2016 Atlantic Striped Bass Stock Assessment Update by G. Nelson

6. Consider Approval of the Advisory Panel Request to Submit Comment to the Mid-Atlantic Fishery Management Council on its Draft Squid Capacity Amendment (4:45 p.m. – 5:00 p.m.) Possible Action
Background • The MAFMC is currently drafting a squid capacity amendment that address several management issues that could affect striped bass fishing opportunities near Martha's Vineyard and Nantucket. • As such, the Atlantic Striped Bass Advisory Panel is seeking approval to submit comment to the MAFMC on its Draft Squid Capacity Amendment.
Board Actions for Consideration • Consider approval of the Advisory Panel request to submit comment to the MAFMC on its Draft Squid Capacity Amendment

6. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC STRIPED BASS MANAGEMENT

The Westin Alexandria
Alexandria, Virginia
August 3, 2016

These minutes are draft and subject to approval by the Atlantic Striped Bass Management Board.
The Board will review the minutes during its next meeting.

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INDEX OF MOTIONS

1. **Approval of agenda** by consent (Page 1).

2. **Approval of proceedings of February 2016** by consent (Page 1).

3. **Move to approve the 2016 Atlantic Striped Bass FMP Review and state compliance reports** (Page 8). Motion by Doug Grout; second by Tom Fote. Motion carried (Page 8).

4. **Move to approve Patrick Paquette membership to the Atlantic Striped Bass Advisory Panel** (Page 8). Motion made by Michelle Duval; second by Adam Nowalsky. Motion carried (Page 8).

5. **Move to adjourn** by consent (Page 8).

ATTENDANCE

Board Members

Pat Keliher, ME (AA)
Rep. Jeffrey Pierce, ME, proxy for Sen. Langley (LA)
Terry Stockwell, ME, Administrative proxy
Steve Train, ME (GA)
G. Ritchie White, NH (GA)
Doug Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Bill Adler, MA (GA)
David Borden, RI (GA)
Jason McNamee, RI, proxy for J. Coit (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
David Simpson, CT (AA)
Rep. Craig Miner, CT (LA)
James Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Andrew Shiels, PA, proxy for J. Arway (AA)
Loren Lustig, PA (GA)
Tom Moore, PA, proxy for Rep. Vereb (LA)
Roy Miller, DE (GA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Mike Luisi, MD, proxy for D. Blazer (AA)
Rachel Dean, MD (GA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Rob O'Reilly, VA, proxy for John Bull (AA)
Michelle Duval, NC, proxy for B. Davis (AA)
Martin Gary, PRFC
Derek Orner, NMFS
Sherry White, USFWS
Dan Ryan, DC

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Staff

Robert Beal
Toni Kerns
Katie Drew
Max Appelman

Guests

Robert Boyles, Jr., SC DNR
Malcolm Rhodes, SC
Jim Estes, FL F&W
Spud Woodward, GA DNR
Wilson Laney, USFWS
Mike Millard, USFWS
Charles Lynch, NOAA
Topher Holmes, NOAA
Debra Lambert, NOAA
Roy Crabtree, NMFS
Jessica Coakley, MAFMC
Jeff Deem, VMRC
Justin Davis, CT DEEP
Peter Aarrestad, CT DEEP
Patrick Geer, GA DNR
Jack Travelstead, CCA
Dan McKiernan, MA DMF
Mike Luisi, MD DNR
Steve Heins, NYS DEC
Doug Christel, MA F & G
Aaron Kornbluth, PEW Trusts
Joseph Gordon, PEW Trusts
Raymond Kane, CHOIR
Louis Daniel, Morehead City, NC
Arnold Leo, Town of E. Hampton, NY

The Atlantic Striped Bass Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 3, 2016, and was called to order at 1:36 o'clock p.m. by Chairman James J. Gilmore.

CALL TO ORDER

MR. JAMES J. GILMORE: Welcome everyone; I would like to call the Striped Bass Board to order. I am Jim Gilmore; I am the Administrative Commissioner from New York, and I will be chairing the meeting today. Welcome back, LGA folks. You've got to keep on time, guys, you know. We're running a tight ship here. I did want to just acknowledge my colleague from the state of Rhode Island for the phenomenal job he did this morning on menhaden, so a round of applause for Bob Ballou. (Applause)

I was so inspired I offered Bob the opportunity to run this meeting; but he repeated how much fun he had this morning. Let's get into it.

APPROVAL OF AGENDA

CHAIRMAN GILMORE: First off, we have approval of the agenda. It should be in your meeting package; any changes to the agenda? We are going to have one addition at the end. We do have an AP nomination, so we are going to add that to Other Business.

We'll put that change in and seeing none other; we'll consider that approved.

APPROVAL OF PROCEEDINGS

CHAIRMAN GILMORE: We also have the proceedings from the February, 2016 meeting. Are there any changes to those proceedings? Seeing none; we'll take those as adopted.

PUBLIC COMMENT

CHAIRMAN GILMORE: Before each meeting we offer the public an opportunity to comment on items not on the agenda. There was no one signed up to make any comments, but by show of hands is there anyone in the audience that would like to make a public comment on items not on the agenda? Seeing none; we'll move right along.

REVIEW OF THE STRIPED BASS ADVISORY PANEL MEETING SUMMARY

CHAIRMAN GILMORE: Our first order of business is the review of the Striped Bass Advisory Panel meeting summary; and Max Appelman is going to do that for us.

MR. MAX APPELMAN: Typically, advisory panels meet at the direction of the board to provide feedback throughout the adaptive management process. However, there were several requests from advisory panel members for staff to conduct an informational meeting, and give the AP an opportunity to discuss a few striped bass fishery topics that are not currently being discussed at the board level. The AP met via conference call on April 29th, to receive an update from staff on those topics.

The first topic on the agenda was the EEZ Transit Zone Clarification and Access Act; so this is in relation to the Block Island Sound Transit Zone within the EEZ. For those who are unfamiliar with the Bill, the current language essentially reaffirms that the Secretary of Commerce in consultation with the commission may issue regulations to permit and regulate recreational fishing for striped bass within the transit zone. Summarizing the APs discussion about this, basically regardless of the outcome of the Bill, the AP does not support the use of legislative procedures to override the current fishery management framework. Back to what the AP was getting at is that they are and have always been in support of fishery management processes that are science driven; that are based on technical expertise, and provide ample opportunity for public comment.

The next item that was on the agenda was discussion of the western North Atlantic squid resource in Nantucket Sound and the surrounding area. Just a little bit of background there. Perhaps, to some of you this might be common knowledge, but squid are considered a significant food source for striped bass; and Nantucket Sound typically supports large concentrations of both predator and prey during the summer months.

In recent years, some AP members and other fishermen have reported a decline in the availability of striped bass during the summer in that area, and also in recent years, there has been above average harvest of squid in and around that area, leading some AP members to the belief that this increased harvest may be a contributing factor to the decreased availability of striped bass in the Sound during that time.

Many of you are likely aware that the Mid-Atlantic Council is currently pursuing a Squid Capacity Amendment; which both directly and indirectly addresses a lot of the concerns of the AP regarding this issue. In short, that amendment considers options for a harvest buffer zone beyond state waters, south of Nantucket Sound, as well as other measures that address the potential for increased effort in the fishery.

The current timeline includes a public comment period on the draft amendment in early 2017. Moving forward, staff is going to continue to track the progress of that amendment and provide updates to the advisory panel as necessary. Moving forward, you know, again this was somewhat of a unique situation, as it was not board directed.

Basically, just making sure the board is aware that this meeting occurred, is aware of the outcomes that came from that meeting, and the discussions that took place; but in the future, if a similar request is made to hold an informational meeting, the board chair will be consulted first. This should help maintain transparency between the board and the AP and the rest of the commission stakeholders; and is also more in line with some of those new policy changes that went into the ISFMP Charter and some of the commissions guiding documents. I'll take any questions.

CHAIRMAN GILMORE: Any questions for Max?

MR. JOHN McMURRAY: Max, I recall a discussion about the Mid's Squid Capacity Amendment, and the AP agreeing to write a letter providing public comment in support of a full analysis of those buffer zone alternatives included in the draft amendment. Well, I guess it is not yet a draft amendment, it is just a PID. Is that recollection correct, and if so, was a letter written and sent? Because I don't think the council has seen it yet if it was.

MR. APPELMAN: That discussion did take place. What we decided to go with is for AP members to submit comment during the public comment period individually, as stakeholders interested in the fishery.

CHAIRMAN GILMORE: Other questions. Ritchie White.

MR. G. RITCHIE WHITE: Just to that point. I think the process would be the AP would bring that issue to the Striped Bass Board and then the Striped Bass Board, if deciding that letter should go, then it would go to the Policy Board. That would be the process for a formal letter to go to another entity on an issue.

CHAIRMAN GILMORE: Other questions?

MR. McMURRAY: Sorry, Jim, I don't mean to jam this up. If that's the case, and I kind of thought that would be the case during our AP meeting. That may be something the board would like to put on the agenda as a future item for discussion.

CHAIRMAN GILMORE: Yes, John, we'll do that. That is correct. Any other questions for Max before we move on?

2016 ATLANTIC STRIPED BASS FMP REVIEW AND STATE COMPLIANCE

CHAIRMAN GILMORE: Okay, seeing none; the next agenda item is to consider approval for the 2016 Atlantic Striped Bass FMP Review and State Compliance. Max is going to do an overview of this, and just let me say it for the first time; because hopefully, you hear it many times.

There is some surprises in this for some states. These are preliminary MRIP numbers that haven't been gone through by the TC or anybody yet. I know I've gotten some comments from different states about going into this, but we're really going to reserve most of this for the annual meeting after the TC and the other folks have gotten it. We'll gladly discuss it, but the only motion we're going to be doing today is actually to accept the review. We're not going to get into beating up things, so Max.

MR. APPELMAN: Just a quick overview of the presentation today. We will cover the most recent stock status, status of the fishery, highlighting again that 2015 fishing year, status of management measures; including a preliminary review of the performance of Addendum IV. Then we'll wrap up with compliance and recommendations.

Based on the 2015 stock assessment update, the Atlantic Striped Bass stock is not overfished and overfishing is not occurring. Again, the 2016 stock assessment update will be available for review in October. In 2014, SSB was estimated at 63,918 metric tons; which is below the target and above the threshold, and F was estimated at 0.2, which is similarly below the threshold and above the target.

This is Figure 1 from the report, basically showing SSB estimates through time. The take home here is that SSB has steadily declined below the target towards the threshold level since about 2004. Also, on this figure are recruitment estimates, which are more or less variable across the time series but you can see that spike in 2012, which is likely that 2011 year class.

This figure is Figure 2 from the report; fishing mortality estimates over time. The take home here is basically over the last ten years or so. Fishing mortality has fluctuated back and forth across that threshold level; and in the terminal year has been estimated between the target and the threshold.

Just a quick look at some harvest numbers in 2015 compared to the previous year. These are total harvest, these are commercial landings plus recreational harvest; and this is according to MRIP. In 2015, total harvest was estimated at 1.96 million fish weighing 23 million pounds. This represents a 23 percent decrease by weight and by number; compared to last year, or 2014. Harvest was again dominated by the recreational sector, and accounted for 79 percent of the total harvest by weight. The commercial landings were estimated at 620,034 fish weighing 4.8 million pounds. That is a 19 percent decrease. Then recreational harvest was estimated at 1.3 million fish weighing 18 million pounds; a 24 percent decrease by weight and 25 percent by number.

Just a quick look at the Albemarle Sound and Roanoke River stock; this is Section 4 of the report. This latest stock status information comes from the 2013 North Carolina specific benchmark assessment, which similarly indicates that the stock is not overfished and overfishing is not occurring; and also stock status trends are very similar to the coastal stock.

In 2012 SSB was estimated at 835,462 pounds and fishing mortality estimated at 0.34. There will also be an updated assessment for the AR stock using catch and index data through 2015 as well, and that should be available for board review in October. Harvest from the Albemarle Sound and Roanoke River in 2015 was estimated at 240,445 pounds; 76 percent of that came from the Albemarle Sound Management Area and the rest from the Roanoke River.

REVIEW OF THE PERFORMANCE OF ADDENDUM IV

MR. APPELMAN: Moving on to status of management measures, this is Table 9 from the report showing coastal commercial quotas and harvest. A reminder that 2015 quota does reflect Addendum IV. In 2015, the total coastal quota was not exceeded; harvest was estimated at 1.9 million pounds. Rhode Island exceeded its quota by 6,903 pounds, and that has been subtracted from the 2016 quota, so Rhode Island's commercial fishery is currently operating under a reduced quota.

Same statistics for the Chesapeake Bay commercial quotas in the harvest, again reflecting Addendum IV. In 2015 the bay-wide quota was not exceeded.

Harvest was estimated at 2.9 million pounds; and each jurisdiction harvested below its quota; therefore, no deductions were applied to 2016 quotas in the Bay.

This is a review of juvenile abundance indices or JAIs. Addendum II defines recruitment failure as a value that is lower than 75 percent or the first quartile of all values in a fixed time series appropriate to each JAI. The PRT annually reviews JAIs from six different surveys, and if any surveys JAI falls below the respective Q1 for three consecutive years, then appropriate action should be recommended to the board.

For the 2016 JAI review the PRT evaluated the 2013, 2014 and 2015 JAI values, which triggered no management action. You can look into Section 5 of the report and Figure 8 for a more detailed discussion on those specific JAI reviews. Addendum 3 of the FMP requires all states with commercial fisheries to implement a commercial tagging program; and monitoring reports are due no less than 60 days prior to the start of their first commercial season.

These monitoring reports typically include a summary of the previous year's tagging program, tag descriptions for the upcoming season, as well as highlighting any issues that may have been encountered in the program thus far. In 2015 all states implemented commercial tagging programs consistent with the requirements of Addendum III.

No major issues stood out in those reports, and again, you can refer to Table 12 in the FMP review for a more detailed summary of each states program requirements. A couple slides here on Addendum IV, just as a little refresher. The Addendum established new fishing mortality reference points as recommended by the 2013 benchmark assessment. The results of that assessment also indicated that F was above the target for several consecutive years, and SSB below target for several years; which triggered management action. Accordingly, the addendum aims at reducing fishing mortality to a level at or below that new target.

To achieve this, prior to the 2015 fishing season all jurisdictions implemented regulations projected to reduce harvest by 25 percent from 2013 levels along the coast, and by 20.5 percent from 2012 levels in the Chesapeake Bay. More specifically, coastal commercial quotas were reduced by 25 percent from the Amendment VI allocations; coastal recreational fisheries implemented a one-fish bag limit, and a 28 inch minimum size limit or alternate measures approved by the board through the conservation equivalency process. Chesapeake Bay commercial quotas were reduced by 20.5 percent from that level harvested in 2012, and there was no standard measure laid out in the addendum for Chesapeake Bay recreational fisheries, so instead the Bay jurisdictions implemented measures that were subject to TC review and projected to reach the 20.5 percent reduction from those 2012 levels.

This is Table 7 from the report. It is simply comparing the 2015 harvest estimate again, these are based on MRIP compared to that number that was predicted by the TC this time last year. Looking at the totals in the bottom row there, the predicted harvest reduction was 25.8 percent and the realized reduction was 22.4 percent, which to me indicates really impressive work conducted by the Technical Committee.

The Chesapeake Bay recreational sector certainly sticks out with a 53 percent increase; but I'm very hesitant to make any interpretations from these numbers at this time for several reasons, but primarily because this is a very rudimentary evaluation. It does not provide any insight to the mechanisms effecting harvest in each of these regions or by sector.

The TC will dive into this a little bit more, a much more in-depth evaluation of the performance of Addendum IV. They will look at things like changes in effort between regions and sectors, and again, those impacts from different fishing sectors. Potential impacts from the emergence of that 2011 year class in the harvest data, and any other things of that nature. Again, that will be a TC evaluation which will be available for board review in October.

Another point to keep in mind is that the ultimate goal of this addendum is to reduce F to the target level. This evaluation doesn't provide any insight to what that F estimate is; again, that information available in October. To wrap up the presentation, no states requested de minimis status at this time, and all states were found to have implemented regulations consistent with the striped bass FMP. I'll take any questions.

CHAIRMAN GILMORE: Thanks, Max, great report. Do I have questions? I've got a few of them coming up. Okay I've got Mike Luisi, then Rob O'Reilly and Tom Fote.

MR. MICHAEL LUISI: I'll take your opening remarks as keep it short, and this doesn't mean a whole lot here. I think Max reiterated that too. I don't necessarily have a question. I don't know if this is the appropriate time. I would like to clarify a few things based on one of the statements that were made in the executive summary. If you want to take questions first, you can certainly do that. If you would like, I can give you my thoughts at this time about one of those statements that was made.

CHAIRMAN GILMORE: Why don't we just go to questions on the summary; if people just have questions on the summary, and then we'll go back to the implications of it? Okay, Rob O'Reilly.

MR. ROB O'REILLY: Max, a couple times you mentioned harvest reductions, and then towards the end, you mentioned the important reduction in fishing mortality rate. I would ask you whether it is the plan of the Technical Committee to make any estimation on the B2s that will be on the coast, a little bit now, more in 2016, more in 2017.

The reason I bring that up is there was a 680 percent increase in B2s just in Virginia in 2015 compared to 2012. The 22.5 percent is impressive, but I think we need some indication of the expectations of how many of the 2011 year class that were present in 2015, how many are expected in 2016/2017?

There are three different migration rates coming from the Bay. I guess the Rugolo-Jones one is still the one of choice, but I think everyone needs to know that; because it may not be a quick situation with the fact that those sub-legal's are going to be more prevalent on the coast, as they have been in the Bay.

MR. APPELMAN: Not sure if that was a question per se, but definitely will be something that the TC looks into. I've written down your comment and am happy to relay that.

MR. THOMAS P. FOTE: I'm thinking about what happened last year and a question I have. When you bring this information for the annual meeting, could you bring back the wave information to go along with this and the wave data on striped bass? The reason I'm asking that question is because we make calculations on what we see in the last previous four years.

I want to see if all this increase in New Jersey was in the last wave, because we had a fishery with Atlantic herring showing up for 25 miles and things. It is like Massachusetts this year projected what they would catch during this time of year. From what people are telling us, they're not going to catch that; so they're going to catch a huge figure in that two month wave. We call this an episodic event, but I would like to know what the reasons; and that is part of the reason we went over.

CHAIRMAN GILMORE: All right, Tom, I think when the TC does their review the wave data is going to be included in that; so you should have that for the materials in October.

MR. WHITE: Question on process, for the report in October the TC will be looking at the effects of conservation equivalency by state and making recommendations on any states that don't meet the conservation equivalency amount. Am I correct in that?

MR. APPELMAN: My understanding is that the TC will make the appropriate recommendations to the board on the effectiveness of those management measures.

MR. McMURRAY: My question is very similar to

Ritchie's. However, I am not clear on what the responsibility of the TC is, as far as interpreting and reacting to the overages, and whether or not the requirement in Addendum IV was to achieve that 25 percent reduction overall, or if it was to achieve the reduction in the Bay; and then also have the reduction on the coastal side. That is my question, was I clear as mud?

MR. APPELMAN: I highlighted this in the presentation. But the goal of the addendum was to reduce fishing mortality to a level at or below the target. We don't have that information yet, and my interpretation is that as a mechanism to get there, that is what the regulations set out to do, is achieve those reductions per sector per region. But the ultimate goal, the bottom line is where is F? We'll have that information in October.

CHAIRMAN GILMORE: Just to add, John. There are no compliance requirements. We had to hit the coastwide overall target. If a state went over theirs, there wasn't a compliance issue with it, so at this point it is just to hit that 25 percent target.

MR. McMURRAY: That's understood, but if the conservation equivalency is not working, I am assuming we would need to revisit it; correct?

CHAIRMAN GILMORE: Yes well, we would definitely talk about that in October; other questions on this? Okay, Mike, do you want to go ahead?

MR. LUISI: Yes thanks, absolutely. I think it ties nicely into John's questions regarding conservation equivalency. When the information was made available for this meeting I got some pretty heavy feedback, or some reaction I guess is what I should say, from stakeholders in our state and also board members here at the commission; regarding the statement in the executive summary that reads that, "Addendum IV regulatory measures achieved a 22.4 percent reduction in harvest compared to the reference harvest level. All sectors achieved their harvest reduction goal, except for the Chesapeake Bay recreational sector, which increased its harvest by 53.4 percent compared to the 2012 harvest levels". If I could, I would like to make a few comments regarding Maryland's perspective on the harvest that occurred in 2015, and just give everybody here, both members of the audience and commissioners, the perspective on our take; as to why those numbers were the way they were.

I went back into Addendum IV and looked at what the management measures were expected to achieve. Addendum IV states in its overview section that the measures were aimed at reducing fishing mortality to the target, beginning in 2015. I think it has been stated, it is pretty clear that reducing fishing mortality was the overarching goal of the management measures, and it wasn't just reducing harvest in numbers.

Fishing mortality is going to be the way that we figure out whether or not we're making progress to that goal. There were also two objectives stated in the overview section of the addendum. One was that the measures were intended to conserve the large 2011 year class that was in the Bay, focusing on the Chesapeake Bay.

The second objective was to conserve the female spawning stock biomass. I would argue that while our harvest increased from that 2012 baseline, we did achieve those objectives; conserving the 2011 year class and protecting the female spawning stock. The reason I can say that is because right now the Chesapeake Bay is in a very unique situation. We've mentioned many times before, and I am not going to belabor the points about how the Bay fishery is different from the coastal fishery.

But what I am going to focus on is one of the conditions that are occurring in the Bay right now that completely separates it from the coast. That has to do with the exploitable stock biomass that we have in the Chesapeake Bay.

Anyone who is paying attention to striped bass kind of has in their dreams the spawning stock biomass graph.

Most people focus on the last 10, 12 years. Their focus is on this steady decline of spawning stock biomass over the last decade. Well, given the enormous fourth largest in history of the survey that is conducted the year class strength for that 2011 year class. We are seeing just the exact opposite in the Chesapeake Bay.

We are seeing an enormous group of fish growing into what is exploitable to fishermen. By having that condition in the Bay, the measures that we put in place and the measures that are being reported here, and the fact that our harvest increased from 2012, is not an indication I believe that Maryland or even Virginia in that case, Potomac River fisheries, didn't achieve the goal of what we were intending to do; which was to preserve that year class and to control the harvest of the spawning stock.

If you refer to Table 4 in the meeting materials, you'll see that harvest, and I'll speak specifically about Maryland, harvest in 2012 was 262,000 fish. It went up the next year to 477,000 fish. It increased the next year to 583,000 fish. In 2015 when the reductions were put into place, Maryland harvested 406,000 fish.

My perspective on that is had we not put the management measures in place that we did that we could have drastically overshot. There was a 30 percent reduction in our state, just based on MRIP information from 2014 to 2015. Had we not done anything, the potential for what we could have caught in 2015 would have indicated a 50 percent or greater increase in what the potential was.

Because like I said, we're at this point where the 2011 year class is just now, it is recruiting to the fishery. There was a reduction there, although compared to the baseline it is being reported that there wasn't. The trophy fishery, I won't get into details about that. You know we have access to the spawning stock for a few weeks, six to eight weeks a year.

Our records and our reports and our surveys indicate that we reduced as much as 30 percent from the previous year to 2015; regarding our take of that spawning stock, the female spawning stock, or just let's say spawning stock in this case. I wanted to lay that out there, Mr. Chairman. There was a pretty strong reaction, due to the numbers that were presented.

But I wanted everybody around the table to understand that we are experiencing something quite different from what is being experienced on the coast, and we're doing everything we can to control that harvest and mitigate the consequences of that harvest. I appreciate the time, thank you.

CHAIRMAN GILMORE: Other questions or comments? Rob, I'm looking at you, because I know you wanted to talk; so go ahead.

MR. O'REILLY: All right, my apologies for the second time around. Just to confirm what was said by Mike. I think the only thing we wait for is the Baranov catch equation. We wait to see if the catch was constrained enough. The abundance overall throughout the entire states increased enough that fishing mortality rate dropped. That is what we're really waiting for, and we'll wait for the October meeting.

CHAIRMAN GILMORE: Any other questions? John McMurray.

MR. McMURRAY: Just a quick question for Max. Those 2011s, when do we expect them to become part of the coastal stock, because it seems, and this is totally anecdotal, that we're seeing them now. I mean there is a ton of 20 to 24 inch fish around.

DR. KATIE DREW: I think now definitely is sort of like the beginning of that trickle out into the coast. I think we can go back and look at some of our emigration rates, but admittedly I think that is one of the areas that we definitely could use some more data on; in terms of the sex-specific and age-specific rates of emigration out of the Bay into the coast. I also think we don't have a good handle on whether the size of that year class would affect how soon they migrate. But I think starting now and moving into the future, you would expect to see those guys move out into the coastal fishery.

CHAIRMAN GILMORE: Any other questions? Okay seeing none; we're going to need a motion to accept these. Doug Grout.

MR. DOUGLAS E. GROUT: **Yes, I would like to move that we approve the Striped Bass FMP Review and State Compliance Reports.**

CHAIRMAN GILMORE: Second, Tom Fote. Is there any discussion on the motion? **Is there any objection to the motion; okay, seeing none, we'll consider those accepted and the motion is approved.**

ADVISORY PANEL NOMINATION

CHAIRMAN GILMORE: That moves us to our last item. We have an AP nomination and Tina is going to come up and give us an overview of that.

MS. TINA L. BERGER: Just to be quick, we have a new nomination from Massachusetts for Patrick Paquette to be added to the advisory panel. He would replace Chuck Casella who served on that panel for a very long time, but is no longer on it. Captain Paquette has experience in recreational for-hire and commercial industries. Thank you.

CHAIRMAN GILMORE: Okay, we're going to need a motion for that. Michelle.

DR. MICHELLE DUVAL: **I move that we appoint Patrick Paquette to the Striped Bass Advisory Panel.**

CHAIRMAN GILMORE: Thanks, Michelle and that is seconded by Adam Nowalsky**. Is there any discussion on the motion, any objection to the motion? Seeing** none; we will add Patrick to the advisory panel. Congratulations, Patrick if you're in the room. I thought I saw you before.

ADJOURNMENT

CHAIRMAN GILMORE: Any other business to come before the Striped Bass Board? Seeing none; I'll entertain a motion to adjourn.

CHAIRMAN GILMORE: So moved. We are adjourned, thank you.

(Whereupon, the meeting was adjourned at 2:12 o'clock p.m., August 3, 2016.)

Atlantic States Marine Fisheries Commission
1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

October 5, 2016

To: **Atlantic Striped Bass Management Board**

From: **Atlantic Striped Bass Technical Committee**

RE: **Performance Evaluation of Addendum IV Regulatory Measures in 2015**

In August 2015, following implementation of Addendum IV which required states to implement regulations that will reduce harvest and bring fishing mortality down to the target-level, the Technical Committee estimated 2015 harvest based on the new state regulations (M15-062).

In August 2016, the Atlantic Striped Bass Plan Review Team conducted a preliminary analysis on the performance of Addendum IV regulatory measures by comparing actual harvest in 2015 to the reference period (2013 for the ocean and 2012 for the Chesapeake Bay). Results indicated that the estimated harvest was very close to the observed harvest for commercial fisheries and on a coastwide scale, however, the recreational fisheries in the ocean and in the Chesapeake Bay diverged significantly from the estimated values.

Following review, the Board directed the Technical Committee to investigate the impacts of a number of variables to shed light on the large differences between actual harvest and those estimated for the ocean and Bay recreational fisheries. Enclosed is the Technical Committee report evaluating the performance of Addendum IV regulatory measures in 2015.

Enclosed: Performance Evaluation of Addendum IV Regulatory Measures in 2015
CC: Striped Bass Technical Committee

M16-087

Atlantic Striped Bass Addendum IV Performance Review

Introduction:
The 2013 benchmark stock assessment update for Atlantic striped bass found that while overfishing was not occurring and the stock was not overfished in 2012, fishing mortality (F) was above the F target and spawning stock biomass was below the SSB target. This triggered management action, and Addendum IV to the Atlantic Striped Bass Fishery Management Plan was adopted in October 2014.

The goal of Addendum IV is to bring F back down to the target level in 2016. Addendum IV required a 25% reduction in harvest from 2013 levels for the ocean[1] fisheries and a 20.5% reduction in harvest from 2012 levels for the Chesapeake Bay fisheries. To achieve this for the commercial sector, Amendment 6 quota allocations were reduced by 25% for the ocean fisheries, and the Chesapeake Bay commercial quota was set at 20.5% less than that harvested from the Bay in 2012. For the recreational sector, ocean fisheries implemented a one fish bag limit and a 28" minimum size limit. Chesapeake Bay recreational fisheries implemented a suite of management measures that were projected to achieve the F target. States could implement alternative measures for ocean recreational fisheries through the conservation equivalency process. States were required to implement the above regulations prior to the 2015 fishing season.

The anticipated reduction in harvest from these management changes was calculated by the Atlantic Striped Bass Technical Committee (TC) based on the available recreational harvest pattern data from 2011-2013 from MRIP and state programs (see memo M15-062). As 2015 was the first year under these new regulations, the Plan Review Team (PRT) reviewed the performance of these measures during the annual FMP review process to determine whether the target reductions in harvest had been achieved[2] in each region and sector.

On the coastwide level, the predicted harvest reduction for 2015 was nearly the same as the observed harvest; the estimated and realized reduction in harvest across all regions and fisheries was 25.8% and 25.9%, respectively. The commercial harvest reduction for both the ocean and Bay fisheries was close to the predicted reductions (Table 1). However, the recreational fisheries in the ocean and in the Chesapeake Bay diverged significantly from the predicted values (Table 2 and 3).

The estimated reductions for the recreational fisheries rely on the assumption that effort, angler behavior, and the size composition of fish available to anglers will remain constant. The TC looked at a number of factors to explain the difference between the predicted and realized reductions, including: (1) changes in effort, (2) changes in the proportion of fish released alive vs. retained,

[1] The "ocean" fishery includes harvest from Delaware Bay and other technically non-ocean locations, but the majority of removals are from ocean waters. It is referred to as the ocean fishery as opposed to the "coastal" fishery to distinguish it from the Chesapeake Bay fishery and avoid confusion with coastwide reference points.
[2] MRIP estimates have been updated since the release of the 2016 FMP Review. Based on the new estimates, all ocean recreational fisheries, including New Jersey, achieved the target harvest reduction in 2015 as described above.

and (3) changes in the size and age structure of the recreational catch. In addition, the Board requested an analysis of differences in harvest by mode, wave, and state to look at potential changes in angler behavior and the prosecution of the fishery.

Results:

Changes in Size and Age Structure of the Catch:

Age-4 fish make up a larger proportion of the harvest in both the Chesapeake Bay (Bay) and the ocean fisheries in 2015 than in their respective reference years (Figure 1). The unusually strong 2011 year class was not available to the fishery in 2012 and 2013, the reference years. At age 4 in 2015, they are nearly fully recruited to the Bay fisheries, but only partially recruited to the ocean fisheries as striped bass typically don't begin to migrate out of the Bay until age 3 or older, with older animals migrating farther along the coast.

Similarly, the recreational harvest length-frequency in the Bay showed a shift towards 20-inch fish in 2015 in both total numbers and proportions, away from the 18-19 inch peak in 2012 (Figure 2). Overall numbers of harvested fish were lower for almost all lengths in the ocean recreational length frequency. The proportion of fish in the 22-25 inch range was slightly higher in 2015 than in 2013, possibly reflecting the beginning of the coastal migrations of the 2011 year class.

Changes in Harvest Patterns by Wave and Mode:

Overall, there did not seem to be consistent patterns in the differences in harvest by wave or mode between 2015 and the reference period (Table and Table). Some states saw increases in some waves or modes, and some saw decreases.

Changes in Effort:

Overall, total effort in the Bay and ocean declined with 13% fewer angler-trips taken in 2015 relative to the reference periods (Table 6). Every state in the ocean recreational fishery also saw a decrease in the total number of trips targeting striped bass in 2015 compared to 2013 with the exception of New Jersey which experienced a 2% increase (Table 7). However, for the Chesapeake Bay recreational fishery, both Maryland and Virginia experienced an increase in the total number of trips targeting striped bass by 58% and 28% respectively (Table 7).

The number of trips taken in 2015 compared to the reference years where striped bass was a primary or secondary target, showed no distinct pattern by wave or by mode. Some states experienced an increase in the number of trips in some waves or modes, and some saw decreases (Table 8 and Table 9).

Changes in Proportions of Fish Released Alive:

Every state in both the ocean and Chesapeake Bay recreational fishery experienced an increase in the proportion of striped bass released alive vs. total catch in 2015 compared to the reference year with the exception of Maryland (Table 10). Maryland experienced a small decrease (<1%) in the proportion of released alive vs. total catch in the Chesapeake Bay. Additionally, Maine, Massachusetts, Connecticut, New Jersey and North Carolina in the ocean recreational fishery all experienced a change in the proportion of striped bass released alive vs. total catch of less than 10%. For these states, releases decreased equally in proportion to total catch. For the remaining states, there was a larger change in total catch between the reference year and 2015 compared to fish releases alive.

Discussion:

The focus of this review is to identify the variables contributing to the difference in the 2015 harvest estimates for the ocean and Chesapeake Bay recreational fisheries from those estimated by the TC. Recreational fisheries in the ocean saw a greater reduction than estimated by the TC, while the recreational fisheries in the Bay experienced an increase in harvest relative to the reference period.

As noted throughout the development and implementation of Addendum IV, size and bag limit analyses are limited by the assumption that effort, angler behavior, catch-per-unit-effort, and the size composition and distribution of fish available to anglers will be the same in the future. If those assumptions are violated, the estimated changes in harvest may be different from what is observed once those management options are implemented.

Specifically, changes in effort and changes in the size, age structure, and the distribution of the 2011 year class along the coast relative to the Chesapeake Bay, are thought to be the most significant variables contributing to the large differences in the realized harvest compared to those estimated by the TC. The 2011 year class led to the largest recruitment event since 2004, and was nearly fully available to the Bay recreational fisheries in 2015 (age 4), whereas these fish were only partially available to the ocean recreational fisheries (i.e., due to age at first migration, there was a greater proportion of the 2011 year class in the Bay relative to the ocean in 2015). This, coupled with the length of those fish in 2015 relative to the Bay's and ocean's minimum size limits (Figure 1 and 2), led to increased catch rates of striped bass in the Bay.

Although total effort in the ocean and Bay decreased, the number of trips that targeted striped bass increased in the Bay, which may have also contributed to higher catch rates in that fishery. Differences in harvest in 2015 compared to the reference period by mode and wave by state did occur, but the changes were variable without trend; some states saw increased effort and harvest in particular waves or modes, while other states saw decreases.

The TC notes that the proportion of fish released alive to the total catch increased for about half of the state fisheries which is most likely due to due to the emergence of the 2011 year class in the catch data and the changes in regulations (i.e., bigger size limits, and smaller bag limits). Increased release mortality is always a concern with more restrictive regulations, but given the relatively high survival rate of striped bass, more releases likely still corresponds to lower removals.

Although the Bay recreational fisheries did not meet the target harvest reduction, the TC notes that the goal of Addendum IV was achieved; F in 2015 was estimated to be below the target level. The TC also notes that when considering the increasing trend in recreational harvest in 2012 (the lowest harvest estimate on record) to 2014, harvest in the Bay in 2015 was undoubtedly lower than it would have been had regulations remained status quo.

Table 1: Estimated and realized harvest reductions for striped bass commercial fisheries. Source: Annual state compliance reports.

Ocean (Commercial – Pounds of fish)							
	Amd. 6 2013 Quota	**2013 Harvest**	**Add. IV 2015 Quota**	**2015 harvest**	**Estimated Reduction from 2013 Quota**	**Actual Reduction from 2013 Quota**	**Actual Reduction from 2013 Harvest**
Ocean Total	3,806,275	2,532,870	2,854,706	1,902,363	-25.0%	-50.0%	-24.9%
Chesapeake Bay (Commercial – Pounds of fish)							
		2012 Harvest	**Add. IV 2015 Quota**	**2015 harvest**	**Estimated Reduction from 2012 Harvest**	**Actual Reduction from 2012 Harvest**	
Chesapeake Bay Total		3,924,372	3,120,247	2,940,291	-20.5%	-25.1%	

Table 2: Estimated and realized changes in removals for striped bass recreational fisheries. Removals includes angler harvest (A + B1) plus dead discards (9% of B2). Source: MRIP.

Recreational Fisheries (Numbers of fish)					
Region	**Reference Removals Estimate***	**2015 Removals Estimate**	**2015 Removals**	**Estimated Change in Removals**	**Actual Change in Removals**
Ocean	2,153,773	1,517,063	1,141,556	-29.6%	-47.0%
Chesapeake Bay	538,111	419,726	852,524	-22.1%	+58.4%

* 2013 for Ocean, 2012 for Bay

Table 3: Realized changes in removals for striped bass recreational fisheries. Source: MRIP.

Region	Sector	Reference Level	2015 Removals	Change in Removals
Chesapeake Bay	Recreational Harvest (A+B1)	330,380	500,465	+51%
	Recreational Release Mortality (9% B2)	207,731	352,059	+69%
Ocean	Recreational Harvest (A+B1)	1,618,015	735,438	-55%
	Recreational Release Mortality (9% B2)	535,758	406,118	-24%

Table 4: Changes in removals by state and wave. Increases in harvest relative to the reference year are highlighted. Source: MRIP. Some cases (e.g., charter boat estimates) have been excluded from the table due to insufficient sample sizes.

	Ocean					
	Harvest (Type A+B1)			Release Mortality (9% B2)		
	2013	2015	Difference (2015-2013)	2013	2015	Difference (2015-2013)
Maine						
MARCH/APRIL	0	0	0	0	0	0
MAY/JUNE	5,307	2,884	-2,423	3,939	9,017	5,078
JULY/AUGUST	7,025	1,771	-5,254	12,338	8,902	-3,436
SEPTEMBER/OCTOBER	8,990	65	-8,925	20,548	1,338	-19,210
NOVEMBER/DECEMBER	0	0	0	0	0	0
New Hampshire						
MARCH/APRIL	0	0	0	0	0	0
MAY/JUNE	8,851	456	-8,395	1,943	1,183	-761
JULY/AUGUST	7,178	1,372	-5,806	2,279	3,720	1,441
SEPTEMBER/OCTOBER	196	0	-196	2,691	144	-2,548
NOVEMBER/DECEMBER	0	0	0	0	0	0
Massachusetts						
MARCH/APRIL	0	0	0	0	0	0
MAY/JUNE	135,827	77,849	-57,978	78,429	75,710	-2,719
JULY/AUGUST	138,573	53,820	-84,753	44,921	27,811	-17,110
SEPTEMBER/OCTOBER	24,545	39,102	14,557	28,500	35,628	7,128
NOVEMBER/DECEMBER	0	0	0	342	0	-342
Rhode Island						
MARCH/APRIL	0	0	0	0	0	0
MAY/JUNE	171,973	22,555	-149,418	19,517	35,829	16,312
JULY/AUGUST	24,130	8,358	-15,772	19,789	6,061	-13,729
SEPTEMBER/OCTOBER	14,531	8,944	-5,587	21,650	5,327	-16,322
NOVEMBER/DECEMBER	0	0	0	13,146	211	-12,935
Connecticut						
MARCH/APRIL	0	0	0	5,066	0	-5,066
MAY/JUNE	14,503	18,286	3,783	11,733	35,510	23,777
JULY/AUGUST	60,047	22,579	-37,468	25,473	4,583	-20,890
SEPTEMBER/OCTOBER	51,750	4,050	-47,700	19,719	9,754	-9,965
NOVEMBER/DECEMBER	0	0	0	3,737	1,245	-2,492
New York						
MARCH/APRIL	8,701	0	-8,701	1,130	0	-1,130
MAY/JUNE	215,951	40,640	-175,311	34,097	11,740	-22,357
JULY/AUGUST	186,884	18,483	-168,401	13,070	3,274	-9,796
SEPTEMBER/OCTOBER	75,066	15,931	-59,135	13,839	3,992	-9,847
NOVEMBER/DECEMBER	4,252	11,328	7,076	26,945	17,134	-9,812
New Jersey						
MARCH/APRIL	80,265	25,560	-54,705	9,367	9,122	-245
MAY/JUNE	39,789	55,045	15,256	8,076	2,682	-5,395
JULY/AUGUST	10,345	43,744	33,399	20,916	21,295	379
SEPTEMBER/OCTOBER	21,492	27,347	5,855	13,554	18,170	4,616
NOVEMBER/DECEMBER	151,596	132,561	-19,035	43,135	26,081	-17,054
Delaware						
MARCH/APRIL	1,827	646	-1,181	330	363	33
MAY/JUNE	4,249	306	-3,943	593	1,174	581
JULY/AUGUST	6,694	597	-6,097	1,579	272	-1,307
SEPTEMBER/OCTOBER	314	0	-314	3,119	1,599	-1,520
NOVEMBER/DECEMBER	6,437	1,551	-4,886	1,894	535	-1,360
Maryland						
MARCH/APRIL	0	0	0	0	0	0
MAY/JUNE	1,216	0	-1,216	32	0	-32
JULY/AUGUST	0	0	0	456	501	45
SEPTEMBER/OCTOBER	0	0	0	0	0	0
NOVEMBER/DECEMBER	8,654	1,761	-6,893	0	0	0
Virginia						
MARCH/APRIL	0	0	0	0	0	0
MAY/JUNE	761	0	-761	142	0	-142
JULY/AUGUST	0	0	0	87	0	-87
SEPTEMBER/OCTOBER	0	0	0	82	89	7
NOVEMBER/DECEMBER	0	0	0	0	0	0
North Carolina						
MARCH/APRIL	0	0	0	25	0	-25
MAY/JUNE	0	0	0	71	0	-71
JULY/AUGUST	0	0	0	0	0	0
SEPTEMBER/OCTOBER	0	0	0	0	0	0
NOVEMBER/DECEMBER	0	0	0	0	0	0

	Chesapeake Bay					
	Harvest (A+B1)			Release Mortality (9% B2)		
	2012	2015	Difference (2015-2012)	2012	2015	Difference (2015-2012)
Maryland						
MARCH/APRIL	21,561	12,595	-8,966	18,270	1,476	-16,794
MAY/JUNE	72,516	133,322	60,806	27,580	30,863	3,283
JULY/AUGUST	71,973	97,392	25,419	76,752	47,316	-29,436
SEPTEMBER/OCTOBER	76,342	84,512	8,170	70,799	67,962	-2,838
NOVEMBER/DECEMBER	17,927	76,790	58,863	5,185	132,462	127,277
Virginia						
MARCH/APRIL	0	212	212	0	219	219
MAY/JUNE	1,065	10,340	9,275	1,653	2,674	1,021
JULY/AUGUST	0	1,750	1,750	3,929	5,066	1,137
SEPTEMBER/OCTOBER	3,686	13,340	9,654	768	11,463	10,695
NOVEMBER/DECEMBER	65,310	56,031	-9,279	2,794	49,658	46,864

Table 5: Changes in removals by state and mode. Increases in harvest from the reference year are highlighted. Source: MRIP.

Ocean	Harvest (Type A+B1)			Release Mortality (9% B2)		
	2013	2015	Difference (2015-2013)	2013	2015	Difference (2015-2013)
Maine						
CHARTER BOAT	1,953	355	-1,598	1,113	519	-594
PARTY BOAT	0	0	0	0	0	0
PRIVATE/RENTAL BOAT	11,387	3,739	-7,648	35,355	14,048	-21,307
SHORE	9,934	625	-9,309	1,470	4,689	3,219
New Hampshire						
CHARTER BOAT	1,045	857	-188	477	504	27
PARTY BOAT	132	0	-132	30	0	-30
PRIVATE/RENTAL BOAT	15,742	970	-14,772	5,752	4,160	-1,592
SHORE	350	0	-350	1,132	382	-750
Massachusetts						
CHARTER BOAT	58,491	21,236	-37,255	1,613	3,813	2,200
PARTY BOAT	0	0	0	33	2	-31
PRIVATE/RENTAL BOAT	231,716	97,845	-133,871	129,322	87,696	-41,626
SHORE	8,738	51,688	42,950	21,225	47,637	26,413
Rhode Island						
CHARTER BOAT	6,401	8,954	2,553	279	698	419
PARTY BOAT	0	0	0	0	0	0
PRIVATE/RENTAL BOAT	207,711	29,315	-178,396	25,557	16,971	-8,586
SHORE	2,922	1,587	-1,335	48,545	29,759	-18,786
Connecticut						
CHARTER BOAT	14,057	29,923	15,866	4,044	8,958	4,914
PARTY BOAT	541	393	-148	40	29	-11
PRIVATE/RENTAL BOAT	115,896	44,303	-71,593	56,643	47,571	-9,072
SHORE	9,863	217	-9,646	9,045	3,492	-5,554
New York						
CHARTER BOAT	333,695	67,924	-265,771	28,177	17,168	-11,010
PARTY BOAT	16,156	7,932	-8,224	567	585	18
PRIVATE/RENTAL BOAT	131,649	72,797	-58,852	30,150	27,573	-2,577
SHORE	9,355	5,652	-3,703	30,186	7,981	-22,205
New Jersey						
CHARTER BOAT	97,981	112,927	14,946	1,547	13,647	12,100
PARTY BOAT	6,650	2,667	-3,983	881	296	-585
PRIVATE/RENTAL BOAT	216,619	165,996	-50,623	57,420	58,224	804
SHORE	80,219	2,669	-77,550	36,747	5,181	-31,566
Delaware						
CHARTER BOAT	526	0	-526	23	46	23
PARTY BOAT	0	0	0	0	0	0
PRIVATE/RENTAL BOAT	17,586	3,100	-14,486	4,339	1,502	-2,837
SHORE	1,409	0	-1,409	3,152	2,394	-758
Maryland						
CHARTER BOAT	0	0	0	0	0	0
PARTY BOAT	0	0	0	0	0	0
PRIVATE/RENTAL BOAT	8,654	1,761	-6,893	456	473	17
SHORE	0	0	0	32	28	-4
Virginia						
CHARTER BOAT	0	0	0	0	0	0
PARTY BOAT	0	0	0	0	0	0
PRIVATE/RENTAL BOAT	0	0	0	0	0	0
SHORE	636	0	-636	311	89	-222
North Carolina						
CHARTER BOAT	0	0	0	1	0	-1
PARTY BOAT	0	0	0	0	0	0
PRIVATE/RENTAL BOAT	0	0	0	0	0	0
SHORE	0	0	0	94	0	-94

Chesapeake Bay	Harvest (A+B1)			Release Mortality (9% B2)		
	2012	2015	Difference (2015-2012)	2012	2015	Difference (2015-2012)
Maryland						
CHARTER BOAT	112,212	90,131	-22,081	11,315	13,360	2,044
PARTY BOAT	181	88	-93	709	73	-636
PRIVATE/RENTAL BOAT	134,615	268,454	133,839	140,929	240,386	99,457
SHORE	13,313	45,939	32,626	45,634	26,260	-19,374
Virginia						
CHARTER BOAT	2,360	14,181	11,821	104	2,900	2,796
PARTY BOAT	108	19	-89	0	1	1
PRIVATE/RENTAL BOAT	66,911	75,183	8,272	8,851	63,578	54,727
SHORE	682	6,471	5,789	190	5,502	5,312

Table 6: Percent change in effort by state. Increases in effort from the reference year are highlighted. Effort is defined as all angler trips. Source: MRIP.

Ocean			
Effort (All Angler Trips)			
	2013	2015	% Difference (2015-2013)/(2013)
Maine	596,091	414,195	-31%
New Hampshire	313,275	221,376	-29%
Massachusetts	2,938,627	2,180,865	-26%
Rhode Island	1,229,342	878,586	-29%
Connecticut	1,209,820	1,340,590	11%
New York	3,872,555	3,235,218	-16%
New Jersey	4,364,247	4,287,444	-2%
Delaware	764,697	495,481	-35%
Maryland	134,157	154,742	15%
Virginia	476,476	249,509	-48%
North Carolina	4,967,753	4,645,659	-6%
TOTAL	**20,867,040**	**18,103,665**	**-13%**

Chesapeake Bay			
Effort (All Angler Trips)			
	2012	2015	% Difference (2015-2012)/(2012)
Maryland	2,195,025	2,164,254	-1%
Virginia	2,373,563	1,832,869	-23%
TOTAL	**4,568,588**	**3,997,123**	**-13%**

Table 7: Percent change in directed effort by state. Increases in effort from the reference year are highlighted. Directed effort is defined as trips where striped bass was a primary or secondary target. Source: MRIP.

Ocean			
Effort (Trips Targeting Striped Bass)			
	2013	2015	% Difference (2015-2013)/(2013)
Maine	401,072	273,038	-32%
New Hampshire	137,416	92,617	-33%
Massachusetts	1,693,635	1,211,500	-28%
Rhode Island	624,801	285,635	-54%
Connecticut	547,782	516,750	-6%
New York	1,175,588	690,470	-41%
New Jersey	1,196,706	1,222,484	2%
Delaware	123,131	46,884	-62%
Maryland	21,614	18,185	-16%
Virginia	21,043	14,140	-33%
North Carolina	98,347	46,033	-53%
TOTAL	**6,041,135**	**4,417,736**	**-27%**

Chesapeake Bay			
Effort (Trips Targeting Striped Bass)			
	2012	2015	% Difference (2015-2012)/(2012)
Maryland	535,628	844,826	58%
Virginia	188,712	241,176	28%
TOTAL	**724,340**	**1,086,002**	**50%**

Table 8: Changes in effort by state and wave. Increases in effort from the reference year are highlighted. Effort includes trips where striped bass was a primary or secondary target. Source: MRIP.

Ocean			
Effort (Angler Trips)			
	2013	2015	Difference (2015-2013)
Maine			
MARCH/APRIL	0	0	0
MAY/JUNE	72,817	83,455	10,638
JULY/AUGUST	171,145	146,155	-24,990
SEPTEMBER/OCTOBER	157,111	43,428	-113,683
NOVEMBER/DECEMBER	0	0	0
New Hampshire			
MARCH/APRIL	0	0	0
MAY/JUNE	32,370	20,630	-11,740
JULY/AUGUST	38,258	59,140	20,882
SEPTEMBER/OCTOBER	66,787	12,847	-53,940
NOVEMBER/DECEMBER	0	0	0
Massachusetts			
MARCH/APRIL	8,172	14,545	6,373
MAY/JUNE	582,914	430,961	-151,953
JULY/AUGUST	696,144	458,215	-237,929
SEPTEMBER/OCTOBER	397,296	298,387	-98,909
NOVEMBER/DECEMBER	9,108	9,393	285
Rhode Island			
MARCH/APRIL	161	27,557	27,396
MAY/JUNE	335,692	110,473	-225,219
JULY/AUGUST	124,923	79,216	-45,707
SEPTEMBER/OCTOBER	131,834	64,969	-66,865
NOVEMBER/DECEMBER	32,191	3,421	-28,770
Connecticut			
MARCH/APRIL	9,381	76,247	66,866
MAY/JUNE	159,413	203,437	44,024
JULY/AUGUST	223,324	118,579	-104,745
SEPTEMBER/OCTOBER	124,680	108,215	-16,465
NOVEMBER/DECEMBER	30,984	10,272	-20,712
New York			
MARCH/APRIL	43,805	5,155	-38,650
MAY/JUNE	336,365	254,651	-81,714
JULY/AUGUST	356,875	153,066	-203,809
SEPTEMBER/OCTOBER	319,507	194,070	-125,437
NOVEMBER/DECEMBER	119,036	83,528	-35,508
New Jersey			
MARCH/APRIL	205,141	122,117	-83,024
MAY/JUNE	243,994	291,805	47,811
JULY/AUGUST	58,093	90,726	32,633
SEPTEMBER/OCTOBER	232,960	195,747	-37,213
NOVEMBER/DECEMBER	456,518	522,089	65,571
Delaware			
MARCH/APRIL	8,284	12,296	4,012
MAY/JUNE	27,135	15,895	-11,240
JULY/AUGUST	16,783	5,050	-11,733
SEPTEMBER/OCTOBER	30,874	4,313	-26,561
NOVEMBER/DECEMBER	40,055	9,330	-30,725
Maryland			
MARCH/APRIL	0	0	0
MAY/JUNE	224	0	-224
JULY/AUGUST	1,245	0	-1,245
SEPTEMBER/OCTOBER	9	1,049	1,040
NOVEMBER/DECEMBER	20,136	17,136	-3,000
Virginia			
MARCH/APRIL	0	0	0
MAY/JUNE	3,621	944	-2,677
JULY/AUGUST	939	0	-939
SEPTEMBER/OCTOBER	0	4,218	4,218
NOVEMBER/DECEMBER	16,482	8,978	-7,504
North Carolina			
JANUARY/FEBRUARY	13,770	14,467	697
MARCH/APRIL	21,125	2,735	-18,390
MAY/JUNE	0	708	708
JULY/AUGUST	7,568	590	-6,978
SEPTEMBER/OCTOBER	22,918	4,460	-18,458
NOVEMBER/DECEMBER	32,966	23,073	-9,893

Chesapeake Bay			
Effort (Angler Trips)			
	2012	2015	Difference (2015-2012)
Maryland			
MARCH/APRIL	71,934	55,536	-16,398
MAY/JUNE	144,479	233,684	89,205
JULY/AUGUST	128,003	166,949	38,946
SEPTEMBER/OCTOBER	128,631	156,851	28,220
NOVEMBER/DECEMBER	62,581	231,807	169,226
Virginia			
MARCH/APRIL	4,403	4,476	73
MAY/JUNE	10,817	37,103	26,286
JULY/AUGUST	3,928	2,659	-1,269
SEPTEMBER/OCTOBER	18,716	61,472	42,756
NOVEMBER/DECEMBER	150,849	135,465	-15,384

Table 9: Changes in effort by state and mode. Increases in effort from the reference year are highlighted. Effort includes trips where striped bass was a primary or secondary target. Source: MRIP.

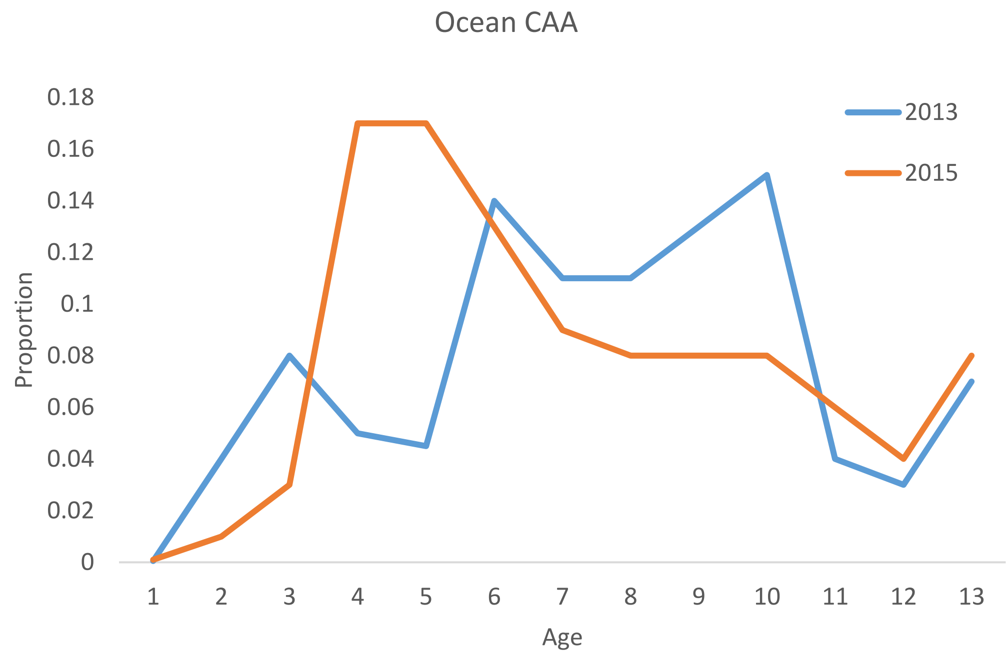
Ocean			
Effort (Angler Trips)			
	2013	2015	Difference (2015-2013)
Maine			
SHORE	165,053	130,557	-34,496
PARTY BOAT	0	0	0
CHARTER BOAT	6,437	6,688	251
PRIVATE/RENTAL BOAT	229,583	135,793	-93,790
New Hampshire			
SHORE	68,722	46,459	-22,263
PARTY BOAT	2,486	10	-2,476
CHARTER BOAT	2,574	2,407	-167
PRIVATE/RENTAL BOAT	63,633	43,741	-19,892
Massachusetts			
SHORE	523,201	549,902	26,701
PARTY BOAT	1,263	424	-839
CHARTER BOAT	73,676	48,111	-25,565
PRIVATE/RENTAL BOAT	1,095,495	613,063	-482,432
Rhode Island			
SHORE	323,065	119,729	-203,336
PARTY BOAT	493	0	-493
CHARTER BOAT	12,614	12,600	-14
PRIVATE/RENTAL BOAT	288,629	153,307	-135,322
Connecticut			
SHORE	107,204	255,597	148,393
PARTY BOAT	8,190	9,240	1,050
CHARTER BOAT	37,784	26,549	-11,235
PRIVATE/RENTAL BOAT	394,604	225,364	-169,240
New York			
SHORE	495,140	220,106	-275,034
PARTY BOAT	44,271	16,840	-27,431
CHARTER BOAT	225,959	151,102	-74,857
PRIVATE/RENTAL BOAT	410,219	302,422	-107,797
New Jersey			
SHORE	747,020	567,845	-179,175
PARTY BOAT	33,918	21,308	-12,610
CHARTER BOAT	41,158	96,471	55,313
PRIVATE/RENTAL BOAT	374,609	536,860	162,251
Delaware			
SHORE	60,326	30,631	-29,695
PARTY BOAT	428	8	-420
CHARTER BOAT	1,133	238	-895
PRIVATE/RENTAL BOAT	61,244	16,007	-45,237
Maryland			
SHORE	648	911	263
PARTY BOAT	9	34	25
CHARTER BOAT	0	0	0
PRIVATE/RENTAL BOAT	20,958	17,239	-3,719
Virginia			
SHORE	20,565	13,018	-7,547
PARTY BOAT	0	0	0
CHARTER BOAT	49		-49
PRIVATE/RENTAL BOAT	429	1,122	693
North Carolina			
MAN-MADE	2,344	8,035	5,691
BEACH/BANK	3,159	116	-3,043
CHARTER BOAT	0	1,271	1,271
PRIVATE/RENTAL BOAT	92,843	36,610	-56,233

Chesapeake Bay			
Effort (Angler Trips)			
	2012	2015	Difference (2015-2012)
Maryland			
SHORE	85,972	110,750	24,778
PARTY BOAT	512	249	-263
CHARTER BOAT	68,417	62,415	-6,002
PRIVATE/RENTAL BOAT	380,728	671,413	290,685
Virginia			
SHORE	15,010	3,841	-11,169
PARTY BOAT	688	213	-475
CHARTER BOAT	2,947	22,503	19,556
PRIVATE/RENTAL BOAT	170,068	214,619	44,551

Table 10: Changes in the percent of striped bass released alive (B2) vs. total catch (A+B1+B2). Source: MRIP.

Ocean			
Percent of total catch released alive			
	2013	**2015**	**Difference (2015-2013)**
Maine	95%	98%	3%
New Hampshire	83%	97%	14%
Massachusetts	85%	90%	5%
Rhode Island	79%	93%	14%
Connecticut	85%	90%	5%
New York	67%	79%	12%
New Jersey	73%	75%	2%
Delaware	81%	93%	12%
Maryland	39%	76%	37%
Virginia	84%	100%	16%
North Carolina	86%	87%	1%

Chesapeake Bay			
Percent of total catch released alive			
	2012	**2015**	**Difference (2015-2012)**
Maryland	89%	88%	-1%
Virginia	59%	89%	30%



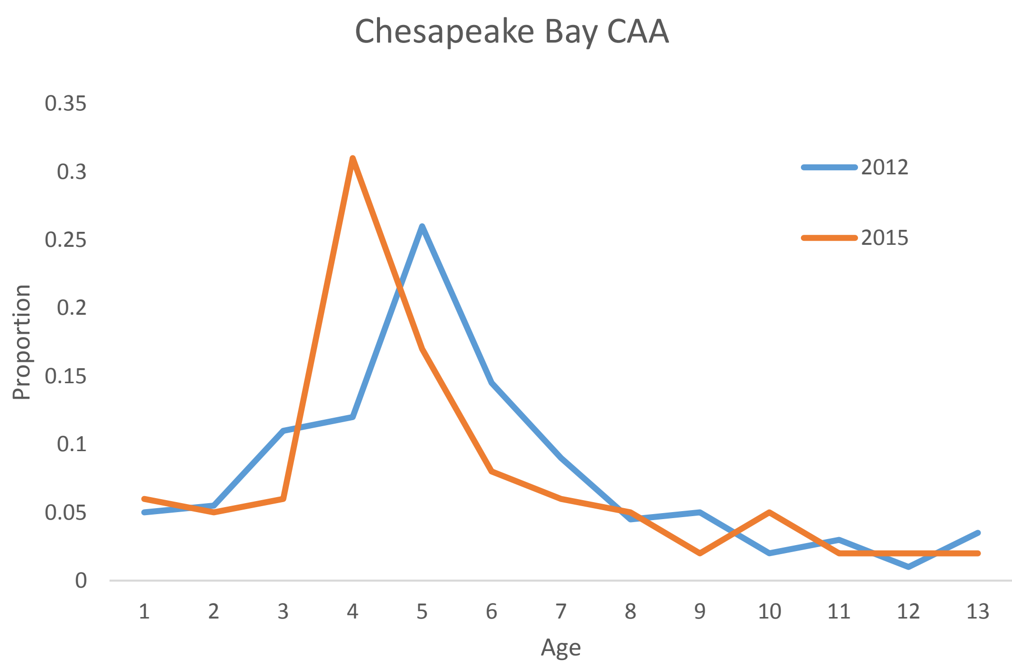


Figure 1: Proportions of catch-at-age by year for the ocean (top) and Bay (bottom) fisheries. Age-4 is the 2011 year class. Source: MRIP.

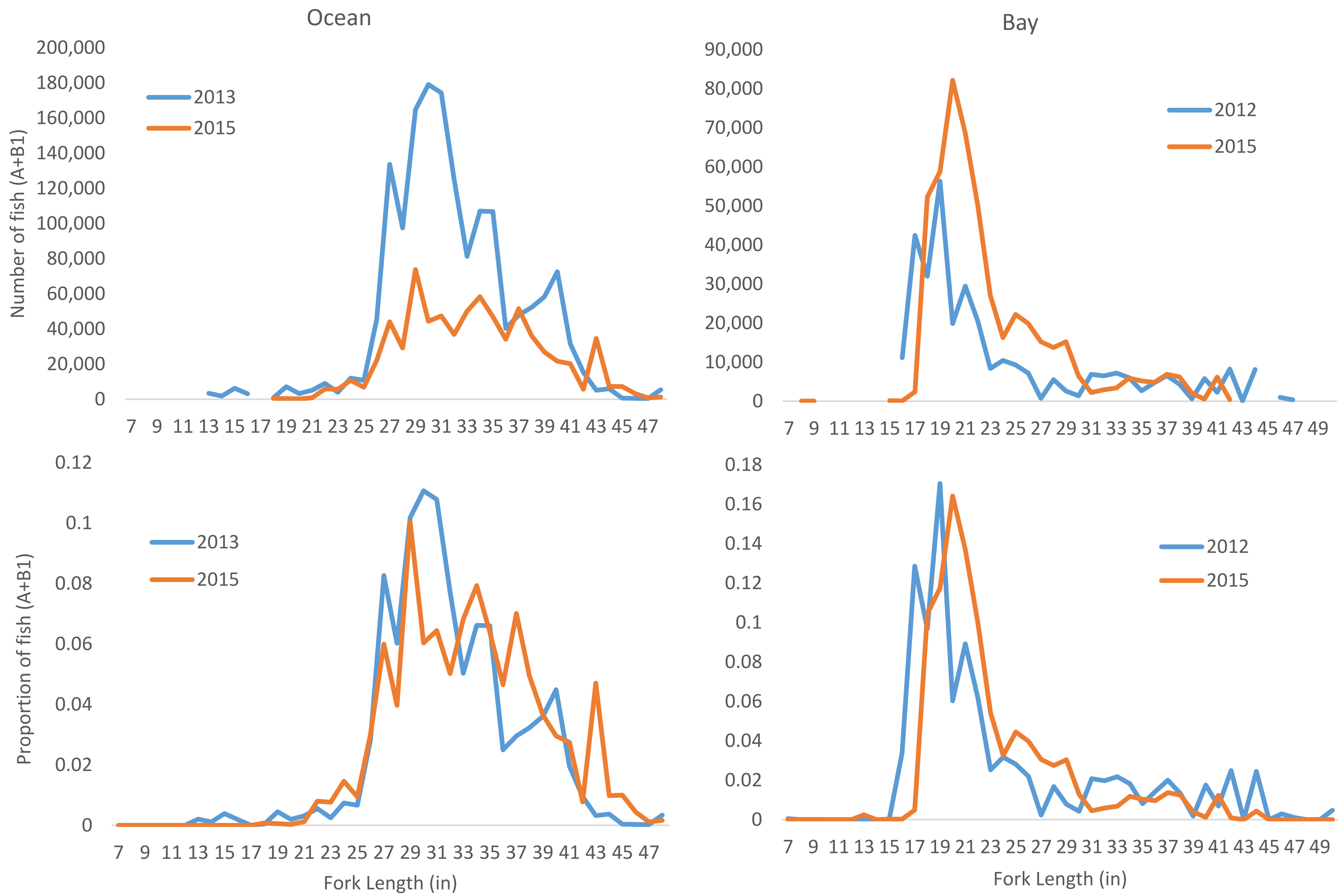


Figure 2: Total numbers and proportions of recreational harvest-at-length for the ocean (left) and Bay (right) fisheries. Source: MRIP.

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

October 5, 2016

To: **Atlantic Striped Bass Management Board**

From: **Atlantic Striped Bass Technical Committee**

RE: **2016 Atlantic Striped Bass Stock Assessment Update**

The 2016 Atlantic Striped Bass Stock Assessment Update utilizes catch and index data from 1982-2015.

In 2015, the Atlantic striped bass stock was not overfished or experiencing overfishing based on the point estimates of fully-recruited fishing mortality (F) and female spawning stock biomass (SSB) relative to the reference points defined in Atlantic Striped Bass Fishery Management Plan. SSB was estimated at 58,853 metric tons (129 million pounds) which is above the SSB threshold of 57,626 metric tons, but below the SSB target of 72,032 metric tons. Total F was estimated at 0.16 which is below the F threshold of 0.22 and below the F target of 0.18.

Commercial removals, i.e., landings plus dead discards, in 2015 were estimated at 917,264 fish. Recreational removals, i.e., angler harvest plus dead releases, in 2015 were estimated at 2,100,094 fish.

Total abundance (age 1+) increased to 195 million fish by 2012 due primarily to the abundant 2011 year-class from the Chesapeake Bay. Total abundance dropped in 2013 as the small 2012 year-class recruited to the population. Abundance increased slightly in 2014 to 127 million fish, and in 2015 total abundance was estimated at 180 million fish. Abundance of age 8+ fish has declined since 2012 and is expected to drop slightly in 2016.

According to the projections model, if a constant catch of 3,017,358 fish, i.e., 2015 total removals, was maintained during 2016-2018, the probability of SSB falling below the threshold is 0.39 in 2016 and declines to 0.20 by 2018. The fully-recruited F is expected to decrease to 0.14 by 2018. The probability of F being above the F target is 0.08 by 2018 and there is little chance (near zero) that F would exceed the F threshold.

Enclosed: 2016 Atlantic Striped Bass Stock Assessment Update

CC: Atlantic Striped Bass Technical Committee
Atlantic Striped Bass Stock Assessment Subcommittee
Atlantic Striped Bass Advisory Panel

M16-088

Atlantic States Marine Fisheries Commission
Atlantic Striped Bass Stock Assessment Update
2016

Prepared by:
Atlantic Striped Bass Technical Committee

Sustainably Managing Atlantic Coastal Fisheries

Update of the Striped Bass Stock Assessment Using Data Through 2015

This document summarizes the striped bass assessment that uses catch and index data from 1982-2015.

Commercial Data Sources

Strict quota monitoring is conducted by states through various state and federal dealer and fishermen reporting systems. Landings are compiled annually from those sources by state biologists. Commercial harvest in some states is recorded in pounds and is converted to number of fish using conversion methods. Biological data (e.g., length, weight, etc.) and age structures (scales) from commercial harvest are collected from a variety of gear types through state-specific port sampling programs. Harvest numbers are apportioned to age classes using length frequencies and age-length keys derived from biological sampling.

Commercial Landings (Weight)

Historically, annual commercial harvest of striped bass peaked at almost 6,804 mt (15 million pounds) in 1973. Landings declined precipitously to 63 mt (140,000 pounds) by 1986. Commercial landings increased from 313 mt (690,039 pounds) in 1990 to 3,332 mt (7.3 million pounds) in 2004 following liberalization of fishery regulations. Since 2005, landings have fluctuated about an average of 3,162 mt (6.97 million pounds); however, landings have declined slightly in recent years (2011-2014) and further declined in 2015 as a result of quota reductions (Figure 1).

Commercial Landings (Numbers)

Commercial harvest of striped bass was over one million fish from 1997 through 2000 and near one million fish through 2006 (Table 1). Since 2007, numbers of fish landed have declined (Table 1). In 2015, only 617,698 fish were harvested and the Chesapeake Bay jurisdictions (Maryland, Virginia, and the Potomac River Fisheries Commission (PRFC)) accounted for 82% of the numbers of striped bass harvested (Table 1).

Commercial Landings Age Composition

The age structure of commercial harvest varies by state due to size regulations and season of the fisheries. The coast-wide time series of commercial-harvest age composition is provided in Table 2. In 2015, the commercial harvest was comprised primarily of ages 3-10 striped bass (Table 2). Harvest in Chesapeake Bay fisheries (Maryland, Virginia, and the PRFC) was comprised mostly of ages 3-8 (Table 3).

Commercial Discards

Discard estimates for fisheries in Chesapeake Bay, the Ocean and Delaware Bay are based on the ratio of tags reported from discarded fish in the commercial fishery to tags reported from discarded fish in the recreational fishery, scaled by total recreational discards. Total commercial discards in 2015 were estimated to be 1.4 million fish.

Total discards are allocated to fishing gears based on the relative number of tags recovered by each gear. Discards by fishing gear were multiplied by gear specific release mortalities and summed to estimate total number of dead discards in a given year. The estimates of dead discards are 299,566 fish for 2015 (Table 4).

Age Composition of Commercial Dead Discards

Commercial discard proportions at age were obtained by applying age distributions from fishery dependent sampling or independent surveys that used comparable gear types. Gear specific proportions at age were applied to discard estimates by gear and the expanded estimates were summed across all gears. Most commercial discards since 2004 were fish of ages 3-7 (Table 4).

Total Removals by Commercial Fisheries

Total commercial striped bass removals (harvest plus dead discards) were 917,264 fish in 2015. Except for 2014, harvest has generally exceeded dead discards since the mid-1990s (Figure 2). Commercial losses in 2015 were dominated by the 2011 year-class (age 4).

Recreational Data Sources

Information on harvest and release numbers, harvest weights, and sizes of harvested bass from 1982-2003 come from the National Marine Fisheries Service's Marine Recreational Fisheries Statistics Survey (MRFSS/MRIP). The MRFSS/MRIP data collection consisted of a stratified intercept survey of anglers at fishing access sites that obtained numbers of fish harvested and released per angler trip, and a telephone survey that derived numbers of angler trips. Estimates of harvest and release numbers are derived on a bi-monthly basis.

In response to a peer review of the MRFSS program (National Resource Council 2006), NMFS established the Marine Recreational Information Program (MRIP) to improve recreational data collection and estimation methodologies. MRIP estimates are now calculated assuming intercepts at a site represent a cluster of samples, and sample sites are weighted by their probability of selection, which is a function of fishing pressure recommended by state advisors. The MRFSS estimation procedure assumed that each intercept was an independent observation and that all sites were equally likely to have been sampled. Re-estimation of catch and harvest from 2004-2010 using the new methodology occurred in 2011 and is the standard used presently. However, the additional site metadata needed to replicate the MRIP estimation method are not currently available prior to 2004; therefore, estimates of catch for 1982–2003 are based on the MRFSS methodology.

Anecdotal evidence had suggested that North Carolina, Virginia, and possibly other states had sizeable wave-1 fisheries beginning in 1996 (wave-1 sampling that began in 2004 in North Carolina waters and large wave-1 tag return data for North Carolina and Virginia supported this contention).

However, MRFSS/MRIP did not sample in January and February (wave-1) prior to 2004; therefore, there was little information for the winter fishery (Jan, Feb) that had developed off of North Carolina and Virginia. Harvest in wave 1 for these fisheries was estimated back to 1996 using observed relationships between landings and tag returns. For North Carolina, the ratio of estimated landings to tag returns in wave-1 of 2004 and annual tag returns in wave-1 were used to estimate annual landings from tag returns in January and February of 1996-2003. For Virginia waters, the 1996-2004 mean ratio of landings and tag returns in wave-6 and annual tag returns in wave-1 were used to estimate landings from tag returns in January and February of 1996-2004. For 2005-2012, MRFSS/MRIP wave-1 estimates of harvest for the winter fishery in Virginia waters were still unavailable; therefore, they were estimated. The approach used to estimate wave-1 harvest in prior years was abandoned because correlation between wave 6 harvest and tag returns off Virginia weakened significantly. In 2012, the regression method of Nelson (NEFSC, 2013) was updated to include the new MRIP NC wave 1 estimates of harvest and 2012 MRIP and tag data, and the wave 1 estimates from 2005-2012 were re-estimated. For 2015, the 2005-2012 regression was used to estimate Virginia wave-1 harvest. Dead releases for the winter recreational fishery in North Carolina and Virginia were not estimated.

Most states use the length frequency distributions of harvested striped bass measured by the MRFSS. The MRFSS measurements are converted from fork length (inches) to total length (inches) using conversion equations. Proportions-at-length are calculated and multiplied by the MRFSS harvest numbers to obtain total number harvested-at-length. Data on sizes of released striped bass come mostly from state-specific sampling or volunteer angling programs. Proportions-at-length are calculated and multiplied by the number of MRFSS/MRIP dead releases to obtain the total number of dead releases-at-length. For those programs that do not collect data on released fish, the lengths of tagged fish released by anglers participating in the American Littoral Society's striped bass tagging program or from state-sponsored tagging programs are used. Details on calculations are given in the 2013 SARC document (NEFSC, 2013).

Many states collect scale samples during state sampling programs designed to collect information on harvest and released striped bass from the recreational fishery. Age-length keys are usually constructed and applied to harvest and dead release numbers-at-length. When sampling of the recreational fishery does not occur, age-length keys are constructed by using data on age-length from commercial sampling, fisheries-independent sampling or striped bass tagging programs. For those states that do not collect scale samples, age-length keys are usually borrowed from neighboring states.

Age composition of the January/February recreational fishery in North Carolina and Virginia was estimated from length-frequency data collected by MRFSS/MRIP and appropriate state age-length keys. Length-frequencies for the North Carolina winter harvest of 2004 came from data in wave-6 of 2003 and wave-1 of 2004. Length-frequencies for the winter harvests of 1996-2003 came from wave-6 of year t-1. Lengths were converted to age for North Carolina with a combined age-length key from New York and North Carolina. Length-frequencies for the Virginia winter harvest in 1996-2012 came from MRFSS/MRIP data in wave-6 of year t-1. The Virginia lengths were converted to age with a Virginia age-length key in 2013, and used the MD coast age distribution was used to apportion wave-1 harvest to age classes in 2014 and 2015 (there was no coastal age data provided by VA).

Recreational Total Landings

Figure 1 traces the impressive growth of the Atlantic coast-wide recreational fisheries from 1982 through 2015. Harvest increased from 1,010 mt (2.2 million pounds) in 1990 to 14,082 mt (31 million pounds) in 2006 (Figure 1). Following the peak in 2006, harvest declined through 2012 to 8,740 mt (19 million pounds), increased in 2013 and 2014, and declined in 2015 due to changes in bag and size limits (Figure 1).

Recreational Landings in Numbers

Recreational harvest of striped bass was greater than 1.4 million fish from 1997 through 2006, and more than 2.4 million striped bass during 2003-2006 (Table 5). Harvest was generally highest in Virginia, Maryland, New Jersey, and Massachusetts (Table 5). Coast-wide harvest of striped bass declined to 1.5 million fish in 2012, increased to an average of 1.97 million fish in 2013-2014, and declined to 1.34 million fish (Table 5).

Age Composition of Recreational Landings

Time series of harvest numbers-at-age are given in Table 6. Coast-wide recreational harvest was dominated by the 2011 (age 4) and 2010 (age 5) year-classes in 2015 (Table 7). Ages 4-10 comprised about 79% of the coast-wide harvest in 2015, and ages 8+ comprised about 41% (Table 6). Recreational harvest from the ocean states (includes Delaware Bay) was comprised mostly (70%) of ages 5-10, while harvest in Chesapeake Bay (MD and VA) was dominated by ages 4-8 (70%) (Table 7).

Recreational Dead Releases

The number of striped bass that are caught and released (B2) is estimated by MRFSS/MRIP (Table 8). The releases have accounted for 85 to 90% of the annual catch in most years (Figure 2). The number of releases that die due to the capture and release process is estimated by multiplying the total release numbers (B2) by an estimate of hooking mortality. The overall 9% hooking mortality rate estimated by Diodati and Richards (1996) was used. Estimates of the number of dead releases are presented in Table 9. The numbers of fish released dead increased from 132 thousand fish in 1990 to 1.4 million fish in 1997. Releases remained around 1.2 million through 2003, but increased to the series maximum of 2.1 million fish in 2006. Releases declined substantially from 2006 through 2012 (Table 9). The number of dead releases increased to 768,599 fish in 2013, declined slightly to 655,429 fish in 2014, and increased to 755,771 fish in 2015. The numbers of fish that die due to the capture/release process are generally highest in Maryland, Massachusetts, New Jersey and New York (Table 9).

Age Composition of Dead Releases

Ages of coast-wide recreational dead releases ranged from 0 to 15+, but most dead releases were ages 1-6 (Table 10). The dead releases were dominated by ages 1-5 in MD and VA and 3-6 in ocean states (Table 10).

Total Removals by Recreational Fisheries

Total recreational striped bass removals (harvest and dead discards) in 2015 were 2.10 million fish (Figure 2). In 2015, the harvest and dead releases combined were dominated by ages 3-7 in Maryland and Virginia and ages 4-10 in ocean states.

Incidental Removals

Some states collect information on the number of striped bass killed for other purposes such as scientific research. These are tabulated by region, age and year in Table 11.

Total Removals

Comparison of the combined losses (commercial, recreational and incidental removals) showed that the recreational fishery removed the largest number of striped bass in 2015 (Figure 3). The recreational fishery has been the dominant source of fishing removals since 1991 (Figure 2). The above components were totaled by year to produce the overall catch at age matrices by region (Table 12). Estimated total removals in the Chesapeake Bay and the Ocean regions declined from 2006 through 2012 (Table 12; Figure 4). The total removals of striped bass in the Chesapeake Bay in 2015 declined by 9.6% compared to 2014 (Table 12; Figure 4). The total removals of striped bass in the Ocean region in 2015 decreased by 20% compared to 2014 (Table 12; Figure 4). Ages 3-7 in 2015 sustained the highest losses in the Chesapeake Bay and ages 4-8 in 2015 sustained the highest losses in the Ocean region.

Catch Weight at Age

Catch mean weight at age data, which is used to calculate total biomass and spawning stock biomass, was calculated for the period 1998-2002 using all available weight data from MA, NY, MD, VA, NH, and CT (1998-2001) and adding data from RI and DE in 2002 (NOAA 46th SAW Striped Bass Assessment Report - Appendix A5). Mean weights at age for the 2003-2014 striped bass catches were determined as a result of the expansion of catch and weight at age. Data came from Maine and New Hampshire recreational harvest and discards; Massachusetts recreational and commercial catch; Rhode Island recreational and commercial catch; Connecticut recreational catch; New York recreational catch and commercial landings; New Jersey recreational catch; and Delaware, Maryland, Virginia, and North Carolina recreational and commercial catch. Weighted mean weights at age were calculated as the sum of weight at age multiplied by the catch at age in numbers, divided by the sum of catch at age in numbers. Details of developing weights at age for 1982 to 1996 can be found in NEFSC Lab Ref. 98-03. Weights at age for 1982-2014 are presented in Table 13.

Indices of Relative Abundance

States provide age-specific and aggregate indices from fisheries-dependent and fisheries-independent sources that are assumed to reflect trends in striped bass relative abundance. Descriptions of the current survey indices are given below. A summary of index information is provided in Table 14.

Fishery-Independent Surveys

Connecticut Trawl Survey (CTTRL)

Connecticut provides an aggregate (ages 4-6) index of relative abundance from a bottom trawl survey. The Connecticut DEEP Marine Fisheries Division has conducted a fisheries–independent Trawl Survey in Long Island Sound since 1984. The Long Island Sound Trawl Survey (LISTS) provides fishery independent monitoring of important recreational species, as well as annual total counts and biomass for all finfish taken in the Survey. All finfish species are measured on all tows. The Long Island Sound Trawl Survey encompasses an area from New London, Connecticut (longitude 72° 03') to Greenwich, Connecticut (longitude 73° 39'). The sampling area includes Connecticut and New York state waters from 5 to 46 meters in depth and is conducted over mud, sand and transitional (mud/sand) sediment types. Long Island Sound is surveyed in the spring (April-June) and fall (September-October) periods with 40 sites sampled monthly for a total of 200 sites annually.

The sampling gear employed is a 14 m otter trawl with a 51 mm codend. To reduce the bias associated with day-night changes in catchability of some species, sampling is conducted during daylight hours only). The Long Island Sound Trawl Survey employs a stratified-random sampling design. The sampling area is divided into 1.85 x 3.7 km (1 x 2 nautical miles) sites, with each site assigned to one of 12 strata defined by depth interval (0 - 9.0 m, 9.1 - 18.2 m, 18.3 - 27.3 m or, 27.4+ m) and substrate type (i.e., mud, sand, or transitional). For each monthly sampling cruise, sites are selected randomly from within each stratum. The number of sites sampled in each stratum was determined by dividing the total stratum area by 68 km^2 (20 square nautical miles), with a minimum of two sites sampled per stratum. Discrete stratum areas smaller than a sample site are not sampled. The CTTRL index is computed as the stratified geometric mean number per tow.

New York Ocean Haul Seine Survey

New York provided age-specific geometric mean indices of relative abundance for striped bass generated from an ocean haul seine survey from 1987 - 2006. Since 1987, NY DEC sampled the mixed coastal stocks of striped bass by ocean haul seine. Sampling was conducted annually during the fall migration on the Atlantic Ocean facing beaches off the east end of Long Island. A crew of commercial haul seine fishermen was contracted to set and retrieve the gear, and assist department biologists in handling the catch. The survey seine measured approximately 1,800 feet long and was composed of two wings attached to a centrally located bunt and cod end. The area swept was approximately ten acres. The seine was fifteen feet deep in the wings and twenty feet deep in the bunt.

Under the original design, sampling dates were selected at random to create a schedule of thirty dates. For each date selected, two of ten fixed stations were chosen at random, without replacement, as the sampling locations for that day. Since this design was difficult to implement due to weather-related delays, the sampling design was altered in 1990. Instead of randomly selecting thirty days, sixty consecutive working days were identified during the fall. One station was randomly selected, without replacement, for each working day until six "rounds" of ten hauls had been scheduled. Hauls that were missed due to bad weather or equipment failure were added to the next scheduled sampling day. No more than three hauls were attempted for any given day so that sampling was evenly distributed over time. Sixty hauls were scheduled for each year.

Since 1995, the survey team was prohibited from gaining access to several of the fixed stations. Instead of the original ten stations, two of the original stations plus three alternate sites were used to complete the annual survey. These alternate stations occur within the geographic range of the original standard stations. Also since 1995, funding delays resulted in a one-month delay in the commencement of field sampling activities. Between 1987 and 1994 field sampling began in early September. Since 1995, sampling began in late September to early October. In addition, decreases in funding have led to reductions in annual sampling effort from sixty seine hauls to forty-five seine hauls per season since 1997. The time series of catch and catch-at-age has been standardized by date for the entire time series.

This survey (see below) ended in 2007 due to state changes in contract relationships with private fishermen. The index remains in the assessment because it provides abundance trends for 1987-2006.

NEFSC Trawl Survey

The original vessel for this survey was replaced in 2009 with a larger vessel that cannot sample the inshore strata where most striped bass were caught. The index is still used in the assessment because it provides abundance trends for 1991-2008. The Northeast Fisheries Science Center provided an aggregate (2-9) index of relative abundance from the spring stratified-random bottom trawl survey. The survey covers waters from the Gulf of Maine to Cape Hatteras, NC. Only data from inshore strata from 1991-2008 are used.

New Jersey Bottom Trawl Survey (NJTRL)

New Jersey provides age-specific (2-9+) geometric mean indices of relative abundance for striped bass from a stratified-random bottom trawl initiated in 1989. The survey area consists of NJ coastal waters from Ambrose Channel, or the entrance to New York harbor, south to Cape Henlopen Channel, or the entrance to Delaware Bay, and from about the 3 fathom isobath inshore to approximately the 15 fathom isobath offshore. This area is divided into 15 sampling strata. Latitudinal boundaries are identical to those which define the sampling strata of the National Marine Fisheries Service (NMFS) Northwest Atlantic groundfish survey. Exceptions are those strata at the extreme northern and southern ends of NJ. Where NMFS strata are extended into NY or DE waters, truncated boundaries were drawn which included only waters adjacent to NJ, except for the ocean waters off the mouth of Delaware Bay, which are also included. Samples are collected with a three-in-one trawl, so named because all the tapers are three to one. The net is a two seam trawl with forward netting of 12 cm (4.7 inches) stretch mesh and rear netting of 8 cm (3.1 inches) stretch mesh. The codend is 7.6 cm stretch mesh (3.0 inches) and is lined with a 6.4 mm (0.25 inch) bar mesh liner. The headrope is 25 m (82 feet) long and the footrope is 30.5 m (100 feet) long. Trawl samples are collected by towing the net for 20 minutes. The total weight of each species is measured with hanging metric scales and the length of all individuals comprising each species caught, or a representative sample by weight for large catches, is measured to the nearest cm fork length and only data from April are used for striped bass.

Maryland Spawning Stock Survey (MDSSN)

Maryland provides spawning stock age-specific (2-13+) mean indices of relative abundance for striped bass in Chesapeake Bay from a gillnet survey initiated in 1985. Multi-panel experimental drift gill nets are deployed in spawning areas in the Potomac River and in the Upper Chesapeake Bay during the spring spawning season in April and May. There are generally 20-25 sampling days in a season. Ten mesh panels 150 feet long that range from 8 to 11.5 feet deep are used. The panels are constructed of multifilament nylon webbing in 3.00- to 10.00-inch stretch-mesh. In the Upper Bay, the entire suite of 10 meshes is fished simultaneously. In the Potomac River, two suites of 5 panels are fished simultaneously. Overall, soak times for each mesh panel range from 15 to 65 minutes. In both systems, all 10 meshes are fished twice daily (20 sets) unless weather or other circumstances prohibit a second soak. Sampling locations are assigned using a stratified random survey design. Each sampled spawning area is considered a stratum. One randomly chosen site per day is fished in each spawning area. The Potomac River sampling area consists of 40 0.5-square-mile quadrants and the Upper Bay sampling area consists of 31 1-square-mile quadrants. The Choptank River was also sampled from 1985-1996. A sub-sample of striped bass captured in the nets is aged. Scales are removed from two- three randomly chosen male striped bass per one cm length group, per week, for a maximum of ten scales per length group over the entire season. Scales are taken from all males over 700 mm TL and all females regardless of total length.

CPUEs for individual mesh sizes and length groups are calculated for each spawning area. Mesh-specific CPUEs ($CPUE_{i,j}$) are calculated by summing the catch in each length group across days and sets, and dividing the result by the total effort for each mesh. Sex-specific mesh selectivity coefficients are then used to correct the mesh-specific length group CPUE estimates. Sex-specific models are used to develop selectivity coefficients for fish sampled from the Potomac River and Upper Bay. Model building and hypothesis testing has determined that male and female striped bass possess unique selectivity characteristics, but no differences are evident between the Upper Bay and the Potomac River. Therefore, sex-specific selectivity coefficients for each mesh and length group are estimated by fitting a skew-normal model to spring data from 1990 to 2000 following the procedure presented in Helser and others. (1998). Model residuals are re-sampled 1,000 times to generate a population of 1,000 mesh- and size-class specific selectivity coefficients for each year, sample area, and sex. The CPUE for each size class and mesh is then divided by the appropriate selectivity coefficient to generate 1,000 replicate matrices of mesh- and length-specific corrected catch frequencies. A vector of selectivity-corrected length-group CPUEs for each spawning area and sex is then developed. The selectivity-corrected CPUEs are averaged across meshes, using a mean that is weighted by the capture efficiency of the mesh. Finally, area- and sex-specific estimates of relative abundance are pooled to develop Bay-wide estimates of relative abundance.

Delaware Spawning Stock Electrofishing Survey (DESSN)

Delaware provides spawning stock age-specific (2-13+) mean indices of relative abundance for striped bass in the Delaware River from an electrofishing survey initiated in 1996. Striped bass are sampled in the Delaware River from the vicinity of Big Timber Creek and League Island near river kilometer 152 located between Central Philadelphia downstream to the Delaware Memorial Bridge below Wilmington, DE at river kilometer 110. A stratified-random sampling design is used and a Smith-Root model 18-E boat electrofisher is used to collect striped bass. Typically, sampling is conducted with the boat moving in the direction of the tidal flow and in a zigzag pattern. Only striped bass approximately >200 mm total length are collected. Sampling is conducted weekly during mid-April to May (two days per week) and seven 12-minute timed samples are made per day. Length, weight, and sex are recorded and scales are collected from each fish. Due to staffing problems, the DE SSN was not completed in 2014.

New York Young-of-the-Year and Yearling Survey (NYYOY and NY Age 1)

In 2014, New York proposed a change in the young-of-year striped bass sampling program for the Hudson River. Objectives were to 1) adopt a more efficient sampling design for the juvenile striped bass survey without compromising the integrity of the index, and 2) determine the time-period for the index that best measures the abundance of juvenile striped bass. In the original program, from 1979-2013, approximately 25 stations were sampled every other week beginning in August and continued through the remaining summer/fall months. Sites were selected from a suite of 36 fixed stations located in the brackish water portion of the Hudson River: Tappan Zee to Haverstraw Bay (rkm 35 – 63). Sampling occurred over two to three days. A minimum of a four person sampling crew was needed to perform the survey each sampling day due to gear constraints and the large amount of data recorded at each site.

The gear is a 71 m x 3 m beach seine with 0.64 mm mesh. Sampling occurs during the day. Fish captured by seine are sorted by species and life stage, counted, and returned to the river. Lengths of striped bass and selected other species are obtained from a subset of the catch. The gear and fish processing procedure has not changed.

The “old” index was based on a six week time-period dating back to the beginning of the survey in 1979, where sampling was conducted from late August through November. However, an in-river, July through November off-shore trawl survey conducted in the same reach, indicated that young-of-year striped bass were present in this nursery area well before the late August start date of the seine program. Subsequently in 1985, three additional weeks of sampling were added to the seine program, moving back the start of sampling to mid-July to create the “nine-week index”. For all years, both the “6-week” (beginning in 1979) and “9-week” (beginning in 1985) relative abundance indices were calculated as geometric means of catch per haul. Only those hauls that resulted in a representative sample, i.e. no major loss due to obstructions or gear problems (tears, hangs, etc.) were included in the calculation. Both series were reported to ASMFC; however, the “6-week” was used as the primary Hudson index.

In the revised sampling program, in 2014, NY sought a more efficient sample design given staffing constraints and the desire to remove redundancies in effort. NY examined the existing 35 year time series, 1979 to 2013, to eliminate sites that compromised the safety of the crew or equipment, sampled redundant adjacent habitats, or presented other recurring sampling issues. This analysis whittled sampling sites down from 25 to 13. The “revised” index incorporates the “9-week” index (mid July through November) seasonal component, retains the broad geographical reach of the nursery area, and does not compromise the integrity of the abundance index as it correlates well with the original indices:

- 6-week 13 site subset (6-week13ss) vs original 6-week: $R = 0.979$, $R^2 = 0.956$, $p < 0.0001$
- 9-week 13 site subset (9-week13ss) vs original 9-week: $R = 0.984$, $R^2 = 0.968$, $p < 0.0001$

In addition to running this correlation to the original index, New York also revisited the validation procedure for the revised index. NY compared the nine week, 13 site subset survey with the Western Long Island Age 1 survey and to the Hudson Age 6-8 gill net (former shad fishery bycatch) index. The correlations met the significance level required by ASMFC for both surveys. The ASFMC Management Board accepted the revision of the index as recommended by the Technical Committee in May 2014.

During the 2014 field season, the sampling design had to be slightly altered due to the presence of a large, immovable hang in one of the 13 selected sites. An adjacent alternate site with similar habitat characteristics was selected as a replacement; recalculation of the index using the substituted site resulted in a slight change to the annual index values. This final revised index still met the validation significance level required by ASMFC. The geometric mean is used as the relative index.

New York also provides an index of relative abundance for yearling striped bass in western Long Island. The beach seine (61-m) survey samples fixed stations during May-October. The geometric mean is used as the relative index.

New Jersey Young-of-the-Year Survey (NJYOY)

New Jersey provides an index of relative abundance for young-of-the year striped bass in the Delaware River for years 1980 to present. A bagged beach seine is used at fixed and random stations, which are sampled biweekly from August-October. About 256 hauls are made each year. Relative abundance index for striped bass is calculated as the mean geometric number of young-of-the-year captured per seine haul.

Virginia Young-of-the-Year Survey (VAYOY)

Virginia provides an index of relative abundance for young-of-the-year bass in the Virginia portion of Chesapeake Bay. Starting in 1980, the fixed station survey is conducted in the James, York, and Rappahannock river systems. Eighteen index stations are sampled five times a year on a biweekly basis from mid-July through September. Twenty auxiliary stations provide geographically expanded coverage during years of unusual precipitation or drought when the normal index stations do not yield samples. A bagged beach seine (30.5 m long) is set by hand with one end fixed on the beach and the other fully extended perpendicular to the beach. The seine is swept with the current. Two hauls are made at each site. Abundance indices are computed as the geometric mean number of young-of-the-year or yearling bass per haul.

Maryland Young-of-the-Year and Yearlings Surveys (MDYOY and MD Age1)

Maryland provides an index of relative abundance for young-of-the-year and yearling striped bass in the Maryland portion of Chesapeake Bay. Begun in 1954, the fixed station survey is conducted in the Upper Bay, Choptank, Nanticoke, and Potomac Rivers. Each station is sampled once during each monthly round performed during July, August, and September. A bagless beach seine (30.5 m long) is set by hand with one end fixed on the beach and the other fully extended perpendicular to the beach. The seine is swept with the current. Two hauls are made at each site. Abundance indices are computed as the geometric mean number of young-of-the-year or yearling bass per haul.

Fisheries-Dependent Indices

Total Catch Rate Index

An aggregate index of relative abundance for 1988 to present is generated from MRFSS/MRIP intercept data. Generalized linear modeling (GLM; McCullagh and Nelder, 1989) is used to derive annual mean catch-per-hour estimates by adjusting the number of caught fish per trip for the classification variables of state, year, two-month sampling wave, number of days fished in the past 12 months (as a measure of avidity), and number of hours fished. In the analyses, only data from anglers who reported that they targeted striped bass is used to insure methods used among anglers are as consistent as possible and to identify those targeting anglers that did not catch striped bass (zero catches). Also, only data from private boats fishing in the Ocean during waves 3-5 are used.

A delta-lognormal model (Lo *et al.* 1992) was selected as the best approach to estimate year effects after examination of model dispersion (Terceiro, 2003) and standardized residual deviance versus linear predictor plots (McCullagh and Nelder, 1989). In the delta-lognormal model, catch data is decomposed into catch success/failure and positive catch per trip ($y > 0$) components. Each component is analyzed separately using appropriate statistical techniques and then the statistical models are recombined to obtain estimates of the variable of interest. The catch success/failure was modeled as a binary response to the categorical variables using multiple logistic regression. The *glm* function in R is used to estimate parameters, and goodness-of-fit was assessed using concordance measures and the Hosmer-Lemeshow test. Positive catches, transformed using the natural logarithm, is modeled assuming a normal error distribution using function *glm* in R. Any variable not significant at α=0.05 with type-III (partial) sum of squares is dropped from the initial

GLM model and the analysis is repeated. First-order interactions were considered in the initial analyses but it was not always possible to generate annual means by the least-square methods with some interactions included (Searle and others 1980); therefore, only main effects are considered. The annual index of striped bass total catch rate is estimated by multiplying together the prediction of the probability of obtaining a positive catch and the least-squares mean estimate of the positive catch from the models.

Virginia Pound Net (VAPNET)

Since 1991, the Virginia Institute of Marine Science has conducted the Virginia pound net survey. The pound net survey takes place on the striped bass spawning grounds in the Rappahannock River between river miles 44-47. VIMS has the option of sampling up to four commercial nets. The upper and lower nets are used for this survey and the middle nets are used for tagging. VIMS alternates sampling between the upper and lower nets. The sampling occurs from March 30 to May 3, when the females are on the spawning ground. The pound nets are checked twice a week, but are fishing constantly. When the samples are collected, the fish are sexed and measured, scales are taken from every fish, and a subsample of fish have otoliths removed.

Comparison of Fisheries-Independent and Fisheries-Dependent Indices

Time series of each index used in the current assessment are shown in Table 15 and 16. The fishery-independent indices for combined ages generally indicated an increase in population abundance from the early 1990s through the mid-1990s, and relatively stable levels through 2007 (Figure 5). The New Jersey and Connecticut trawl indices showed declines through 2011, increases in 2012 and 2013, and declines thereafter (Figure 5) The Maryland gillnet survey showed a relatively stable spawning stock biomass population since the mid-1980s. The Delaware electrofishing index exhibited a slight decline in spawning stock through 2009, an increase through 2011 and a variable decline through 2015 (Figure 5).

The coast-wide MRFSS/MRIP index indicated that abundance declined from 1998 to 2003, rose steadily through 2006, declined through 2011, increased through 2013, declined slightly in 2014 and rose in 2015 (Figure 5). The VA pound net index showed variable but level trends prior to 1999, an increase in 1999 and 2000, a decline through 2002, an increase through 2004, and then a variable but level trend through 2010. A decline occurred in 2011 and the index has remained at about the same level during 2012-2014, but declined in 2015.

Young-of-the-year and age-1 indices in Chesapeake Bay were variable but declines were observed during 2004-2010 and in some years close to low values that had not been observed since 1990 (Figure 6). In Delaware River, recruitment of YOY increased from 2007 through 2009, declined slightly during 2010-2011, increased in 2013 and 2014 and decline slightly in 2015. Recruitment in the Hudson River declined from 2007-2013, but has since increased (Figure 6). Strong year-classes were evident in 1993, 1996, 2001, 2003, 2011 and 2015 in Chesapeake Bay (Maryland and Virginia), and in 1993, 1995, 1999, 2003, 2009 and 2014 in Delaware River, in 1997, 1999, 2001, 2003, 2010 and 2014 in Hudson River (Figure 6).

Age composition data for the age-specific indices are given in Table 17.

Model Description

See the 2013 SARC document for complete description of the striped bass statistical catch-at-age model. A summary of the model structure used in this assessment is listed in Table 18.

Data Inputs

Plus Group

As in the 2013 benchmark, an age 13+ plus-group was used for catch and indices data as an attempt to address the increase in scale-ageing bias after ages 12 or so.

Removals Data

Total removals (recreational and commercial harvest numbers plus number of discards that die due to handling and release and incidental removals) and the proportions of catch-at-age of striped bass fisheries are the primary data used in the model. The removals data were partitioned into three “fleets” in an attempt to account for more realistic patterns in fishing selectivity known to have occurred as management measures changed over time. All selectivity time blocks corresponded to Amendment changes. Removals data were split into *Chesapeake Bay*, *Ocean* and the *Commercial Dead Discards*. The latter was a separate fleet because commercial discards were from a multitude of gears that do not necessarily target striped bass and the mixed gear types may have a unique selectivity over time. In addition, the data prior to 1996 could not be separated into regions. The Chesapeake Bay fleet includes commercial and recreational harvest and recreational dead discards taken in the Bay by MD, VA, and the PRFC. The Ocean fleet includes commercial and recreational harvest and recreational dead discards taken in the ocean by ME, NH, MA, RI, CT, NY, NJ, DE (Delaware Bay and ocean), MD, VA and NC.

Young-of-the-Year and Age 1 Indices

All indices used in the benchmark assessment were used in the update. Each index was linked to a particular age (Table 19). Young-of-the-year indices were lagged one year ahead and linked to age 1.

Starting Values

Initial starting values for all parameters are given in Table 20. Based on the coast-wide age samples, the starting effective sample sizes for the age proportions in each fleet were set at 50.
The effective sample sizes from the 2015 assessment used as starting values in the current assessment.

Sex Proportions-at-age

Female sex proportions-at-age are used to apportion the numbers-at-age to female numbers-at-age for calculation of female spawning stock biomass. The sex proportions were derived from available state catch datasets. The proportions used were:

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+
Prop	0.53	0.56	0.56	0.52	0.57	0.65	0.73	0.81	0.88	0.92	0.95	0.97	1.00

Female Maturity

The proportions mature-at-age for females were derived from literature values and field samples.

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+
Prop	0.0	0.0	0.0	0.04	0.13	0.45	0.89	0.94	1.00	1.00	1.00	1.00	1.00

Natural Mortality

The age-specific M estimates used in the updated base model are:

Age	1	2	3	4	5	6	≥7
M	1.13	0.68	0.45	0.33	0.25	0.19	0.15

Model Specification

Model parameters were solved in phases. The parameters solved in each phase were:

1 Yr 1, Age 1 N or Avg N (log)
2 recruitment deviations and fishing mortality
3 stock-recruitment parameters
4 catch selectivity parameters
5 survey selectivity parameters
6 catchability coefficients of survey indices

Catch Selectivity Functions

The same four time blocks for catch selectivity estimations used in the 2013 benchmark were used in this update except 2015 was added to the last time block. The periods are listed in Table 18.

Stock-Recruitment Curve

Based on literature reviews and committee opinion, the Beverton-Holt equation was selected as the appropriate stock recruitment relationship for striped bass.

Data Weighting

Data weighting was accomplished by first running the model with all initial starting values, lambda weights = 1, and index CV weights = 1. The lambda weights for the total removal data were increased to 2 for the Bay, Ocean, and Commercial Discards to force the model to better fit the data in these early years (1982-1984). Based on recommendations by the SARC panel, the initial effective sample sizes were first adjusted once by using the Francis (Francis 2011) multipliers and the model was re-run. After the model was re-run, the index CV weights were adjusted to obtain index RMSE values close to 1.0. The estimated RMSE values were used as the CV weights and this allowed the resulting RMSE values to be near 1.0. The model was re-run to make small adjustments in the RMSE values. Since the MRFSS and MDSSN indices have considerable influence on the model results, the CV weights for these indices were then adjusted until the RMSE values were nearly identical to balance the influence of each index.

Results

Resulting RMSE for fleet catch and survey indices and effective sample sizes for age compositions are given in Table 21. Resulting contributions to total likelihood are listed in Table 22. The converged total likelihood was 11006.9. Estimates of fully-recruited fishing mortality for each fleet, total fishing mortality, recruitment, parameters of the selectivity functions for the selectivity periods, catchability coefficients for all surveys, and parameters of the survey selectivity functions are given in Table 23 and are shown graphically in Figures 7-9. Graphs depicting the observed and predicted values and residuals for the catch age composition, survey indices, and survey compositions are given in Appendix A. The model fit the observed total catches (Figure 7) and catch age compositions of all fleets well, except for ages 1 and 13+ for the Ocean and Commercial Discard fleets (Appendix A), and the YOY, age 1, CTTRL, and NEFSC indices reasonably well (Appendix A). The predicted trends matched the observed trends in age composition survey indices (except MDSSN and NYOHS), and predicted the survey age composition reasonably well (MDSSN) to poorly (NJ Trawl) (Appendix A).

Estimates of the catch selectivity patterns for each fleet showed that, although the patterns varied over time with changes in regulation, selectivity was dome-shaped for Chesapeake Bay and Commercial Discard fleets and primarily flat-topped for the Ocean over time (Figure 8).

Fishing Mortality

Partial fully-recruited fishing mortality in 2015 for the Bay, Ocean and Commercial Discard fleets was 0.058, 0.118, and 0.013, respectively (total fully-recruited F_{2015} =0.156) (Table 23; Figure 9). The maximum total F-at-age in 2015 was 0.156 at age 11 (Table 24). Fishing mortality-at-age in 2015 for the three fleets is shown in Figure 10. Fishing mortality-at-age peaked at age 5 in the Chesapeake Bay, age 13+ in the Ocean fleet and at age 5 in the Commercial Discards fleets (Table 24).

Population Abundance (January 1)

Striped bass abundance (1+) increased steadily from 1982 through 1997 when it peaked around 249 million fish (Table 25; Figure 11). Total abundance fluctuated without trend through 2004. From

2005-2009, age 1+ abundance declined to about 131 million fish. Total abundance increased to 192 million fish by 2012 (Figure 11). The increase in 2012 was due primarily to the abundant 2011 year class from Chesapeake Bay (Table 25). Total abundance dropped in 2013 as the very small 2012 year-class from Chesapeake Bay recruited to the population (Figure 11). Abundance increased slightly in 2014 to 127 million fish and increased to 180 million fish in 2015. Abundance of striped bass age 8+ increased steadily through 2004 to 11.3 million fish, but declined to 7.6 million fish through 2010 (Table 25; Figure 11). A small increase in 8+ abundance occurred in 2011 as the 2003 year class became age 8 (Figure 11). Abundance of age 8+ fish has declined since 2012 (Figure 11) and is expected to drop slightly in 2016. The model estimated age-1 abundance in 2015 (the 2014 year-class) to be large and it appears to be the largest year-class since 2003 (however recruitment estimates in the terminal year of the model tend to be highly uncertain).

Spawning Stock Biomass and Total Biomass

Weights-at-age used to calculate female spawning stock biomass (SSB) were generated from catch weights-at-age and the Rivard algorithm described in the NEFSC's VPA/ADAPT program. Female SSB grew steadily from 1982 through 2003 when it peaked at about 77 thousand metric tons (Table 26, Figure 12A). Female SSB has since declined and was estimated at 58,853 metric tons (95% CI: 44,755-72,952) in 2015 (Table 26; Figure 12A). The estimate of SSB in 2015 remained above the threshold level of 57,626 thousand metric tons and indicates that striped bass were not overfished. However, given the error associated with the 2015 values, there is a probability of 0.41 that the female spawning stock biomass in 2015 was below the threshold. The spawning stock numbers (Figure 12B) declined more rapidly than the spawning stock biomass.

Exploitable biomass (January 1) increased from 1,399 metric tons in 1982 to its peak at 27 thousand metric tons in 2006 (Figure 12C). Exploitable biomass has since declined to 13,171 metric tons in 2015 (Figure 12C).

Retrospective Analysis

Retrospective analysis plots and percent difference plots between the 2015 and peels of the retrospective analysis are shown in Figure 13. Small retrospective bias was evident in the more recent estimates of fully-recruited total F, SSB, and age 8+ abundance of SCA (Figure 13). The general retrospective pattern suggests that fishing mortality is likely slightly over-estimated (between 2 and 13% since 2007) and could decrease with the addition of future years of data, while female spawning biomass appears under-estimated and could increase with the addition of future years of data. Similar retrospective trends have been observed in the previous assessments of striped bass using the ADAPT VPA (ASMFC 2005), the 2007 benchmark, 2013 benchmark and 2015 assessment.

Comparison of Results from the 2016 Updated Assessment with 2015 Assessment

Fully-recruited fishing mortality and female spawning stock biomass estimates from the 2016 update and 2015 assessment are shown in Figure 14. The updated assessment produced just slightly higher fully-recruited fishing mortality and slightly lower female spawning stock biomass estimates than the 2015 assessment (Figure 14).

Comparison of Results from the 2016 Updated Assessment with Results from a Run using Separate Fleet-Selectivity Time Blocks for 2015

When fleet selectivities in 2015 were modeled as separate time blocks, only very minor differences in estimates of spawning stock biomass or fully-recruited fishing mortality were found (Figure 15).

Status of the Stock

In 2015, the Atlantic striped bass stock was not overfished and was not experiencing overfishing based on the point estimates of fully-recruited fishing mortality and female spawning stock biomass relative to the reference points defined in Addendum IV to the Fishery Management Plan for Atlantic Striped Bass. Female spawning stock biomass was estimated at 58,853 metric tons (129 million pounds) which was above the SSB threshold of 57,626 metric tons, but below the SSB target of 72,032 metric tons. Total fishing mortality was estimated at 0.16 which was below the F threshold of 0.22 and also below the F target of 0.18 (Figure 14). However, because of error associated with these estimates, there is a probability of 0.41 that the 2015 female SSB estimates was below or equal to the SSB threshold, or conversely, a probability of 0.59 that the 2015 female SSB is above the threshold. There is a probability of 0.01 that the 2015 fully-recruited fishing mortality is above or equal the fishing mortality threshold, or conversely, a 0.99 chance that the 2015 fully-recruited recruited is below the fishing mortality threshold. If the estimates of SSB and fully-recruited F are adjusted for the average retrospective bias in the last five years, the probability of the 2015 female SSB estimates being below or equal to the SSB threshold declines to 0.25, while the probability of the 2015 fully-recruited fishing mortality being above or equal the fishing mortality threshold is very close to zero.

Projections

Three scenarios were run to investigate changes in female SSB over three-year projections. In the first scenario, the changes in SSB and fishing mortality relative to their threshold and target reference points were examined by projecting the population assuming the catch taken in 2015 (3,017,358 fish) was also taken during 2016-2018. In the second scenario, the population was projected assuming the fishing mortality observed in 2015 (0.156) was the same in 2016-2018. In the third scenario, the population was projected assuming fishing mortality in 2016-2018 was equal to F target of 0.18. In all scenarios, additional runs were made with the estimates of abundance and fishing mortality adjusted for average retrospective bias.

For each scenario, the model begins in year 2015 with known January-1 abundance-at-age data with associated standard errors from the SCA model, the fully-recruited fishing mortality estimate in 2015 (F=0.156), selectivity-at-age in 2015, Rivard weights in 2015, natural mortality, female sex proportions-at-age, and female maturity-at-age are used to calculate female spawning biomass as modeled in the SCA model. For 2016, the January-1 abundance-at-age is calculated from the known values of 2015 abundance-at-age, selectivity and fully-recruited fishing mortality. For the remaining years, the Jan-1 abundance-at-age is projected and is calculated by using the previous year's abundance-at-age, selectivity, fishing mortality and natural mortality following the standard exponential decay model. In the constant catch scenario, the fully-recruited fishing mortality in 2016-2018 is estimated by using an iterative approach in which catch-at-age is calculated by using the catch equation given a January-1 abundance-at-age, starting fishing mortality and selectivity-at-age from 2015. The sum of age-specific catches are then compared to the assumed constant catch for 2016-2018. This procedure is repeated by changing fully-recruited F until the square of the log difference between predicted catch and total catch is minimized. Given the value of fully-recruited F, spawning stock biomass for the current year is then calculated. For the constant F scenarios, total catch is calculated each year from the January-1 abundances and the current year fishing mortality rates.

For each iteration of the simulation, the abundance-at-age in 2015 is randomly drawn from a normal distribution parameterized with the 2015 estimates of January-1 abundance–at-age and associated standard errors from the stock assessment model. For the remaining years, abundance of age-1 recruits is randomly selected from the 1990-2015 recruitment estimates. An age 13 plus-group is assumed. For years 2016-2018, selectivity-at-age assumed equal to the average selectivity for years 2011-2015. Female spawning stock biomass was calculated by using average Rivard weight estimates from 2011-2015, sex proportions-at-age, and female maturity-at-age.

For each year of the projection, the probability of SSB being equal to or lower than the SSB reference point was calculated from the 10,000 simulations by using function *pgen* in R package *fishmethods*. The SSB reference point was the 1995 SSB estimate (57,626 metric tons) and the error of the estimates of current SSB and SSB reference point were incorporated in the calculation of probability. Similarly, the probability of current F being greater than or equal to the F reference point (F=0.219) was calculated from 10,000 simulations as well. The CV of the F reference point was assumed equal to the average value for the 2011-2015 fully-recruited F estimates.

If the constant catch of 3,017,358 fish was maintained during 2016-2018, the probability of being below the SSB threshold reference point decreases to 0.20 by 2018 (Figure 16). The fully-recruited F is expected to decrease to 0.15 by 2018 and there is little chance that the fully-recruited F would exceed the F reference point in any year (Figure 16). If the numbers-at-age were adjusted for average (2010-2014) retrospective bias, the probabilities of being below the SSB reference point are reduced (Figure 16). The probability of being below the SSB threshold reference point decreases to 0.09 by 2018 (Figure 16). The fully-recruited F is expected to decrease to 0.14 by 2018 and the chance that the fully-recruited F would exceed the F reference point in any year is close to zero. Projections run to estimate the probability of SSB being less than or equal to the SSB target (=72,032 mt), and F being equal to or greater than the F_{target} (=0.18) reference points showed the probability of being below the SSB target reference point decreases to 0.95 by 2018 (Figure 17). The probability of fully-recruited F being at or above the F_{target} is expected to decline as fully-recruit F drops (Figure 17). If the numbers-at-age in 2015 are adjusted for average (2010-2014) retrospective bias, the probability of being at or below the SSB target declines to 0.88 by 2018 (Figure 17). The fully-recruited F is expected to decrease and the probability of F being at or below the F_{target} drops to 0.08 by 2018.

If the total fully-recruited fishing mortality was assumed equal to the 2015 value during 2016-2018, the probability of being below the SSB reference point decreases to 0.15 by 2018 (Figure 18). Catch is expected to decline in 2016, but then increase to about 3.2 million fish by 2018. If the 2015 numbers-at-age and fully-recruited F were adjusted for average (2010-2014) retrospective bias, the probabilities of being below the SSB reference point are reduced to 0.05 by 2018 (Figure 18), but catch in 2018 would be slightly less (3.1 million fish) than catch estimated from the unadjusted values. Projections run to estimate the probability of SSB being less than or equal to the SSB target (=72,032 mt) reference point showed the probability of being below the SSB target reference point decreases to 0.95 by 2018 (Figure 18). If the numbers-at-age in 2015 were adjusted for average (2010-2014) retrospective bias, the probability of being at or below the SSB target declines to 0.85 by 2018 (Figure 18).

If the total fully-recruited fishing mortality was assumed equal to the F_{target} of 0.18 during 2016-2018, the probability of being below the SSB threshold reference point decreases to 0.40 by 2018 (Figure 19). Catch is expected to decline in 2016, but then increase to about 3.5 million fish by 2018. If the 2015 numbers-at-age and fully-recruited F were adjusted for average (2010-2014) retrospective bias, the probabilities of being below the SSB reference point are reduced to 0.19 by 2018 (Figure 19), but catch in 2018 would be slightly less (3.4 million fish) than catch estimated with the unadjusted values. Projections run to estimate the probability of SSB being less than or equal to the SSB target (=72,032 mt) reference point showed the probability of being below the SSB target reference point decreases to 0.99 by 2018 (Figure 19). If the numbers-at-age in 2015 were adjusted for average (2010-2014) retrospective bias, the probability of being at or below the SSB target declines to 0.96 by 2018 (Figure 19).

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Table 1. Commercial harvest (numbers) by state and year.

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	PRFC	VA	NC	Total
1982			26,183	52,896	207	74,935		12,794	189,089	54,421	14,905	3,200	428,630
1983			9,528	48,173	83	66,334		5,806	147,079	63,171	15,962	1,405	357,541
1984			5,838	8,878	192	70,472		12,832	392,696	372,924	6,507	532	870,871
1985	90		7,601	7,173	350	52,048		1,359		82,550	23,450		174,621
1986			3,797	2,668						10,965	251		17,681
1987			3,284	23						9,884	361		13,552
1988			3,388							19,334	10,588		33,310
1989			7,402										7,402
1990			5,927	784		11,784		698	534	38,884	56,222	803	115,636
1991			9,901	3,596		15,426		3,091	31,880	44,521	44,970	413	153,798
1992			11,532	9,095		20,150		2,703	119,286	23,291	42,912	1,745	230,714
1993			13,099	6,294		11,181		4,273	211,089	24,451	39,059	3,414	312,860
1994			11,066	4,512		15,212		4,886	208,914	25,196	32,382	5,275	307,443
1995			44,965	19,722		43,704		5,565	280,051	29,308	88,274	23,325	534,914
1996			38,354	18,570		39,707		20,660	415,272	46,309	184,495	3,151	766,518
1997			44,841	7,061		37,852		33,223	706,847	87,643	165,583	25,562	1,108,612
1998			43,315	8,835		45,149		31,386	790,154	93,299	204,911	16,040	1,233,089
1999			40,838	11,559		49,795		34,841	650,022	90,575	205,143	21,040	1,103,812
2000			40,256	9,418		54,894		25,188	627,777	91,471	202,227	6,480	1,057,712
2001			40,248	10,917		58,296		34,373	549,896	87,809	148,346	22,936	952,820
2002			48,926	11,653		47,142		30,440	296,635	80,300	127,211	15,784	658,091
2003			61,262	15,497		68,354		31,531	439,482	83,091	161,777	13,823	874,817
2004			66,556	15,867		70,367		28,406	461,064	91,888	147,998	31,014	913,160
2005			65,332	14,949		70,560		26,336	569,964	80,615	119,244	26,573	973,572
2006			75,062	15,429		73,528		30,212	655,951	92,288	109,396	2,799	1,054,664
2007			57,634	13,934		78,287		31,090	598,495	86,695	140,602	16,621	1,023,358
2008			65,330	16,616		73,263		31,866	594,655	81,720	134,603	12,903	1,010,955
2009			63,875	20,725		82,574		21,590	618,076	89,693	138,303	8,675	1,043,512
2010			65,277	17,256		81,896		19,830	584,554	90,258	159,197	12,670	1,030,938
2011			63,309	14,344		87,349		20,517	490,969	96,126	148,063	10,814	931,490
2012			66,394	14,953		66,897		15,738	472,517	90,616	111,891	323	839,329
2013			62,570	13,825		76,206		17,679	399,118	78,006	117,697	0	765,101
2014			60,619	10,468		52,903		14,894	370,661	81,429	175,324	0	766,298
2015			42,974	12,213		44,809		10,990	300,928	69,981	135,804	0	617,698

Table 2. Total commercial harvest (numbers) by age and year.

	Age													
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
1982	0	45,129	200,221	117,158	22,927	5,035	3,328	2,861	1,871	4,407	5,837	7,639	12,217	428,630
1983	0	54,348	120,639	120,999	38,278	7,416	1,954	677	607	1,690	1,314	2,375	7,245	357,541
1984	0	478,268	270,140	55,598	30,580	21,688	6,441	1,744	1,020	771	146	279	4,196	870,871
1985	0	53,699	45,492	7,545	9,448	19,248	21,569	6,581	3,692	1,514	466	607	4,760	174,621
1986	0	639	6,020	3,207	180	703	1,425	1,199	546	182	105	220	3,255	17,681
1987	0	0	3,087	4,265	1,618	252	1,104	1,075	448	233	95	273	1,102	13,552
1988	0	0	2,086	3,961	15,491	6,469	2,803	539	541	218	266	108	828	33,310
1989	0	0	0	0	0	139	1,111	959	1,007	631	475	164	2,916	7,402
1990	0	650	12,551	48,024	29,596	15,122	3,111	2,357	1,147	519	272	130	2,157	115,636
1991	0	2,082	22,430	44,723	41,048	21,614	8,546	4,412	4,816	1,163	269	125	2,570	153,798
1992	0	640	32,277	58,009	46,661	41,581	22,186	11,514	8,746	6,314	1,062	464	1,260	230,714
1993	0	1,848	21,073	93,868	87,447	42,112	32,485	13,829	8,396	6,420	3,955	763	664	312,860
1994	0	1,179	22,873	71,614	101,512	48,269	28,530	14,886	8,902	5,323	2,513	1,250	592	307,443
1995	0	6,726	35,190	114,519	134,709	98,471	38,918	34,191	37,324	21,827	8,364	3,166	1,509	534,914
1996	0	557	50,102	127,825	179,031	161,361	120,693	51,995	29,907	18,864	11,663	9,674	4,847	766,518
1997	0	1,843	37,754	342,867	213,454	206,836	102,034	76,149	54,989	30,373	17,813	13,813	10,686	1,108,612
1998	0	6,124	54,375	267,791	411,067	184,209	94,726	75,915	63,592	31,809	19,948	12,110	11,423	1,233,089
1999	0	7,591	94,342	211,645	264,460	221,773	92,992	66,837	63,357	35,916	20,939	14,180	9,780	1,103,812
2000	0	244	51,876	203,457	284,772	194,336	121,949	72,841	51,768	37,496	19,263	11,391	8,320	1,057,712
2001	0	165	86,190	189,602	241,867	140,555	89,963	95,580	34,026	31,547	22,172	12,853	8,300	952,820
2002	0	184	39,914	133,965	130,689	107,219	68,875	45,032	56,146	28,715	20,386	12,252	14,713	658,091
2003	0	3,932	59,027	156,836	171,626	132,005	96,662	76,612	70,049	59,722	20,916	15,944	11,484	874,817
2004	1,221	18,069	83,780	173,546	123,717	102,815	94,480	97,849	73,246	57,207	43,534	22,876	20,818	913,160
2005	0	145	43,488	239,748	252,020	102,076	57,072	56,939	75,306	50,440	41,629	25,937	28,771	973,572
2006	0	81	90,820	192,639	335,889	150,133	48,304	43,705	46,313	61,550	39,664	23,017	22,550	1,054,664
2007	0	0	4,711	305,597	207,826	190,053	78,099	51,494	64,579	51,397	32,964	20,498	16,141	1,023,358
2008	0	0	12,506	233,419	311,903	125,702	92,605	60,928	42,177	41,351	35,246	29,726	25,394	1,010,955
2009	0	69	19,745	190,560	356,448	191,280	68,995	69,342	41,636	31,813	27,531	18,630	27,461	1,043,512
2010	0	7,178	46,448	219,450	247,340	177,935	133,809	58,962	45,183	30,091	21,540	17,394	25,606	1,030,938
2011	0	788	49,592	127,860	199,887	198,523	118,074	93,069	45,488	42,628	15,586	12,507	27,489	931,490
2012	0	7,574	52,373	100,268	247,767	138,058	93,514	54,667	60,289	25,132	25,512	14,275	19,900	839,329
2013	0	465	56,877	130,722	149,660	148,739	70,319	57,246	50,022	53,178	14,798	12,540	20,534	765,101
2014	0	469	58,072	108,014	194,079	133,322	87,856	49,620	41,178	38,606	26,715	9,220	19,147	766,298
2015	0	0	11,880	181,537	109,099	78,162	62,399	49,541	28,815	42,146	20,796	16,265	17,060	617,699

Table 3. Age composition of commercial harvest in 2015 by state.

2015														
State	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
MA	0	0	0	2	31	166	1,155	4,177	5,667	8,017	9,078	6,206	8,475	42,974
RI	0	0	0	203	1,142	1,327	1,234	1,292	1,681	1,785	1,408	811	1,329	12,213
NY	0	0	0	354	4,866	10,172	9,945	8,510	6,081	3,277	1,112	367	126	44,809
DE	0	0	0	0	631	2,375	4,058	2,292	1,355	56	112	56	56	10,990
MD Bay	0	0	424	126,886	64,304	35,241	29,698	23,299	6,845	9,316	2,022	273	19	298,327
MD Cst	0	0	0	0	0	14	25	425	480	559	417	621	60	2,601
PRFC	0	0	0	153	17,649	21,178	11,203	4,451	1,535	13,659	0	153	0	69,981
VA Bay	0	0	11,456	53,926	20,476	7,607	5,009	4,850	4,626	4,606	5,362	6,679	4,903	129,500
VA Cst	0	0	0	12	0	82	72	245	546	872	1,285	1,099	2,092	6,304
NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	11,880	181,537	109,099	78,162	62,399	49,541	28,815	42,146	20,796	16,265	17,060	617,699

Table 4. Commercial discards (numbers) by age and year.

	Age															
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Total
1982	0	31645	3644	11456	5623	1291	2397	1014	369	92	85	0	0	7	0	57,624
1983	0	24067	1453	2878	7761	2311	610	610	262	174	0	0	0	0	0	40,127
1984	0	33575	1611	5812	9734	11272	2815	117	586	66	0	52	0	0	0	65,639
1985	0	7728	30472	5939	10891	3395	2742	1045	261	131	131	0	0	0	0	62,734
1986	0	5841	20758	100067	27989	13315	4295	1415	346	0	0	0	0	0	0	174,024
1987	0	4206	14382	28597	51389	16940	6520	1319	1011	395	111	86	111	0	0	125,066
1988	0	6142	22593	36616	70959	71694	23232	9116	3110	1653	218	195	24	0	0	245,552
1989	0	13854	50240	49029	83396	82757	33479	15502	6342	705	1409	1409	663	41	0	338,827
1990	0	14526	68713	80935	111888	115702	71600	36256	5948	1539	1401	1503	0	0	0	510,011
1991	79	12632	37009	64210	77335	56894	36912	24857	6610	4071	6542	16	0	0	0	327,167
1992	117	3698	34218	36746	44412	34688	14798	11179	3398	2356	991	0	0	0	0	186,601
1993	0	7449	50160	79011	95116	63487	20941	15351	9270	4606	1651	536	260	0	0	347,839
1994	0	31770	47169	45081	88122	84570	39229	12524	6223	3674	712	415	30	0	0	359,518
1995	0	72822	75520	53551	94158	121592	61447	19083	7569	4269	2290	2346	807	0	0	515,454
1996	0	27133	114085	76336	61884	58787	30835	14916	6148	3989	159	502	50	0	0	394,824
1997	476	7108	64352	61871	30602	20951	14002	6592	1963	4309	2658	801	1060	0	0	216,745
1998	0	13233	53899	98510	83288	29197	12970	12591	7860	4372	3891	2419	3311	124	367	326,032
1999	984	58076	49894	43744	55740	14477	5213	3704	1980	1304	648	612	240	3	0	236,619
2000	196	178457	189933	157291	62699	33918	26938	7831	4111	3876	801	863	41	17	25	666,997
2001	0	2638	58079	77958	88808	29410	18877	11613	9664	6371	4778	1957	737	10	0	310,900
2002	1700	20888	42641	21409	28791	23720	12381	6854	5645	2255	1522	149	173	33	43	168,201
2003	1512	6227	28061	54464	56728	19866	30850	18633	16410	13572	8164	3207	2894	165	1222	261,974
2004	2943	52811	80744	76790	62580	48683	52231	41378	23549	9829	10381	2365	446	899	14	465,642
2005	432	11513	103930	245644	169860	68808	54397	43911	43609	23102	16147	8477	5238	2009	1466	798,544
2006	0	555	25769	28836	36995	27669	15055	16698	12693	13187	7392	4430	5245	0	0	194,524
2007	284	6302	18190	89608	97557	139873	78655	48521	42665	30644	22419	19979	11902	0	0	606,599
2008	0	109	2928	45076	71474	58005	44675	21699	13857	13043	12619	14253	10978	0	0	308,715
2009	0	1661	80748	166818	123878	91220	30653	38426	20517	16384	15706	7675	18258	0	0	611,944
2010	0	1379	16212	76208	64148	46221	19637	9510	6534	4079	3116	1792	6007	0	0	254,841
2011	0	3880	61564	109748	131320	80575	54479	49187	37502	30917	15468	11281	9401	9127	13006	617,457
2012	0	9118	50673	116560	205853	136385	109776	38433	41328	17081	22239	17148	2808	10723	14736	792,861
2013	0	4502	70746	116465	100230	73842	44949	32774	22008	20188	7357	10847	10143	2065	9465	525,581
2014	0	21	37916	108024	233435	180063	148881	62830	47609	50812	33159	6274	7234	4291	10842	931,391
2015	0	15	8707	89382	49169	29661	27396	20369	15407	14502	14448	17612	4416	2234	6248	299,566

Table 5. Recreational harvest (numbers) by state and year (includes wave 1 estimated harvest for Virginia).

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC	Total
1982	929	0	83,933	1,757	50,081	21,278	58,294	0	984	0	0	217,256
1983	7,212	4,576	39,316	1,990	42,826	43,731	127,912	135	31,746	0	0	299,444
1984	0	0	3,481	1,230	5,678	57,089	13,625	16,571	16,789	0	0	114,463
1985	11,862	0	66,019	670	15,350	23,107	13,145	0	2,965	404	0	133,522
1986	0	0	29,434	3,291	1,760	27,477	36,999	0	14,077	1,585	0	114,623
1987	0	90	10,807	2,399	522	14,191	9,279	0	4,025	2,442	0	43,755
1988	0	647	21,050	5,226	2,672	20,230	12,141	0	133	24,259	367	86,725
1989	738	0	13,044	4,303	5,777	12,388	1,312	0	0	0	0	37,562
1990	2,912	617	20,515	4,677	6,082	24,799	44,878	2,009	736	56,017	0	163,242
1991	3,265	274	20,799	17,193	4,907	54,502	38,300	2,741	77,873	42,224	391	262,469
1992	6,357	2,213	57,084	14,945	9,154	45,162	41,426	2,400	99,354	21,118	967	300,180
1993	612	1,540	58,511	17,826	19,253	78,560	64,935	4,055	104,682	78,481	264	428,719
1994	3,771	3,023	74,538	5,915	16,929	87,225	34,877	4,140	199,378	127,945	7,426	565,167
1995	2,189	3,902	73,806	29,997	38,261	155,821	254,055	15,361	355,237	149,103	11,450	1,089,182
1996	1,893	6,461	68,300	60,074	62,840	225,428	127,952	22,867	337,415	244,746	17,136	1,175,112
1997	35,259	13,546	199,373	62,162	64,639	236,902	67,800	19,706	334,068	518,483	96,189	1,648,127
1998	38,094	5,929	207,952	44,890	64,215	166,868	88,973	18,758	391,824	383,786	45,773	1,457,062
1999	21,102	4,641	126,755	56,320	55,805	195,261	237,010	8,772	263,191	411,873	65,658	1,446,388
2000	62,186	4,262	181,295	95,496	53,191	270,798	402,302	39,543	506,462	389,126	20,452	2,025,113
2001	59,947	15,291	288,032	80,125	54,165	189,714	560,208	41,195	382,557	355,020	58,873	2,085,127
2002	71,907	12,857	308,749	78,190	51,060	202,075	416,455	29,149	282,429	411,248	109,052	1,973,171
2003	57,765	24,878	407,100	115,471	95,983	313,761	391,842	29,522	525,191	455,812	127,727	2,545,052
2004	48,816	8,386	445,745	83,990	102,844	263,096	424,208	25,429	368,682	548,768	230,783	2,550,747
2005	83,617	24,940	340,743	110,490	141,290	376,894	411,532	20,438	533,929	293,161	104,904	2,441,938
2006	75,347	13,521	314,987	75,811	115,214	367,835	509,606	20,159	669,140	547,482	79,023	2,788,125
2007	53,694	6,348	315,409	101,400	118,549	474,062	289,656	8,465	765,169	353,372	37,376	2,523,500
2008	59,152	5,308	377,959	51,191	108,166	685,589	309,411	26,934	415,403	401,155	25,750	2,466,018
2009	62,153	8,587	344,401	71,427	60,876	356,311	283,024	19,539	501,845	326,867	5,650	2,040,680
2010	17,396	5,948	341,045	70,108	92,806	538,374	320,413	16,244	457,898	102,405	23,778	1,986,415
2011	18,105	32,704	255,507	88,635	63,288	674,844	393,194	18,023	445,171	146,603	94,182	2,230,256
2012	11,624	14,498	377,931	61,537	64,573	424,522	168,629	25,399	262,143	134,758	0	1,545,614
2013	23,143	17,657	298,945	218,236	143,373	490,855	345,008	19,520	477,295	118,686	0	2,152,718
2014	20,750	6,415	277,138	103,516	86,763	409,342	225,910	8,774	583,028	67,486	0	1,789,122
2015	4,720	1,828	170,770	39,857	70,644	262,181	284,257	3,101	406,371	100,593	0	1,344,322

Table 6. Recreational harvest (numbers) by age and year (includes wave 1 for Virginia).

							Age						
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
1982	0	5,721	36,125	81,725	24,916	10,963	16,943	11,960	8,970	5,980	4,983	5,980	2,990	217,257
1983	4,617	25,001	50,976	62,840	95,870	27,371	15,035	3,338	1,799	1,799	2,699	2,699	5,398	299,443
1984	2,021	22,316	24,474	15,610	16,528	15,288	8,034	2,548	0	849	849	0	5,945	114,463
1985	225	3,305	13,315	22,732	36,208	19,572	18,593	9,786	1,957	1,957	0	0	5,872	133,522
1986	11,002	5,426	9,354	12,136	12,339	13,473	12,285	18,427	7,020	4,387	2,632	877	5,265	114,623
1987	1,083	1,370	3,822	2,596	4,838	3,756	3,756	2,817	3,756	1,878	939	1,878	11,267	43,756
1988	1,023	8,195	5,116	5,120	6,135	11,214	10,191	12,225	9,169	3,056	3,056	3,056	9,169	86,725
1989	0	0	3,130	2,087	4,174	6,260	7,304	4,174	2,087	2,087	1,043	0	5,217	37,562
1990	627	7,933	17,317	39,534	22,708	22,980	16,657	15,810	7,680	3,009	1,797	899	6,290	163,242
1991	1,368	21,382	38,339	61,798	27,957	13,322	24,432	26,848	23,268	9,293	4,159	937	9,367	262,470
1992	1,881	15,923	61,295	52,925	54,507	20,325	13,805	23,488	23,613	18,849	3,854	1,943	7,771	300,179
1993	2,209	18,044	53,461	93,539	68,083	49,704	18,614	20,458	36,054	35,685	19,855	4,461	8,552	428,719
1994	2,112	43,976	138,180	95,461	91,957	47,419	29,827	23,833	34,809	29,999	13,650	8,815	5,128	565,167
1995	562	134,922	222,570	183,276	105,211	164,461	64,387	81,839	59,042	34,224	24,276	6,888	7,523	1,089,181
1996	531	129,149	257,038	214,669	109,367	116,156	137,033	80,275	58,041	27,210	18,534	19,437	7,673	1,175,113
1997	1,837	2,837	74,549	240,321	185,350	213,594	217,940	290,961	183,150	120,586	58,005	32,037	26,958	1,648,125
1998	0	20,368	133,541	229,441	168,884	164,613	134,977	153,529	163,905	96,099	87,690	41,837	62,180	1,457,063
1999	0	2,307	39,471	141,735	166,527	282,809	200,750	168,942	155,988	108,584	87,820	42,054	49,400	1,446,388
2000	0	503	37,950	255,084	402,268	367,123	423,409	201,142	120,257	97,670	53,095	28,375	38,237	2,025,112
2001	1,036	559	60,048	169,642	340,240	403,155	379,607	314,763	150,791	92,207	80,417	44,978	47,683	2,085,127
2002	0	1,530	33,823	141,000	266,095	405,275	334,964	249,670	237,566	107,817	86,338	46,611	62,481	1,973,171
2003	0	36,600	76,642	198,625	295,548	362,028	463,663	336,910	275,724	218,321	123,058	72,670	85,263	2,545,052
2004	427	214	94,601	207,895	211,670	268,011	301,427	435,274	331,997	265,634	210,003	103,959	119,632	2,550,745
2005	0	322	40,333	245,135	337,585	282,138	285,659	240,402	308,962	233,801	232,352	100,482	134,766	2,441,938
2006	0	8,326	112,441	209,402	372,824	335,684	245,484	289,948	249,576	341,499	248,790	158,204	215,948	2,788,125
2007	0	73	25,068	333,424	269,399	403,913	267,964	239,743	269,469	267,806	182,806	133,849	129,988	2,523,500
2008	0	246	7,036	74,691	340,359	211,584	473,211	359,388	200,562	243,217	197,085	156,271	202,367	2,466,018
2009	0	970	15,868	103,386	228,968	429,381	221,964	309,080	169,576	122,503	132,590	111,295	195,097	2,040,680
2010	0	8,973	25,576	141,402	156,928	288,769	487,688	201,524	215,001	155,490	81,649	79,440	143,974	1,986,415
2011	0	8,101	33,913	89,551	176,608	330,321	360,990	542,248	186,305	174,692	84,284	63,411	179,831	2,230,256
2012	880	5,750	37,455	51,034	138,448	166,043	230,082	267,495	275,475	91,442	91,694	60,174	129,641	1,545,614
2013	0	24,441	91,051	168,967	140,260	348,574	240,079	233,810	264,731	340,962	81,245	69,275	149,323	2,152,718
2014	0	425	113,852	179,894	226,704	179,158	203,847	129,816	180,710	203,607	147,676	76,302	147,129	1,789,122
2015	0	3,005	23,855	207,931	242,432	169,185	128,184	120,008	92,874	112,647	82,032	53,430	108,738	1,344,321

Table 7. Age composition of recreational harvest in 2015 by state.

2015							Age							
State	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
ME	0	0	0	126	931	1,204	856	611	390	280	194	104	24	4,720
NH	0	0	0	50	345	430	333	203	139	126	97	60	46	1,828
MA	0	0	491	7,135	25,470	23,825	19,192	25,132	23,590	20,555	14,185	3,912	7,284	170,770
RI	0	0	0	193	2,368	2,876	4,004	4,731	6,275	6,246	4,699	2,681	5,784	39,857
CT	0	279	650	158	10,534	19,395	14,286	7,983	6,685	4,196	3,301	1,560	1,617	70,644
NY	0	0	0	11,459	34,247	46,767	31,815	16,631	16,323	20,534	19,629	15,784	48,992	262,181
NJ	0	0	772	52,384	57,749	30,877	22,298	23,926	21,586	27,043	19,128	7,315	21,180	284,257
DE	0	0	5	152	179	215	120	259	287	320	821	205	537	3,100
MD Bay	0	0	0	84,740	104,426	41,329	32,359	35,468	16,100	31,071	18,040	19,827	21,250	404,610
MD Cst	0	0	0	0	0	145	114	326	209	260	151	379	178	1,761
VA Bay	0	2,726	21,937	51,536	6,183	1,620	2,412	3,608	566	1,111	1,264	286	1,225	94,473
VA Cst	0	0	0	0	0	504	396	1,132	726	903	524	1,316	618	6,120
NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	3,005	23,855	207,931	242,432	169,186	128,185	120,010	92,874	112,645	82,032	53,429	108,736	1,344,321

Table 8. Recreational releases by state and year.

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC	Total
1982	687	0	6,441	2,551	643,187	12,297	87,648	0	30,376	0	0	783,187
1983	0	0	34,018	5,444	0	1,469	117,807	0	213,487	11,997	0	384,222
1984	1,887	0	98,405	85,135	31,176	40,469	52,930	0	104,095	8,775	0	422,872
1985	81,153	93	12,360	40,567	26,946	57,540	5,524	702	147,103	2,598	0	374,586
1986	4,379	0	442,298	2,014	10,494	123,842	0	0	390,063	7,528	0	980,618
1987	18,106	435	93,660	63,849	78,434	253,986	56,697	16,988	118,395	7,611	0	708,161
1988	4,528	6,699	209,632	23,347	25,532	92,611	486,306	2,455	132,250	5,631	0	988,991
1989	16,028	4,822	193,067	38,007	125,370	365,712	265,958	4,807	114,269	72,766	0	1,200,806
1990	12,542	15,518	339,511	67,509	89,490	265,099	254,384	14,411	420,084	175,046	0	1,653,594
1991	67,490	6,559	448,735	30,975	301,476	756,663	166,198	38,334	1,036,011	208,350	256	3,061,047
1992	31,177	27,613	779,814	120,410	292,259	799,149	413,506	36,932	749,959	115,899	679	3,367,397
1993	373,064	14,979	833,566	100,993	271,318	694,107	308,253	89,543	1,556,848	100,374	1,524	4,344,569
1994	363,703	43,501	2,102,514	138,989	489,967	1,132,707	568,047	103,992	2,785,392	197,022	5,005	7,930,839
1995	505,758	285,486	3,280,882	356,324	507,124	1,209,585	694,889	115,363	2,401,277	370,949	16,225	9,743,862
1996	1,626,705	292,820	3,269,746	314,336	1,051,612	1,436,091	776,165	99,372	2,545,238	759,916	116,667	12,288,668
1997	1,417,976	279,298	5,417,751	606,746	722,708	1,018,892	736,734	130,073	4,019,987	1,232,323	135,853	15,718,341
1998	691,378	243,301	7,184,358	613,421	1,026,192	884,626	488,319	185,016	2,641,680	796,372	173,704	14,928,367
1999	649,816	145,730	4,576,208	360,121	704,025	1,228,628	1,152,682	105,696	2,387,615	940,755	263,445	12,514,721
2000	942,593	209,606	7,382,031	541,516	926,367	1,373,069	885,289	151,838	3,244,731	1,022,040	129,729	16,808,809
2001	870,522	164,336	5,410,899	377,474	1,107,707	824,278	965,650	162,677	2,890,054	620,947	49,953	13,444,497
2002	1,392,200	238,003	5,718,984	530,402	696,976	588,155	715,099	114,650	2,928,589	706,729	63,269	13,693,056
2003	846,708	260,167	4,361,710	448,707	843,037	1,083,808	925,885	169,012	4,652,800	970,554	48,945	14,611,333
2004	693,400	225,777	4,979,075	525,936	826,724	2,709,246	1,502,694	155,655	3,479,634	1,732,890	222,302	17,053,333
2005	2,985,203	572,633	3,988,679	633,871	1,761,628	1,412,191	1,218,893	251,049	3,855,552	1,295,768	103,432	18,078,899
2006	4,000,309	460,615	7,809,777	834,953	986,700	1,722,386	1,890,294	247,653	3,711,343	1,655,007	24,262	23,343,299
2007	1,115,068	257,372	5,331,470	677,851	984,638	1,677,717	1,789,294	248,689	3,064,928	949,158	13,838	16,110,023
2008	465,003	77,237	3,649,415	416,373	3,104,779	1,346,385	1,309,453	260,677	1,338,728	532,161	10,776	12,510,987
2009	263,512	57,443	2,282,601	398,686	1,161,278	1,073,467	800,510	145,586	1,423,332	358,991	5,407	7,970,813
2010	193,743	51,833	1,671,437	183,112	670,534	1,068,672	690,340	65,048	1,508,647	134,350	20,365	6,258,081
2011	142,505	98,693	973,192	214,302	612,367	1,506,080	884,013	110,085	1,127,511	153,582	110,150	5,932,480
2012	214,185	64,226	989,509	247,075	264,927	586,044	406,096	109,960	2,206,518	101,736	1,615	5,191,891
2013	422,598	84,015	1,691,026	826,280	778,250	989,783	1,107,218	83,494	2,387,276	168,989	1,057	8,539,986
2014	277,209	78,612	1,826,412	163,239	303,836	726,137	1,051,323	185,166	2,415,192	254,795	626	7,282,547
2015	213,964	56,065	1,546,094	526,982	684,657	551,730	859,435	43,803	3,117,552	797,174	0	8,397,456

Table 9. Recreational dead releases (numbers) by state and year (using 0.09 release mortality).

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC	Total
1982	62	0	580	230	57,887	1,107	7,888	0	2,734	0	0	70,487
1983	0	0	3,062	490	0	132	10,603	0	19,214	1,080	0	34,580
1984	170	0	8,856	7,662	2,806	3,642	4,764	0	9,369	790	0	38,058
1985	7,304	8	1,112	3,651	2,425	5,179	497	63	13,239	234	0	33,713
1986	394	0	39,807	181	944	11,146	0	0	35,106	678	0	88,256
1987	1,630	39	8,429	5,746	7,059	22,859	5,103	1,529	10,656	685	0	63,734
1988	408	603	18,867	2,101	2,298	8,335	43,768	221	11,903	507	0	89,009
1989	1,443	434	17,376	3,421	11,283	32,914	23,936	433	10,284	6,549	0	108,073
1990	1,129	1,397	30,556	6,076	8,054	23,859	22,895	1,297	37,808	15,754	0	148,823
1991	6,074	590	40,386	2,788	27,133	68,100	14,958	3,450	93,241	18,752	23	275,494
1992	2,806	2,485	70,183	10,837	26,303	71,923	37,216	3,324	67,496	10,431	61	303,066
1993	33,576	1,348	75,021	9,089	24,419	62,470	27,743	8,059	140,116	9,034	137	391,011
1994	32,733	3,915	189,226	12,509	44,097	101,944	51,124	9,359	250,685	17,732	450	713,776
1995	45,518	25,694	295,279	32,069	45,641	108,863	62,540	10,383	216,115	33,385	1,460	876,948
1996	146,403	26,354	294,277	28,290	94,645	129,248	69,855	8,943	229,071	68,392	10,500	1,105,980
1997	127,618	25,137	487,598	54,607	65,044	91,700	66,306	11,707	361,799	110,909	12,227	1,414,651
1998	62,224	21,897	646,592	55,208	92,357	79,616	43,949	16,651	237,751	71,673	15,633	1,343,553
1999	58,483	13,116	411,859	32,411	63,362	110,577	103,741	9,513	214,885	84,668	23,710	1,126,325
2000	84,833	18,865	664,383	48,736	83,373	123,576	79,676	13,665	292,026	91,984	11,676	1,512,793
2001	78,347	14,790	486,981	33,973	99,694	74,185	86,909	14,641	260,105	55,885	4,496	1,210,005
2002	125,298	21,420	514,709	47,736	62,728	52,934	64,359	10,319	263,573	63,606	5,694	1,232,375
2003	76,204	23,415	392,554	40,384	75,873	97,543	83,330	15,211	418,752	87,350	4,405	1,315,020
2004	62,406	20,320	448,117	47,334	74,405	243,832	135,242	14,009	313,167	155,960	20,007	1,534,800
2005	268,668	51,537	358,981	57,048	158,547	127,097	109,700	22,594	347,000	116,619	9,309	1,627,101
2006	360,028	41,455	702,880	75,146	88,803	155,015	170,126	22,289	334,021	148,951	2,184	2,100,897
2007	100,356	23,163	479,832	61,007	88,617	150,995	161,036	22,382	275,844	85,424	1,245	1,449,902
2008	41,850	6,951	328,447	37,474	279,430	121,175	117,851	23,461	120,486	47,894	970	1,125,989
2009	23,716	5,170	205,434	35,882	104,515	96,612	72,046	13,103	128,100	32,309	487	717,373
2010	17,437	4,665	150,429	16,480	60,348	96,180	62,131	5,854	135,778	12,092	1,833	563,227
2011	12,825	8,882	87,587	19,287	55,113	135,547	79,561	9,908	101,476	13,822	9,913	533,923
2012	19,277	5,780	89,056	22,237	23,843	52,744	36,549	9,896	198,587	9,156	145	467,270
2013	38,034	7,561	152,192	74,365	70,043	89,080	99,650	7,514	214,855	15,209	95	768,599
2014	24,949	7,075	164,377	14,692	27,345	65,352	94,619	16,665	217,367	22,932	56	655,429
2015	19,257	5,046	139,148	47,428	61,619	49,656	77,349	3,942	280,580	71,746	0	755,771

Table 10. Recreational dead releases (numbers) in 2015 by age and state.

2015	Age													
State	0	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
ME	0	0	53	1,248	8,691	7,282	1,310	188	161	96	96	65	39	27	19,257
NH	0	0	22	420	2,281	1,668	343	100	72	42	38	29	18	14	5,046
MA	0	0	440	8,334	46,502	38,499	12,491	6,075	4,593	5,893	6,198	5,040	3,407	1,676	139,148
RI	0	0	1,068	7,654	24,835	7,526	1,441	703	642	768	722	722	514	832	47,428
CT	0	19	1,725	5,324	26,123	9,435	5,497	2,805	2,037	2,014	1,883	1,742	1,206	1,810	61,620
NY	0	465	6,180	6,704	22,683	7,416	3,068	888	566	478	433	368	227	178	49,656
NJ	33	1,124	2,830	5,265	29,395	17,741	6,791	3,739	2,479	2,490	2,175	1,834	791	664	77,349
DE	97	0	207	164	456	1,081	650	609	184	58	177	131	52	76	3,942
MD Bay	0	67,092	62,560	21,926	94,247	17,471	4,423	1,570	1,121	593	1,996	2,652	3,510	918	280,078
MD Cst	0	0	1	1	57	120	142	16	43	26	25	17	40	13	501
VA Bay	0	17,128	6,050	31,102	9,975	4,371	1,051	303	86	264	309	374	510	134	71,657
VA Cst	0	0	0	0	10	21	25	3	8	5	4	3	7	3	89
NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	129	85,828	81,137	88,143	265,254	112,630	37,233	17,000	11,993	12,726	14,056	12,977	10,322	6,345	755,772

Table 11. Age composition of incidental removals.

Bay	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	63	194	1250	730	289	86	65	42	25	26	19	24	12	2825
2000	39	96	2125	3439	1255	355	195	101	61	40	33	9	8	7756
2001	0	15	337	956	660	120	63	56	50	51	21	10	4	2343
2002	0	9	62	408	508	156	84	36	27	17	7	1	1	1317
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 11 cont.

Ocean	Age													
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	1	4	271	203	107	136	26	3	0	0	0	0	0	752
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	1	29	6	6	15	21	25	10	6	2	0	0	121
2005	0	20	5	5	11	13	15	23	19	8	4	1	1	125
2006	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2007	0	3	8	11	8	5	0	0	0	0	0	0	0	35
2008	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2009	0	0	17	15	0	0	0	0	0	0	0	0	0	32
2010	0	0	17	14	1	0	0	0	0	0	0	0	0	32
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12. Total removals and associated coefficients of variation and age proportions of total removals of striped bass split into Chesapeake Bay, Ocean, and Commercial Discard fleets, 1982-2015. Age-0 fish are not included.

	Chesapeake Bay		Age Proportions												
Year	Total	CV	1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	262,133	0.857	0.00507	0.12678	0.59014	0.23839	0.03160	0.00498	0.00099	0.00089	0.00012	0.00000	0.00029	0.00047	0.00029
1983	277,824	0.224	0.01104	0.28325	0.36483	0.28873	0.03398	0.00918	0.00351	0.00307	0.00086	0.00028	0.00016	0.00032	0.00078
1984	798,853	0.444	0.00557	0.61276	0.33834	0.03751	0.00495	0.00013	0.00068	0.00005	0.00001	0.00000	0.00000	0.00000	0.00000
1985	122,842	0.447	0.01132	0.52144	0.40241	0.04234	0.01142	0.00471	0.00483	0.00153	0.00000	0.00000	0.00000	0.00000	0.00000
1986	56,504	0.516	0.09360	0.28059	0.46742	0.10997	0.01729	0.00595	0.01951	0.00567	0.00000	0.00000	0.00000	0.00000	0.00000
1987	23,170	0.489	0.05059	0.17128	0.40184	0.24355	0.07494	0.00375	0.02876	0.02530	0.00000	0.00000	0.00000	0.00000	0.00000
1988	42,211	0.887	0.02643	0.20139	0.10296	0.10244	0.36728	0.14152	0.05660	0.00138	0.00000	0.00000	0.00000	0.00000	0.00000
1989	16,791	0.285	0.06463	0.56728	0.15406	0.10122	0.07011	0.02801	0.01070	0.00400	0.00000	0.00000	0.00000	0.00000	0.00000
1990	205,740	0.333	0.01873	0.14393	0.18579	0.32698	0.17722	0.10363	0.02839	0.00924	0.00457	0.00152	0.00000	0.00000	0.00000
1991	352,428	0.171	0.00255	0.15667	0.24267	0.25941	0.15361	0.07895	0.05201	0.02952	0.01372	0.00641	0.00448	0.00000	0.00000
1992	383,546	0.156	0.00530	0.09234	0.22350	0.24898	0.18261	0.12646	0.06779	0.03110	0.01392	0.00612	0.00188	0.00000	0.00000
1993	597,071	0.152	0.00278	0.11137	0.16410	0.27782	0.20806	0.11027	0.06903	0.02844	0.01566	0.00797	0.00363	0.00087	0.00000
1994	859,681	0.158	0.00841	0.08882	0.17138	0.19982	0.23514	0.13061	0.08229	0.04048	0.02364	0.01201	0.00506	0.00235	0.00000
1995	1,133,791	0.132	0.00447	0.14701	0.20492	0.22479	0.16855	0.14799	0.04925	0.03082	0.01229	0.00383	0.00414	0.00097	0.00099
1996	1,465,451	0.137	0.00036	0.09842	0.26089	0.18188	0.16817	0.14229	0.08644	0.03241	0.01535	0.00720	0.00462	0.00121	0.00076
1997	1,998,211	0.117	0.02075	0.04500	0.07404	0.32221	0.18116	0.15894	0.08528	0.05664	0.02819	0.01457	0.00648	0.00427	0.00247
1998	1,934,786	0.099	0.00169	0.03597	0.14993	0.25242	0.27003	0.12710	0.06030	0.03604	0.02901	0.01880	0.00978	0.00517	0.00377
1999	1,726,756	0.107	0.00123	0.01763	0.15538	0.22930	0.22668	0.19522	0.07263	0.03593	0.02879	0.01361	0.01137	0.00630	0.00593
2000	2,019,358	0.092	0.01360	0.05297	0.06707	0.24036	0.27401	0.16615	0.09269	0.04241	0.01809	0.01515	0.00751	0.00515	0.00486
2001	1,695,685	0.089	0.02650	0.05998	0.11749	0.19551	0.23594	0.13129	0.08764	0.06882	0.02137	0.01887	0.01455	0.01317	0.00888
2002	1,311,055	0.096	0.01116	0.10412	0.10416	0.19271	0.18460	0.15229	0.10087	0.04483	0.05433	0.01364	0.01389	0.00794	0.01547
2003	2,052,319	0.075	0.00000	0.10428	0.13637	0.17148	0.14837	0.12365	0.09679	0.06315	0.05577	0.05495	0.01998	0.01202	0.01319
2004	1,825,612	0.076	0.03768	0.04394	0.20312	0.20733	0.11058	0.09403	0.08510	0.06536	0.04986	0.03511	0.03521	0.01488	0.01780
2005	1,963,065	0.088	0.00404	0.12303	0.06758	0.24029	0.21357	0.08748	0.05656	0.03891	0.05310	0.03768	0.03703	0.02214	0.01857
2006	2,329,278	0.072	0.01351	0.05082	0.17163	0.17673	0.24904	0.11652	0.04082	0.03479	0.03336	0.04266	0.02650	0.01715	0.02646
2007	2,134,342	0.100	0.00347	0.03161	0.03894	0.34255	0.18042	0.15994	0.05946	0.03628	0.03861	0.03262	0.03410	0.01809	0.02391
2008	1,548,345	0.081	0.01419	0.01321	0.04745	0.17432	0.34241	0.09064	0.09039	0.05106	0.02367	0.03694	0.03197	0.04284	0.04091
2009	1,702,422	0.082	0.00349	0.03330	0.04027	0.22943	0.25108	0.19254	0.03551	0.05209	0.04212	0.02027	0.02750	0.02219	0.05020
2010	1,482,203	0.111	0.00349	0.00724	0.13179	0.16251	0.23568	0.19246	0.14358	0.03569	0.03282	0.01731	0.00698	0.00878	0.02166
2011	1,378,058	0.088	0.01078	0.02751	0.04607	0.28452	0.15229	0.17340	0.12382	0.08052	0.02371	0.02888	0.01392	0.00895	0.02563
2012	1,198,075	0.108	0.05011	0.05544	0.10794	0.11923	0.25603	0.14501	0.08838	0.03531	0.05086	0.01895	0.02779	0.00991	0.03504
2013	1,363,533	0.081	0.00092	0.06761	0.14675	0.24527	0.17454	0.16533	0.06290	0.03869	0.02743	0.03883	0.00938	0.01235	0.01000
2014	1,492,601	0.112	0.00325	0.01253	0.21758	0.19752	0.25472	0.12027	0.07659	0.03177	0.02626	0.02042	0.02401	0.00270	0.01238
2015	1,348,627	0.114	0.06245	0.05290	0.06439	0.31251	0.17416	0.08338	0.06121	0.05404	0.02264	0.04602	0.02203	0.02316	0.02110

Table 12 cont.

	Ocean		Age Proportions												
Year	Total	CV	1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	454,241	0.366	0.00192	0.09698	0.22097	0.32694	0.09921	0.03720	0.04890	0.03454	0.02380	0.02287	0.02365	0.02971	0.03331
1983	413,741	0.699	0.00653	0.04616	0.19767	0.25603	0.30420	0.07791	0.03870	0.00765	0.00524	0.00825	0.00959	0.01205	0.03003
1984	224,539	0.450	0.00973	0.11611	0.15973	0.20421	0.19731	0.16935	0.06206	0.01893	0.00451	0.00722	0.00443	0.00124	0.04517
1985	219,014	0.679	0.00017	0.01728	0.11977	0.13099	0.20756	0.17460	0.18067	0.07387	0.02579	0.01585	0.00213	0.00277	0.04854
1986	164,055	0.324	0.04844	0.02205	0.15063	0.18503	0.12483	0.10479	0.08366	0.13130	0.04612	0.02785	0.01669	0.00669	0.05193
1987	97,873	0.265	0.01071	0.03159	0.17315	0.19850	0.15288	0.08658	0.06610	0.04540	0.05458	0.02157	0.01056	0.02198	0.12638
1988	166,833	0.326	0.00637	0.10903	0.12105	0.13938	0.13371	0.12561	0.09128	0.09001	0.06513	0.01963	0.01991	0.01897	0.05992
1989	136,245	0.276	0.00021	0.11817	0.22478	0.13368	0.16919	0.10076	0.08498	0.04536	0.03088	0.01995	0.01114	0.00120	0.05969
1990	221,962	0.126	0.00071	0.08812	0.14014	0.20822	0.11709	0.12640	0.10339	0.09868	0.04569	0.01956	0.00932	0.00463	0.03806
1991	339,335	0.144	0.00138	0.07349	0.13753	0.21154	0.10729	0.05437	0.10331	0.11826	0.10193	0.03752	0.01508	0.00313	0.03518
1992	450,413	0.106	0.00216	0.03819	0.25005	0.17186	0.16916	0.06228	0.04469	0.08125	0.08000	0.06316	0.01181	0.00534	0.02005
1993	535,519	0.119	0.00479	0.03264	0.12837	0.21235	0.16552	0.12198	0.04575	0.04911	0.08234	0.08233	0.04671	0.01088	0.01721
1994	726,704	0.074	0.00071	0.08875	0.30239	0.15930	0.15848	0.06702	0.03408	0.03328	0.05852	0.05144	0.02245	0.01571	0.00787
1995	1,367,251	0.099	0.00003	0.18718	0.15586	0.13456	0.08978	0.13697	0.05718	0.08427	0.07277	0.04281	0.02543	0.00738	0.00578
1996	1,582,160	0.067	0.00033	0.03773	0.20362	0.19814	0.14332	0.11791	0.12558	0.06498	0.04515	0.02287	0.01586	0.01732	0.00721
1997	2,173,177	0.055	0.00106	0.07183	0.09794	0.14617	0.10018	0.09920	0.10283	0.14866	0.09919	0.06575	0.03218	0.01912	0.01587
1998	2,098,919	0.064	0.00589	0.05958	0.10075	0.14372	0.15136	0.11133	0.08738	0.09777	0.09259	0.04866	0.04597	0.02207	0.03292
1999	1,953,346	0.062	0.00039	0.00743	0.07537	0.10786	0.11237	0.19360	0.12586	0.10795	0.09818	0.06923	0.05035	0.02498	0.02644
2000	2,584,015	0.064	0.00356	0.02137	0.04529	0.15533	0.15168	0.16933	0.19966	0.09557	0.05935	0.04518	0.02493	0.01290	0.01586
2001	2,554,609	0.045	0.00170	0.01553	0.04076	0.07805	0.16409	0.18713	0.17640	0.15741	0.07048	0.03981	0.03448	0.01607	0.01810
2002	2,553,899	0.052	0.00317	0.03562	0.05083	0.07920	0.11422	0.20629	0.14982	0.12079	0.10372	0.05129	0.03890	0.02117	0.02498
2003	2,682,570	0.047	0.00035	0.04553	0.07122	0.06428	0.11528	0.12142	0.17520	0.13276	0.10143	0.07438	0.04304	0.02630	0.02881
2004	3,173,119	0.063	0.00127	0.01806	0.12858	0.09754	0.08148	0.09566	0.09711	0.15098	0.10876	0.08659	0.06406	0.03374	0.03617
2005	3,079,601	0.055	0.00434	0.08402	0.06446	0.13414	0.12610	0.09345	0.09115	0.08397	0.10216	0.07424	0.06973	0.02901	0.04321
2006	3,614,394	0.051	0.00081	0.02834	0.20945	0.06263	0.12243	0.10721	0.06851	0.08024	0.06795	0.09247	0.06733	0.04167	0.05098
2007	2,862,392	0.052	0.00062	0.03268	0.09830	0.12323	0.09599	0.13814	0.09448	0.08547	0.09679	0.09560	0.05763	0.04446	0.03661
2008	3,054,618	0.059	0.00321	0.01403	0.05737	0.06605	0.15785	0.09098	0.16941	0.12409	0.07045	0.08173	0.06487	0.04276	0.05720
2009	2,099,071	0.055	0.00088	0.03088	0.02788	0.05193	0.07758	0.24108	0.10273	0.15564	0.08113	0.05836	0.05782	0.04468	0.06941
2010	2,098,391	0.058	0.00022	0.01035	0.04893	0.02783	0.05848	0.13228	0.26271	0.10345	0.11146	0.08251	0.04706	0.04250	0.07222
2011	2,317,689	0.054	0.00390	0.01838	0.03177	0.05015	0.03966	0.13735	0.15787	0.24812	0.08807	0.08143	0.03775	0.02870	0.07686
2012	1,654,349	0.074	0.00144	0.03236	0.03716	0.03177	0.07348	0.09537	0.14922	0.18255	0.17587	0.05969	0.05344	0.03946	0.06820
2013	2,322,884	0.083	0.00053	0.04376	0.08175	0.05137	0.04516	0.14030	0.10623	0.11100	0.12871	0.15534	0.03757	0.02908	0.06918
2014	1,718,249	0.072	0.00027	0.00728	0.10278	0.06659	0.07649	0.09272	0.11313	0.08143	0.11062	0.12741	0.08378	0.04897	0.08856
2015	1,369,036	0.062	0.00117	0.00935	0.02705	0.17038	0.16748	0.12573	0.09133	0.07937	0.07588	0.07800	0.06288	0.03563	0.07574

Table 12 cont.

	Commercial Discards		Age Proportions												
Year	Total	CV	1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	57,624	0.350	0.00000	0.54917	0.06325	0.19881	0.09759	0.02240	0.04160	0.01760	0.00640	0.00160	0.00148	0.00000	0.00012
1983	40,127	0.350	0.00000	0.59977	0.03620	0.07172	0.19342	0.05759	0.01521	0.01521	0.00652	0.00435	0.00000	0.00000	0.00000
1984	65,639	0.350	0.00000	0.51151	0.02455	0.08854	0.14829	0.17173	0.04288	0.00179	0.00893	0.00100	0.00000	0.00079	0.00000
1985	62,734	0.350	0.00000	0.12319	0.48574	0.09467	0.17361	0.05411	0.04371	0.01665	0.00416	0.00208	0.00208	0.00000	0.00000
1986	174,024	0.350	0.00000	0.03356	0.11928	0.57502	0.16084	0.07651	0.02468	0.00813	0.00199	0.00000	0.00000	0.00000	0.00000
1987	125,066	0.350	0.00000	0.03363	0.11499	0.22866	0.41089	0.13545	0.05213	0.01055	0.00808	0.00315	0.00089	0.00069	0.00089
1988	245,552	0.350	0.00000	0.02501	0.09201	0.14912	0.28898	0.29197	0.09461	0.03713	0.01267	0.00673	0.00089	0.00079	0.00010
1989	338,827	0.350	0.00000	0.04089	0.14828	0.14470	0.24613	0.24425	0.09881	0.04575	0.01872	0.00208	0.00416	0.00416	0.00208
1990	510,011	0.350	0.00000	0.02848	0.13473	0.15869	0.21938	0.22686	0.14039	0.07109	0.01166	0.00302	0.00275	0.00295	0.00000
1991	327,167	0.350	0.00024	0.03861	0.11312	0.19626	0.23638	0.17390	0.11282	0.07598	0.02020	0.01244	0.02000	0.00005	0.00000
1992	186,601	0.350	0.00063	0.01982	0.18337	0.19692	0.23801	0.18589	0.07930	0.05991	0.01821	0.01263	0.00531	0.00000	0.00000
1993	347,839	0.350	0.00000	0.02142	0.14421	0.22715	0.27345	0.18252	0.06020	0.04413	0.02665	0.01324	0.00475	0.00154	0.00075
1994	359,518	0.350	0.00000	0.08837	0.13120	0.12539	0.24511	0.23523	0.10911	0.03484	0.01731	0.01022	0.00198	0.00115	0.00008
1995	515,454	0.350	0.00000	0.14128	0.14651	0.10389	0.18267	0.23589	0.11921	0.03702	0.01468	0.00828	0.00444	0.00455	0.00156
1996	394,824	0.350	0.00000	0.06872	0.28895	0.19334	0.15674	0.14889	0.07810	0.03778	0.01557	0.01010	0.00040	0.00127	0.00013
1997	216,745	0.350	0.00220	0.03279	0.29690	0.28546	0.14119	0.09666	0.06460	0.03041	0.00906	0.01988	0.01226	0.00370	0.00489
1998	326,032	0.350	0.00000	0.04059	0.16532	0.30215	0.25546	0.08955	0.03978	0.03862	0.02411	0.01341	0.01193	0.00742	0.01166
1999	236,619	0.350	0.00416	0.24544	0.21086	0.18487	0.23557	0.06118	0.02203	0.01565	0.00837	0.00551	0.00274	0.00259	0.00103
2000	666,997	0.350	0.00029	0.26755	0.28476	0.23582	0.09400	0.05085	0.04039	0.01174	0.00616	0.00581	0.00120	0.00129	0.00012
2001	310,900	0.350	0.00000	0.00849	0.18681	0.25075	0.28565	0.09460	0.06072	0.03735	0.03108	0.02049	0.01537	0.00629	0.00240
2002	168,201	0.350	0.01011	0.12418	0.25351	0.12728	0.17117	0.14102	0.07361	0.04075	0.03356	0.01340	0.00905	0.00089	0.00148
2003	261,974	0.350	0.00577	0.02377	0.10711	0.20790	0.21654	0.07583	0.11776	0.07112	0.06264	0.05181	0.03116	0.01224	0.01634
2004	465,642	0.350	0.00632	0.11341	0.17340	0.16491	0.13439	0.10455	0.11217	0.08886	0.05057	0.02111	0.02229	0.00508	0.00292
2005	798,544	0.350	0.00054	0.01442	0.13015	0.30761	0.21271	0.08617	0.06812	0.05499	0.05461	0.02893	0.02022	0.01062	0.01091
2006	194,524	0.350	0.00000	0.00285	0.13247	0.14824	0.19018	0.14224	0.07739	0.08584	0.06525	0.06779	0.03800	0.02277	0.02696
2007	606,599	0.350	0.00047	0.01039	0.02999	0.14772	0.16083	0.23059	0.12967	0.07999	0.07034	0.05052	0.03696	0.03294	0.01962
2008	308,715	0.350	0.00000	0.00035	0.00948	0.14601	0.23152	0.18789	0.14471	0.07029	0.04489	0.04225	0.04088	0.04617	0.03556
2009	611,944	0.350	0.00000	0.00271	0.13195	0.27260	0.20243	0.14907	0.05009	0.06279	0.03353	0.02677	0.02567	0.01254	0.02984
2010	254,841	0.350	0.00000	0.00541	0.06361	0.29904	0.25172	0.18137	0.07706	0.03732	0.02564	0.01601	0.01223	0.00703	0.02357
2011	617,457	0.350	0.00000	0.00628	0.09971	0.17774	0.21268	0.13049	0.08823	0.07966	0.06074	0.05007	0.02505	0.01827	0.05107
2012	792,861	0.350	0.00000	0.01150	0.06391	0.14701	0.25963	0.17202	0.13846	0.04847	0.05212	0.02154	0.02805	0.02163	0.03565
2013	525,581	0.350	0.00000	0.00857	0.13460	0.22159	0.19070	0.14050	0.08552	0.06236	0.04187	0.03841	0.01400	0.02064	0.04124
2014	931,391	0.350	0.00000	0.00002	0.04071	0.11598	0.25063	0.19333	0.15985	0.06746	0.05112	0.05456	0.03560	0.00674	0.02402
2015	299,566	0.350	0.00000	0.00005	0.02906	0.29837	0.16413	0.09901	0.09145	0.06800	0.05143	0.04841	0.04823	0.05879	0.04306

Table 13. Catch weights-at age (kilograms).

Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	0.13	0.64	1.09	1.54	2.42	3.75	4.83	5.79	6.20	8.68	10.80	11.20	14.05
1983	0.20	0.55	0.94	1.37	2.37	3.29	3.77	5.36	6.01	8.10	9.57	10.39	11.11
1984	0.24	0.60	1.69	1.62	2.67	3.39	5.07	5.65	6.76	7.76	8.41	12.65	12.38
1985	0.06	0.61	1.07	1.66	2.19	3.59	4.91	5.46	6.77	7.45	9.00	10.69	13.91
1986	0.14	0.57	1.27	2.40	2.44	3.12	3.95	5.05	5.44	6.09	7.75	9.16	12.78
1987	0.20	0.77	1.41	2.11	2.50	2.91	3.61	4.74	5.52	6.49	7.77	9.78	13.15
1988	0.31	0.91	1.10	1.98	3.12	4.02	4.38	4.70	5.24	5.62	8.58	10.40	13.27
1989	0.16	0.83	1.22	2.23	3.06	4.53	5.37	6.23	6.04	8.68	8.94	9.74	13.36
1990	0.08	0.89	1.14	2.05	2.35	3.83	4.91	5.96	5.70	5.97	7.44	9.08	12.60
1991	0.21	0.92	1.29	2.17	2.62	3.17	4.81	5.64	6.46	6.24	9.46	8.30	14.22
1992	0.10	0.69	1.31	1.93	2.81	3.67	4.90	5.79	6.96	8.15	9.77	12.44	13.97
1993	0.07	0.76	1.31	1.99	2.77	3.58	4.80	6.11	7.03	8.01	9.53	10.76	14.55
1994	0.24	1.05	1.69	2.21	2.85	3.50	4.94	6.20	6.80	7.53	9.73	10.69	12.73
1995	0.28	0.70	1.35	2.18	2.77	3.65	5.38	6.16	7.27	8.86	7.57	9.73	16.66
1996	0.14	1.05	1.47	2.32	3.23	4.52	6.39	7.11	7.81	9.20	9.31	10.10	13.70
1997	0.13	0.62	1.18	2.46	2.81	3.64	4.51	5.07	6.73	9.17	9.94	10.24	14.78
1998	0.39	0.77	1.20	1.62	2.25	2.95	4.69	5.66	6.82	7.03	7.76	9.87	11.87
1999	0.62	0.90	1.11	1.44	1.91	2.51	3.36	5.03	6.56	7.85	8.69	9.76	11.98
2000	0.37	0.55	1.10	1.45	1.96	2.79	3.89	5.09	7.11	7.37	9.70	10.70	13.55
2001	0.16	0.38	1.12	1.75	2.21	3.25	4.12	5.02	6.36	7.79	8.65	8.29	10.87
2002	0.12	0.31	1.06	1.51	2.18	3.17	4.19	5.48	6.03	7.56	9.09	9.75	11.52
2003	0.10	0.60	1.00	1.40	2.20	3.20	4.10	5.20	6.10	7.20	8.50	9.40	11.00
2004	0.23	0.33	0.84	1.40	2.43	3.11	4.14	5.17	6.07	7.12	8.18	9.03	10.71
2005	0.13	0.50	1.14	1.64	2.22	3.23	4.18	5.64	6.38	7.21	8.51	10.00	12.19
2006	0.18	0.38	0.81	1.35	1.96	2.80	3.84	5.35	6.70	7.41	8.58	9.40	12.05
2007	0.10	0.46	0.94	1.30	2.10	3.07	4.31	5.32	6.89	7.84	9.39	10.12	12.77
2008	0.21	0.45	1.04	1.43	2.14	3.47	5.05	5.51	6.69	8.26	9.19	9.82	12.00
2009	0.26	0.62	1.03	1.41	1.92	3.29	4.49	5.74	6.87	7.73	8.81	9.47	12.24
2010	0.16	0.70	1.11	1.41	1.99	3.34	4.27	5.21	6.27	7.65	8.97	9.15	11.59
2011	0.20	0.52	1.04	1.55	2.00	3.08	4.10	5.13	6.41	7.54	8.20	9.98	13.08
2012	0.08	0.48	1.01	1.67	2.30	3.25	4.44	5.88	6.57	8.31	9.05	10.41	13.84
2013	0.19	0.49	0.96	1.39	2.27	3.38	4.14	5.30	6.69	7.55	9.26	10.44	13.14
2014	0.49	0.55	0.89	1.27	2.15	3.07	4.28	5.30	6.99	8.43	9.17	11.91	14.29
2015	0.15	0.29	0.92	1.59	2.50	3.75	4.56	5.69	6.97	7.69	8.95	10.54	14.12

Table 14. Description and characteristics of fishery-independent and –dependent indices.

State	Index	Design	Time of Year	What Stock?	Ages
Marine Recreational Fisheries Survey	Total Catch Rate Index	Stratified Random	May-Dec	Mixed	Aggregate (3-13+)
Connecticut Trawl Survey	Mean number per tow	Stratified Random	April-June	Mixed	Aggregate (4-6)
NEFSC Trawl Survey	Mean number per tow	Stratified Random	March-May	Mixed	Aggregate (2-9)
New Jersey Trawl Survey	Mean number per tow	Stratified Random	April	Mixed	2-13+
New York Ocean Haul Seine Survey	Mean number per haul	Random	Sept-Nov	Mixed	2-13+
Delaware Electrofishing Survey	Mean number per hour	Lattice	April-May	Delaware	2-13+
New York YOY Seine Survey	Mean number per haul	Fixed	July-Nov	Hudson	0
New York W. Long Island Seine Survey	Mean number per haul	Fixed	May-Oct	Hudson	1
New Jersey YOY Seine Survey	Mean number per haul	Fixed/Random	Aug-Oct	Delaware	0
Virginia YOY Seine Survey	Mean number per haul	Fixed	July-Sept	Chesapeake	0
Maryland YOY and Age 1 Seine Survey	Mean number per haul	Fixed	July-Sept	Chesapeake	0-1
Maryland Gillnet Survey	Mean number per set	Stratified Random	April-May	Chesapeake	2-13+
Virginia Pound Net Survey	Mean number per set	Fixed	March-May	Chesapeake	1-13+

Table 15. Index and coefficients of variation for fishery-independent and –dependent indices.

	Aggregate						Age-specific									
	MRIP		NEFSC		CTTRL		NYOHS		NJTRL		MD SSN		DE SSN		VAPNET	
Year	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV
1982																
1983																
1984					0.02	1.00										
1985					0.01	1.00					4.88	0.25				
1986					0.01	1.00					10.07	0.25				
1987					0.05	0.40	3.83	0.11			7.15	0.25				
1988	0.40	0.79			0.04	0.50	3.60	0.10			3.27	0.25				
1989	0.30	0.85			0.06	0.33	2.58	0.13	0.23	0.61	3.96	0.25				
1990	0.25	0.77			0.16	0.27	3.50	0.18	1.13	0.60	5.04	0.25				
1991	0.32	0.38	0.23	0.17	0.15	0.21	3.28	0.19	1.41	0.67	4.61	0.25			18.75	0.25
1992	0.90	0.24	0.24	0.34	0.22	0.25	3.00	0.19	0.65	0.70	6.29	0.25			8.45	0.25
1993	0.67	0.21	0.48	0.21	0.27	0.16	3.32	0.11	0.67	0.53	6.25	0.25			21.72	0.25
1994	1.07	0.16	1.39	0.22	0.30	0.19	2.90	0.15	1.47	0.40	5.13	0.25			13.87	0.25
1995	1.32	0.14	0.95	0.20	0.60	0.13	2.84	0.18	4.21	0.14	4.62	0.25			14.52	0.25
1996	1.64	0.12	0.60	0.20	0.63	0.14	5.11	0.10	5.66	0.20	7.59	0.25	3.38	0.10	12.30	0.25
1997	1.59	0.13	1.18	0.13	0.85	0.13	4.84	0.14	5.82	0.21	3.87	0.25	4.10	0.09	20.10	0.25
1998	2.03	0.10	0.73	0.15	0.97	0.13	5.01	0.15	5.01	0.10	4.79	0.25	3.73	0.12	14.85	0.25
1999	2.00	0.11	0.45	0.23	1.10	0.12	3.46	0.16	3.51	0.12	3.97	0.25	2.59	0.12	29.89	0.25
2000	1.76	0.12	1.27	0.19	0.84	0.14	4.36	0.11	5.31	0.13	3.52	0.25	2.05	0.16	39.70	0.25
2001	1.42	0.12	0.62	0.26	0.61	0.15	3.47	0.15	1.58	0.36	2.83	0.25	1.88	0.18	18.63	0.25
2002	1.23	0.14	0.98	0.14	1.30	0.10	3.23	0.20	2.13	0.17	4.00	0.25	1.60	0.15	5.23	0.25
2003	1.06	0.15	0.77	0.24	0.87	0.09	4.24	0.19	6.83	0.10	4.55	0.25	2.47	0.12	15.65	0.25
2004	1.17	0.14	0.33	0.25	0.56	0.09	4.88	0.09	6.05	0.15	6.11	0.25	2.89	0.12	31.64	0.25
2005	1.52	0.14	0.29	0.20	1.17	0.10	3.91	0.14	6.41	0.12	4.96	0.25	1.77	0.14	18.14	0.25
2006	1.61	0.13	0.63	0.29	0.61	0.09	4.37	0.14	2.61	0.28	4.92	0.25	2.22	0.18	22.14	0.25
2007	0.93	0.15	0.74	0.13	1.02	0.10			3.50	0.32	2.14	0.25	1.78	0.33	31.52	0.25
2008	0.81	0.15	0.65	0.17	0.57	0.09			1.38	0.33	4.37	0.25	1.72	0.12	18.32	0.25
2009	0.80	0.15			0.60	0.10			2.24	0.34	5.70	0.25	1.25	0.17	22.96	0.25
2010	0.76	0.15			0.40	0.21			0.73	0.53	4.53	0.25	2.69	0.21	34.89	0.25
2011	0.68	0.15			0.48	0.21			2.07	0.28	4.58	0.25	3.25	0.20	8.96	0.25
2012	1.10	0.15			0.43	0.17			3.48	0.09	2.64	0.25	1.94	0.19	17.48	0.25
2013	1.72	0.15			0.67	0.13			2.51	0.10	4.41	0.25	2.10	0.07	10.60	0.25
2014	1.15	0.15			0.41	0.20			0.31	0.19	5.57	0.25			13.01	0.25
2015	1.33	0.15			0.20	0.24			0.29	0.31	7.34	0.25	0.86	0.13	7.26	0.25

Table 16. Young-of-the-year and age-1 fishery-independent indices of relative abundance.

	Unlagged											
	YOY								Age 1			
	NY		NJ		MD		VA		NY		MD	
Year	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV
1969					2.81	0.34					0.25	0.50
1970					12.52	0.26					0.13	0.50
1971					4.02	0.28					1.36	0.38
1972					3.26	0.30					0.46	0.42
1973					2.32	0.34					0.46	0.34
1974					2.63	0.32					0.26	0.38
1975					2.81	0.28					0.22	0.46
1976					1.58	0.30					0.13	0.70
1977					1.60	0.30					0.06	0.76
1978					3.75	0.26					0.18	0.46
1979	3.54	0.30			1.78	0.28					0.29	0.46
1980	10.01	0.24			1.02	0.28					0.18	0.44
1981	14.57	0.22			0.59	0.32					0.02	1.02
1982	23.30	0.19	0.10	1.22	3.57	0.27	2.71	0.50			0.02	1.16
1983	26.72	0.23	0.07	1.48	0.61	0.33	3.40	0.40			0.32	0.40
1984	24.67	0.20	0.37	0.71	1.64	0.28	4.47	0.46			0.01	2.00
1985	2.20	0.54	0.03	2.05	0.91	0.36	2.41	0.41	0.61	1.20	0.16	0.50
1986	4.65	0.49	0.32	0.55	1.34	0.32	4.74	0.37	0.30	1.00	0.03	0.94
1987	28.36	0.57	0.53	0.47	1.46	0.33	15.74	0.34	0.21	1.11	0.06	0.92
1988	49.28	0.37	0.35	0.41	0.73	0.39	7.64	0.32	0.81	0.90	0.07	0.58
1989	35.37	0.44	1.07	0.36	4.87	0.34	11.23	0.29	1.78	0.70	0.19	0.48
1990	35.53	0.46	1.05	0.32	1.03	0.29	7.34	0.31	0.37	0.84	0.33	0.42
1991	6.00	0.52	0.47	0.26	1.52	0.32	3.76	0.33	1.26	0.67	0.20	0.44
1992	16.93	0.37	1.18	0.23	2.34	0.32	7.35	0.36	1.34	0.66	0.15	0.52
1993	21.99	0.48	1.78	0.24	13.97	0.25	18.11	0.23	0.75	0.70	0.19	0.50
1994	23.61	0.38	0.96	0.24	6.40	0.27	10.48	0.27	1.43	0.76	0.78	0.36
1995	19.03	0.35	1.98	0.25	4.41	0.24	5.45	0.32	1.29	0.68	0.12	0.56
1996	12.12	0.40	1.70	0.23	17.61	0.25	23.00	0.29	1.54	0.75	0.08	0.78
1997	27.11	0.49	1.01	0.24	3.91	0.25	9.35	0.30	1.00	0.84	0.26	0.46
1998	16.10	0.43	1.31	0.26	5.50	0.25	13.25	0.29	2.10	0.79	0.17	0.50
1999	30.67	0.39	1.90	0.23	5.34	0.30	2.80	0.34	2.05	0.59	0.37	0.36
2000	6.88	0.54	1.78	0.26	7.42	0.23	16.18	0.31	1.56	0.74	0.26	0.40
2001	28.90	0.54	1.20	0.23	12.57	0.28	14.17	0.32	2.16	0.60	0.32	0.36
2002	14.72	0.37	0.53	0.29	2.20	0.27	3.98	0.37	2.53	0.53	0.79	0.32
2003	29.78	0.50	2.47	0.24	10.83	0.26	22.89	0.28	1.19	0.53	0.07	0.66
2004	8.73	0.38	1.13	0.26	4.85	0.25	12.70	0.27	2.41	0.53	0.74	0.36
2005	11.28	0.54	1.22	0.22	6.91	0.25	9.09	0.28	0.64	0.89	0.28	0.44
2006	5.83	0.44	0.67	0.25	1.78	0.29	10.10	0.28	2.02	0.62	0.28	0.42
2007	42.65	0.42	1.41	0.21	5.12	0.27	11.96	0.30	0.58	0.80	0.07	0.60
2008	19.04	0.39	1.26	0.24	1.26	0.31	7.97	0.33	1.24	0.65	0.31	0.40
2009	13.92	0.47	1.92	0.24	3.92	0.23	8.42	0.30	0.33	0.79	0.12	0.54
2010	25.62	0.46	1.30	0.21	2.54	0.25	9.07	0.35	0.45	0.76	0.17	0.45
2011	12.16	0.53	1.41	0.26	9.57	0.24	27.09	0.26	2.00	0.66	0.02	1.02
2012	9.85	0.49	0.34	0.24	0.49	0.32	2.68	0.29	0.90	0.60	0.35	0.34
2013	5.07	0.41	0.90	0.13	3.42	0.21	10.94	0.29	0.56	0.68	0.05	0.74
2014	24.60	0.38	1.65	0.08	4.06	0.29	11.30	0.29	0.82	0.61	0.12	0.57
2015	21.68	0.44	0.94	0.12	10.67	0.22	12.00	0.26	3.16	0.56	0.23	0.39

Table 17. Age composition of age-specific survey indices.

NYOHS

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1987		0.0318	0.1949	0.3591	0.2787	0.0883	0.0349	0.0067	0.0017	0.0000	0.0006	0.0000	0.0028
1988		0.2255	0.2687	0.1945	0.1660	0.0851	0.0218	0.0144	0.0039	0.0021	0.0007	0.0000	0.0137
1989		0.1833	0.2690	0.1478	0.1596	0.1025	0.0936	0.0217	0.0030	0.0020	0.0030	0.0020	0.0108
1990		0.0608	0.2957	0.3063	0.1139	0.0985	0.0557	0.0444	0.0158	0.0058	0.0010	0.0000	0.0023
1991		0.2070	0.3666	0.2439	0.0519	0.0166	0.0253	0.0416	0.0230	0.0063	0.0020	0.0036	0.0115
1992		0.0792	0.4166	0.2577	0.1211	0.0329	0.0143	0.0170	0.0250	0.0175	0.0032	0.0058	0.0096
1993		0.1563	0.3868	0.2908	0.0701	0.0328	0.0094	0.0090	0.0115	0.0131	0.0070	0.0025	0.0082
1994		0.1410	0.2705	0.1562	0.1346	0.0832	0.0546	0.0375	0.0222	0.0406	0.0127	0.0241	0.0203
1995		0.2450	0.2695	0.2542	0.0720	0.0658	0.0352	0.0123	0.0054	0.0123	0.0115	0.0031	0.0084
1996		0.0832	0.7475	0.1142	0.0328	0.0094	0.0073	0.0027	0.0013	0.0007	0.0000	0.0005	0.0003
1997		0.2063	0.2425	0.4508	0.0669	0.0184	0.0037	0.0037	0.0039	0.0017	0.0007	0.0009	0.0006
1998		0.1876	0.2969	0.1714	0.2855	0.0366	0.0091	0.0058	0.0029	0.0002	0.0010	0.0015	0.0011
1999		0.0697	0.6277	0.1722	0.0594	0.0438	0.0050	0.0032	0.0046	0.0035	0.0039	0.0007	0.0046
2000		0.1273	0.1930	0.4338	0.1541	0.0364	0.0368	0.0041	0.0039	0.0016	0.0018	0.0010	0.0044
2001		0.0524	0.4553	0.1474	0.2129	0.0735	0.0274	0.0194	0.0032	0.0039	0.0011	0.0000	0.0025
2002		0.3225	0.2261	0.1843	0.0805	0.0735	0.0572	0.0198	0.0198	0.0013	0.0048	0.0018	0.0057
2003		0.2022	0.3647	0.1251	0.0922	0.0406	0.0646	0.0506	0.0227	0.0177	0.0126	0.0009	0.0049
2004		0.0501	0.5698	0.2734	0.0628	0.0222	0.0076	0.0061	0.0036	0.0011	0.0014	0.0017	0.0002
2005		0.2444	0.1280	0.4126	0.1370	0.0336	0.0138	0.0035	0.0090	0.0065	0.0035	0.0037	0.0045
2006		0.0639	0.6359	0.0728	0.1610	0.0424	0.0144	0.0057	0.0025	0.0003	0.0010	0.0000	0.0000

NJ Trawl

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1989	0.0000	0.2780	0.4440	0.0060	0.1370	0.0520	0.0110	0.0160	0.0000	0.0560	0.0000	0.0000	0.0000
1990	0.0000	0.0610	0.1820	0.0200	0.4140	0.1320	0.0290	0.0970	0.0050	0.0610	0.0000	0.0000	0.0000
1991	0.0000	0.2770	0.2840	0.0210	0.0200	0.1480	0.1320	0.0170	0.0340	0.0460	0.0210	0.0000	0.0000
1992	0.0000	0.2580	0.4780	0.0610	0.0640	0.0550	0.0740	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000
1993	0.0000	0.2380	0.3530	0.1500	0.0870	0.1230	0.0240	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000
1994	0.0000	0.2870	0.3700	0.1550	0.0900	0.0480	0.0310	0.0100	0.0090	0.0000	0.0000	0.0000	0.0000
1995	0.0000	0.6580	0.1720	0.0670	0.0450	0.0320	0.0120	0.0070	0.0040	0.0030	0.0000	0.0000	0.0000
1996	0.0000	0.1620	0.5800	0.1600	0.0610	0.0210	0.0130	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000
1997	0.0000	0.1870	0.4090	0.2360	0.1130	0.0350	0.0120	0.0050	0.0010	0.0030	0.0000	0.0000	0.0000
1998	0.0000	0.4420	0.1930	0.0430	0.1300	0.0860	0.0540	0.0250	0.0140	0.0110	0.0020	0.0010	0.0000
1999	0.0000	0.0770	0.3200	0.1810	0.2560	0.1150	0.0320	0.0110	0.0050	0.0030	0.0000	0.0010	0.0000
2000	0.0000	0.1520	0.1400	0.1570	0.2740	0.1670	0.0730	0.0270	0.0060	0.0020	0.0010	0.0000	0.0000
2001	0.0000	0.1480	0.1670	0.1990	0.2990	0.1030	0.0420	0.0230	0.0130	0.0060	0.0010	0.0000	0.0000
2002	0.0000	0.0050	0.0230	0.0710	0.2060	0.3590	0.2300	0.0760	0.0240	0.0040	0.0000	0.0000	0.0000
2003	0.0000	0.3040	0.2380	0.0410	0.1260	0.0970	0.1220	0.0490	0.0150	0.0060	0.0010	0.0010	0.0000
2004	0.0000	0.1820	0.5190	0.0900	0.0400	0.0580	0.0430	0.0360	0.0210	0.0080	0.0040	0.0010	0.0000
2005	0.0000	0.4928	0.2179	0.0610	0.1055	0.0473	0.0418	0.0193	0.0090	0.0025	0.0018	0.0004	0.0007
2006	0.0000	0.0605	0.1003	0.0549	0.2475	0.2560	0.1001	0.0690	0.0456	0.0447	0.0129	0.0073	0.0012
2007	0.0000	0.0287	0.0405	0.2849	0.1571	0.2686	0.0905	0.0325	0.0250	0.0232	0.0204	0.0193	0.0101
2008	0.0000	0.0126	0.0542	0.1013	0.4130	0.0979	0.1441	0.0902	0.0269	0.0158	0.0110	0.0196	0.0118
2009	0.0000	0.1092	0.0085	0.0339	0.1526	0.4425	0.0972	0.0936	0.0374	0.0169	0.0039	0.0034	0.0008
2010	0.0000	0.0272	0.0165	0.0035	0.0448	0.1776	0.4689	0.0912	0.0955	0.0532	0.0212	0.0004	0.0000
2011	0.0000	0.0998	0.0867	0.0706	0.0215	0.0954	0.1651	0.2748	0.0888	0.0472	0.0258	0.0059	0.0183
2012	0.0029	0.1942	0.0929	0.0413	0.0819	0.0460	0.1051	0.1715	0.2066	0.0473	0.0084	0.0018	0.0000
2013	0.0000	0.5249	0.1973	0.0071	0.0177	0.0622	0.0470	0.0417	0.0394	0.0529	0.0075	0.0024	0.0000
2014	0.0000	0.0661	0.5814	0.1700	0.0191	0.0435	0.0389	0.0231	0.0272	0.0116	0.0116	0.0075	0.0000
2015	0.0714	0.1429	0.1857	0.6000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 17 cont.

MDSSN

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1985		0.2879	0.6259	0.0653	0.0098	0.0027	0.0045	0.0001	0.0008	0.0001	0.0001	0.0008	0.0020
1986		0.2286	0.2593	0.4942	0.0040	0.0053	0.0020	0.0029	0.0028	0.0000	0.0000	0.0000	0.0009
1987		0.1989	0.3609	0.1610	0.2463	0.0250	0.0031	0.0036	0.0003	0.0000	0.0000	0.0000	0.0009
1988		0.1246	0.2370	0.2178	0.1741	0.2279	0.0040	0.0000	0.0001	0.0133	0.0000	0.0000	0.0011
1989		0.0837	0.3908	0.2034	0.1150	0.1233	0.0831	0.0004	0.0002	0.0001	0.0000	0.0000	0.0000
1990		0.1550	0.3140	0.2391	0.0959	0.0681	0.0636	0.0592	0.0017	0.0002	0.0002	0.0010	0.0020
1991		0.1593	0.4148	0.1351	0.1023	0.0580	0.0566	0.0418	0.0231	0.0009	0.0033	0.0000	0.0049
1992		0.0435	0.3515	0.2440	0.0932	0.1111	0.0682	0.0463	0.0218	0.0111	0.0052	0.0000	0.0039
1993		0.0655	0.2112	0.2994	0.1411	0.0816	0.0830	0.0593	0.0361	0.0118	0.0050	0.0014	0.0047
1994		0.0523	0.2016	0.1908	0.2296	0.1159	0.0662	0.0835	0.0343	0.0167	0.0061	0.0024	0.0006
1995		0.1082	0.2538	0.1457	0.1319	0.1122	0.0871	0.0543	0.0429	0.0252	0.0210	0.0076	0.0101
1996		0.0052	0.4852	0.1346	0.0458	0.0916	0.0849	0.0557	0.0467	0.0221	0.0200	0.0062	0.0021
1997		0.1050	0.1197	0.3477	0.1189	0.0560	0.0510	0.0668	0.0577	0.0319	0.0311	0.0097	0.0046
1998		0.0753	0.2983	0.0684	0.3118	0.0675	0.0276	0.0387	0.0362	0.0314	0.0190	0.0207	0.0052
1999		0.0177	0.4392	0.2019	0.1432	0.0890	0.0287	0.0166	0.0279	0.0132	0.0128	0.0067	0.0031
2000		0.0290	0.1437	0.3053	0.1427	0.1652	0.0773	0.0399	0.0229	0.0225	0.0220	0.0138	0.0157
2001		0.0167	0.1384	0.1852	0.1826	0.0822	0.1007	0.1345	0.0466	0.0421	0.0348	0.0196	0.0166
2002		0.2407	0.1037	0.0961	0.2081	0.0849	0.0747	0.0790	0.0568	0.0185	0.0102	0.0135	0.0138
2003		0.0390	0.2418	0.1051	0.0815	0.1352	0.1248	0.0676	0.0604	0.0756	0.0217	0.0232	0.0240
2004		0.0512	0.2932	0.1992	0.0671	0.0539	0.0719	0.0761	0.0609	0.0432	0.0447	0.0133	0.0254
2005		0.1353	0.2111	0.1477	0.1941	0.0486	0.0516	0.0434	0.0548	0.0408	0.0350	0.0226	0.0152
2006		0.0174	0.5259	0.0817	0.0969	0.0599	0.0297	0.0253	0.0366	0.0425	0.0265	0.0212	0.0366
2007		0.0376	0.1067	0.3553	0.0691	0.0710	0.0626	0.0343	0.0417	0.0464	0.0742	0.0371	0.0640
2008		0.0074	0.1989	0.2486	0.2574	0.0385	0.0520	0.0445	0.0254	0.0272	0.0227	0.0317	0.0457
2009		0.0704	0.0739	0.2684	0.0905	0.2425	0.0370	0.0398	0.0547	0.0158	0.0277	0.0212	0.0579
2010		0.0166	0.3305	0.1113	0.1435	0.1115	0.1212	0.0148	0.0307	0.0225	0.0088	0.0113	0.0777
2011		0.0500	0.1600	0.2700	0.0990	0.1250	0.0830	0.0980	0.0220	0.0200	0.0170	0.0170	0.0390
2012		0.0574	0.1965	0.0876	0.0895	0.0674	0.0872	0.0854	0.0946	0.0281	0.0624	0.0512	0.0926
2013		0.0166	0.3305	0.1113	0.1435	0.1115	0.1212	0.0148	0.0307	0.0225	0.0088	0.0113	0.0777
2014		0.0500	0.1600	0.2700	0.0990	0.1250	0.0830	0.0980	0.0220	0.0200	0.0170	0.0170	0.0390
2015		0.0260	0.0100	0.6246	0.0632	0.0687	0.0331	0.0288	0.0215	0.0309	0.0266	0.0279	0.0388

DE SSN

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1996		0.0060	0.4170	0.1920	0.0610	0.0850	0.0760	0.0640	0.0580	0.0150	0.0090	0.0090	0.0090
1997		0.0930	0.0740	0.3910	0.1370	0.0510	0.0640	0.0730	0.0320	0.0300	0.0230	0.0090	0.0230
1998		0.0400	0.0870	0.0980	0.3470	0.0900	0.0610	0.1050	0.0950	0.0340	0.0250	0.0080	0.0110
1999		0.0000	0.1050	0.1440	0.1770	0.2350	0.0720	0.0540	0.0760	0.0580	0.0510	0.0140	0.0140
2000		0.0360	0.0360	0.2100	0.1710	0.1380	0.2230	0.0660	0.0300	0.0390	0.0320	0.0100	0.0100
2001		0.0060	0.1150	0.1000	0.1850	0.1100	0.1400	0.2000	0.0500	0.0150	0.0400	0.0200	0.0200
2002		0.0340	0.0710	0.1910	0.1780	0.1570	0.1130	0.0890	0.0970	0.0260	0.0160	0.0100	0.0180
2003		0.0200	0.0970	0.0970	0.1340	0.0890	0.1110	0.1250	0.1050	0.1210	0.0340	0.0280	0.0380
2004		0.0070	0.1660	0.2310	0.0980	0.0680	0.0540	0.1120	0.0780	0.0810	0.0440	0.0140	0.0470
2005		0.0960	0.1570	0.1680	0.1980	0.0810	0.0460	0.0300	0.0360	0.0610	0.0360	0.0460	0.0460
2006		0.0595	0.2007	0.0967	0.1413	0.1413	0.0706	0.0520	0.0409	0.0483	0.0483	0.0372	0.0632
2007		0.0061	0.0887	0.3700	0.1804	0.1009	0.0734	0.0306	0.0245	0.0306	0.0275	0.0398	0.0275
2008		0.0299	0.0329	0.1257	0.3024	0.1467	0.1317	0.0449	0.0359	0.0359	0.0269	0.0449	0.0419
2009		0.1296	0.1014	0.0930	0.1803	0.1352	0.0901	0.0789	0.0366	0.0338	0.0169	0.0282	0.0761
2010		0.1469	0.2041	0.1204	0.1143	0.1224	0.0898	0.0469	0.0429	0.0245	0.0224	0.0204	0.0449
2011		0.0220	0.0550	0.1890	0.1720	0.1300	0.0950	0.1140	0.0950	0.0450	0.0300	0.0120	0.0410
2012		0.1538	0.2985	0.2062	0.0308	0.0338	0.0185	0.0677	0.0338	0.0185	0.0154	0.0554	0.0677
2013		0.0382	0.0795	0.0572	0.0684	0.1701	0.1590	0.1335	0.1145	0.0636	0.0334	0.0270	0.0556
2014													
2015		0.0496	0.0780	0.1560	0.2199	0.1064	0.0922	0.0426	0.0213	0.0638	0.0851	0.0355	0.0496

Table 17 cont.

VA Poundnet

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1991	0.0231	0.0182	0.1970	0.4403	0.1469	0.0919	0.0275	0.0138	0.0275	0.0000	0.0000	0.0138	0.0000
1992	0.0245	0.0613	0.0736	0.1963	0.3374	0.1411	0.0368	0.0491	0.0245	0.0552	0.0000	0.0000	0.0000
1993	0.0056	0.0267	0.0487	0.1678	0.4470	0.1710	0.0305	0.0197	0.0272	0.0216	0.0342	0.0000	0.0000
1994	0.0000	0.1082	0.0361	0.0999	0.3449	0.1668	0.0864	0.0443	0.0391	0.0248	0.0248	0.0248	0.0000
1995	0.0029	0.2184	0.3448	0.0718	0.1609	0.0489	0.0431	0.0489	0.0287	0.0057	0.0201	0.0057	0.0000
1996	0.0000	0.0426	0.3314	0.2387	0.1361	0.1052	0.0743	0.0309	0.0309	0.0075	0.0000	0.0000	0.0025
1997	0.0000	0.0306	0.1990	0.4133	0.0638	0.0026	0.0357	0.0408	0.0765	0.0510	0.0510	0.0179	0.0179
1998	0.0000	0.0132	0.1492	0.4393	0.1027	0.0028	0.0361	0.0486	0.0541	0.0618	0.0618	0.0153	0.0153
1999	0.0000	0.0269	0.3932	0.3918	0.0951	0.0037	0.0170	0.0147	0.0109	0.0123	0.0133	0.0147	0.0065
2000	0.0000	0.0008	0.3964	0.4604	0.0848	0.0028	0.0127	0.0127	0.0102	0.0074	0.0094	0.0013	0.0013
2001	0.0000	0.0038	0.1471	0.4020	0.2303	0.0054	0.0311	0.0467	0.0467	0.0435	0.0242	0.0140	0.0054
2002	0.0000	0.0000	0.0975	0.2753	0.2639	0.0478	0.1300	0.0784	0.0535	0.0363	0.0115	0.0000	0.0057
2003	0.0000	0.0000	0.0486	0.1917	0.2128	0.0236	0.1169	0.0895	0.1086	0.0914	0.0722	0.0211	0.0236
2004	0.0000	0.0000	0.1111	0.1783	0.1889	0.1120	0.0714	0.1332	0.0746	0.0535	0.0320	0.0352	0.0099
2005	0.0000	0.0034	0.1037	0.3076	0.1569	0.0402	0.0436	0.0958	0.0958	0.0533	0.0391	0.0323	0.0283
2006	0.0000	0.0041	0.3606	0.2925	0.1449	0.0064	0.0233	0.0416	0.0393	0.0535	0.0105	0.0091	0.0142
2007	0.0000	0.0010	0.0799	0.2713	0.1957	0.0362	0.0355	0.0479	0.0600	0.0850	0.1206	0.0225	0.0444
2008	0.0000	0.0093	0.2402	0.3930	0.1779	0.0278	0.0328	0.0311	0.0158	0.0235	0.0235	0.0251	0.0000
2009	0.0000	0.0031	0.0826	0.2215	0.3028	0.0939	0.0533	0.0533	0.0520	0.0520	0.0293	0.0162	0.0402
2010	0.0000	0.0069	0.0787	0.1945	0.3121	0.1266	0.0458	0.0308	0.0380	0.0530	0.0329	0.0209	0.0598
2011	0.0000	0.0090	0.0516	0.1211	0.1547	0.1076	0.0886	0.0987	0.1076	0.1166	0.0706	0.0280	0.0460
2012	0.0000	0.0000	0.0824	0.1882	0.2235	0.1247	0.0612	0.0541	0.0753	0.0494	0.0565	0.0259	0.0588
2013	0.0000	0.0000	0.1557	0.1642	0.1802	0.0783	0.0283	0.0245	0.0283	0.1066	0.0368	0.0821	0.1151
2014	0.0000	0.0000	0.2575	0.2037	0.0315	0.0000	0.0046	0.0361	0.0500	0.1038	0.1176	0.0407	0.1545
2015	0.0000	0.0000	0.0854	0.4394	0.1570	0.0138	0.0193	0.0138	0.0000	0.0716	0.0455	0.0592	0.0950

Table 18. Model structure, equation, and data inputs used in this assessment.

General Definitions	Symbol	Description/Definition
Year Index	y	y = {1982,..,2014} for catch. y = {1970,..,2014} for indices.
Age Index	a	a = {1,..,13+}
Fleet Index	f	f = {1: Chesapeake Bay, 2: Coast, 3: Commercial Dead Discards}
Indices Index:	t	t = {1,..,14}
Input Data	**Symbol**	**Description/Definition**
Observed Fleet Catch	$C_{f,y}$	Reported number of striped bass killed each year (y) by fleet (f)
Coefficient of Variation for Fleets	$CV_{f,y}$	Calculated from MRIP harvest and releases estimates with associated proportional standard errors (commercial harvest from census – no error)
Observed Fleet Age Compositions	$P_{f,y,a}$	Proportion-at-age (a) for each year (y) and fleet (f)
Observed Total Indices of Relative Abundance	$I_{t,y}$	Reported by various states. YOY and Age 1 Indices: 6 Age-aggregated Indices: 3 (1 fishery-dependent; 2 fishery-independent) Indices with Age Composition: 5 (all fishery-independent)
Coefficient of Variation for Indices	$CV_{t,y}$	Calculated from indices and associated standard errors
Observed Age Compositions of Indices of Relative Abundance	$P_{t,y,a}$	Proportion-at-age (a) for each year (y) and index (t)
Effective Sample Size	$\hat{n}$	Starting Values Fleets: Bay – 32, Ocean – 47, Commercial Discards - 23 Indices: NYOHS – 19, NJ Trawl – 5.0, MDSSN – 18, DESSN – 25, VAPNET – 8. The multiplier from equation 1.8 method of Francis (2011) is used to adjust the starting values.

Table 18 cont.

Population Model	Symbol	Equation
Age-1 numbers	$\hat{N}_{y,1}$	$\hat{N}_{y,1} = \exp^{\left(\log_e(\hat{\alpha})+\log_e(SSB_{y-1})-\log_e\left(1+\frac{SSB_{y-1}}{\hat{\beta}}\right)+\hat{e}_y-0.5\hat{\sigma}_R^2\right)}$ $\hat{\sigma}_R = \sqrt{\frac{\sum_y(\hat{e}_y-\hat{\bar{e}})^2}{n-1}}$ where e_y are independent and identically distributed normal random variables with zero mean and constant variance and are constrained to sum to zero over all years
Abundance-at-Age	$\hat{N}_{y,a}$	First year (ages 2-A in 1970): $\hat{N}_{y,a} = \hat{N}_{y,a-1}\exp^{-\hat{F}_{1982,a-1}-M_{1982,a-1}}$ Rest of years (ages 2-12): $\hat{N}_{y,a} = \hat{N}_{y-1,a-1}\exp^{-\hat{F}_{y-1,a-1}-M_{y-1,a-1}}$
Plus-group abundance-at-age	$\hat{N}_{y,A}$	$\hat{N}_{y,A} = \hat{N}_{y-1,A-1}\exp^{-\hat{F}_{y-1,A-1}-M_{y-1,A-1}} + \hat{N}_{y-1,A}\exp^{-\hat{F}_{y-1,A}-M_{y-1,A}}$
Fishing Mortality	$\hat{F}_{f,y,a}$	$\hat{F}_{f,y,a} = \hat{F}_{f,y}\cdot\hat{s}_{f,a}$ where $F_{f,y}$ and $s_{f,a}$ are estimated parameters
Total Mortality	$\hat{Z}_{y,a}$	$Z_{y,a} = F_{y,a} + M_{y,a}$
Fleet Selectivity	$\hat{s}_{f,a}$	Fleet 1 (Chespeake Bay): 1982-1984, 1985-1989, 1990-1995, 1996-2015 Fleet 2 (Coast): 1982-1984 Fleet 3 (Commercial Dead Discards): 1985-1989,1990-1996,1997-2002, 2003-2015 $\hat{s}_a = \frac{1}{1-\hat{\gamma}}\cdot\left(\frac{1-\hat{\gamma}}{\hat{\gamma}}\right)^{\hat{\gamma}}\frac{\exp^{\hat{\alpha}\hat{\gamma}(\hat{\beta}-a)}}{1+\exp^{\hat{\alpha}(\hat{\beta}-a)}}$ Fleet 2 (Coast): 1985-1989, 1990-1996, 1997-2015 $\hat{s}_a = \exp^{(-\exp^{-\hat{\beta}(a-\hat{\alpha})})}$ Fleet 3 (Commercial Dead Discards): 1982-1984 $\hat{s}_a = \alpha\exp^{\beta a}$
Predicted Catch-At-Age	$\hat{C}_{f,y,a}$	$\hat{C}_{f,y,a} = \frac{\hat{F}_{f,y,a}}{\hat{F}_{f,y,a}+M_{y,a}}\cdot(1-\exp^{-\hat{F}_{y,a}-M_{y,a}})\cdot\hat{N}_{y,a}$

Table 18 cont.

Population Model	Symbol	Equation
Predicted Total Catch	$\hat{C}_{f,y}$	$\hat{C}_{f,y} = \sum_a \hat{C}_{f,y,a}$
Predicted Proportions of Catch-At-Age	$\hat{P}_{f,y,a}$	$\hat{P}_{f,y,a} = \frac{\hat{C}_{f,y,a}}{\sum_a \hat{C}_{f,y,a}}$
Predicted Aggregated Indices of Relative Abundance	$\hat{I}_{t,y,\sum a}$	$\hat{I}_{t,y,\Sigma a} = \hat{q}_t \cdot \sum_a \hat{N}_{y,a} \cdot \exp^{-p_t \cdot Z_{y,a}}$ where q_t is the estimated catchability coefficient of index t and p_t is the fraction of the year when the survey takes place.
Predicted Age-Specific Indices of Relative Abundance	$\hat{I}_{t,y,a}$	$\hat{I}_{t,y,a} = \hat{q}_t \cdot \hat{s}_{t,a} \cdot \hat{N}_{y,a} \cdot \exp^{-p_t \cdot \hat{Z}_{y,a}}$
Predicted Total Indices of Relative Abundance with Age Composition Data	$\hat{I}_{t,y}$	$\hat{I}_{t,y} = \hat{q}_t \sum_a \hat{s}_{t,a} \cdot \hat{N}_{y,a} \cdot \exp^{-p_t \cdot \hat{Z}_{y,a}}$
Predicted Age Composition of Survey	$\hat{U}_{t,y,a}$	$\hat{U}_{t,y,a} = \frac{\hat{I}_{t,y,a}}{\sum_a \hat{I}_{t,y,a}}$
Female Spawning Stock Biomass (metric tons)	SSB_y	$SSB_y = \sum_{a=1}^{A} N_{y,a} \cdot sr_a \cdot m_a \cdot w_{y,a} / 1000$

Table 18 cont.

Likelihood	Symbol	Equation
Concentrated Lognormal Likelihood for Fleet Catch (F) and Indices of Relative Abundance (T)	$-L_F$; $-L_T$	$-L_F = 0.5 * \sum_f n_f * \ln\left(\frac{\sum_f RSS_f}{\sum_f n_f}\right)$; $-L_T = 0.5 * \sum_t n_t * \ln\left(\frac{\sum_t RSS_t}{\sum_t n_t}\right)$ where $RSS_f = \lambda_f \sum_y \left(\frac{\ln(C_{f,y} + 1e^{-5}) - \ln(\hat{C}_{f,y} + 1e^{-5})}{\delta_f \cdot CV_{f,y}}\right)^2$ $RSS_t = \lambda_t \sum_y \left(\frac{\ln(I_{t,y} + 1e^{-5}) - \ln(\hat{I}_{t,y} + 1e^{-5})}{\delta_t \cdot CV_{t,y}}\right)^2$ $CV_{f,y}$ and $CV_{t,y}$ are the annual coefficient of variation for the observed total catch (f) and index (t) in year y, δ_f and δ_t is the CV weights for total catch f and index t, and λ_t and λ_f are relative weights.
Multinomial fleet catch (FC) and index (TC) age compositions	$-L_{FC}$; $-L_{TC}$	$-L_{FC} = \lambda_f \sum_y -n_{f,y} \sum_a P_{f,y,a} \cdot \ln(\hat{P}_{f,y,a} + 1e^{-7})$ $-L_{TC} = \lambda_t \sum_y -n_{t,y} \sum_a U_{t,y,a} \cdot \ln(\hat{U}_{t,y,a} + 1e^{-7})$ where λ_f and λ_t are a user-defined weighting factors and n_y are the effective sample sizes.
Constraints Added To Total Likelihood	P_{n1}, P_{rdev}, P_{fadd}	$P_{n1} = \lambda_{n1}(\hat{N}_{y,1} - N^e_{y,1})^2$ - forces $N_{1,1}$ to follow S-R curve $P_{rdev} = \lambda_R \sum_y \log_e(\hat{\sigma}_R) + \frac{\hat{e}_y^2}{2\hat{\sigma}_R^2}$ - for bias correction to constrain deviations $P_{f_{add}} = \begin{cases} \text{phase} < 3, & 10 \cdot \sum_y (F_{f,y} - 0.15)^2 \\ \text{phase} \geq 3, & 0.000001 \cdot \sum_y (F_{f,y} - 0.15)^2 \end{cases}$ - avoid small F values at start

Table 18 cont.

Diagnostics	Symbol	Equation
Standardized residuals (lognormal – catch and surveys)	$r_{f,y,a}$ or $r_{t,y,a}$	$r_{t,y} = \frac{\log I_{t,y} - \log \hat{I}_{t,y}}{\sqrt{\log_e((\delta_t CV_{t,y})^2 + 1)}}$ $r_{f,y} = \frac{\log C_{f,y} - \log \hat{C}_{f,y}}{\sqrt{\log_e(CV_{f,y}^2 + 1)}}$
Standardized residuals (age compositions – catch and surveys)	$ra_{f,y,a}$ or $ra_{t,y,a}$	$ra_{f,y,a} = \frac{P_{f,y,a} - \hat{P}_{f,y,a}}{\sqrt{\frac{\hat{P}_{f,y,a}(1-\hat{P}_{f,y,a})}{\hat{\hat{n}}_f}}}$ $ra_{t,y,a} = \frac{P_{t,y,a} - \hat{P}_{t,y,a}}{\sqrt{\frac{\hat{P}_{t,y,a}(1-\hat{P}_{t,y,a})}{\hat{\hat{n}}_t}}}$
Root mean square error	$RMSE$	Total catch $RMSE_f = \sqrt{\frac{\sum_y r_{f,y}^2}{n_f}}$ Index $RMSE_t = \sqrt{\frac{\sum_y r_{t,y}^2}{n_t}}$

Table 19. The fraction of total mortality (p) that occurs prior to the survey and ages to which survey indices are linked.

Survey	p	Linked Ages
Age-specific		
NY YOY	0	1 (January 1st)
NJ YOY	0	1 (January 1st)
MD YOY	0	1 (January 1st)
VA YOY	0	1 (January 1st)
MD Age 1	0	2 (January 1st)
NY Age 1	0	2 (January 1st)
Aggregate		
MRFSS	0.5	3-13+
NEFSC	0.333	2-9
CT Trawl	0.333	4-6
Indices with age composition		
NY OHS	0.75	2-13+
NJ Trawl	0.25	2-13+
MD SSN	0.25	2-13+
DE SSN	0.25	2-13+
VA Poundnet	0.25	1-13+

Table 20. Starting values used in the SCA model.

Parameter(s)	Equation	ADMB Name	Phase	Start Value	Lower Bound	Upper Bound
Yr 1, Age 1 N or Avg N (log)		log_R	1	10	0.27	25
R Deviation (log)		log_R_dev	2	0	-20	20
Fishing Mortality (log)		log_F	2	-1.6	-12	2.31
Aggregate qs (log)		agg_qs	6	-16	-50	0
AgeComp qs (log)		ac_qs	6	-16	-50	0
Catch Selectivity	Gompertz	flgom_a	4	3	-20	150
Catch Selectivity	Gompertz	flgom_b	4	1	-20	150
Catch Selectivity	Thompson	flthom_a	4	-3.81	-20	0
Catch Selectivity	Thompson	flthom_b	4	3	0	150
Catch Selectivity	Thompson	flthom_c	4	0.9	1.00E-28	0.999
Catch Selectivity	Exponential	flexp_a	4	0.1	-150	150
Catch Selectivity	Exponential	flexp_b	4	1	-150	150
AC Selectivity	Gompertz	acgom_a	5	3	-20	150
AC Selectivity	Gompertz	acgom_b	5	1	-20	150
AC Selectivity	Gamma	acgam_a	5	3	0	150
AC Selectivity	Gamma	acgam_b	5	1	0	150
AC Selectivity	Thompson	acthom_a	5	-3.81	-20	0
AC Selectivity	Thompson	acthom_b	5	3	0	150
AC Selectivity	Thompson	acthom_c	5	0.9	1.00E-28	0.999
AC Selectivity	User-Defined	userparms	5	0.6	0	1
S-R Equation	Beverton	BH_a	3	10000	0	100000
S-R Equation	Beverton	BH_b	3	11000	0	100000

Table 21. RMSE and effective sample size estimates for the fleet catch, relative abundance indices, and age compositions.

				Percentile	
Index	n	Weight	RMSE	0.025	0.975
NYYOY	36	2.65	0.987	0.771	1.236
NJYOY	33	1.45	1.002	0.761	1.245
MDYOY	46	1.85	0.993	0.799	1.211
VAYOY	33	1.40	0.980	0.761	1.245
NYAge1	30	1.35	1.010	0.748	1.256
MDAge1	46	1.25	1.006	0.799	1.211
MRFSS	28	1.83	1.009	0.738	1.263
CTTRL	32	3.30	1.015	0.757	1.248
NEFSC	18	1.30	0.996	0.669	1.318
NYOHS	20	2.80	1.039	0.687	1.304
NJTRAWL	27	4.30	1.005	0.733	1.268
MDSSN	31	2.82	0.990	0.752	1.252
DESSN	19	2.90	1.012	0.678	1.311
VAPNET	25	2.00	0.993	0.722	1.277

Age Composition	
Fleet/Index	n_{eff}
Bay Fleet	32.5
Ocean Fleet	48.7
Commercial Discards	22.5
NYOHS	19.1
NJTRAWL	4.7
MDSSN	17.7
DESSN	25.4
VAPNET	9.3

Table 22. Likelihood components with respective contributions from the base model run.

Likelihood Components		
Concentrated Log-likelihood	Weight	RSS
Bay Total Catch:	2	20.04
Ocean Total Catch:	2	0.57
Comm Discards Total Catch:	2	0.12
Aggregate Abundance Indices		
NY YOY	1	24.50
NJ YOY	1	26.50
MD YOY	1	39.68
VA YOY	1	28.76
NY Age 1	1	26.46
MD Age 1	1	34.18
MRFSS/MRIP	1	26.93
CTTRL	1	22.36
NEFSC	1	15.76
Age Comp Abundance Indices		
NYOHS	1	20.35
NJ Trawl	1	18.08
MD SSN	1	24.69
DE SSN	1	18.15
VA PNET	1	21.99
Total RSS		369.14
No. of Obs		526.00
Conc. Likel.		-93.13
Age Composition Data		Likelihood
Bay Age Comp:	1	2142.44
Ocean Age Comp:	1	3827.52
Comm Discards Age Comp:	1	1565.91
NYOHS	1	635.96
NJ Trawl	1	250.80
MD SSN	1	1109.57
DE SSN	1	1098.21
VA PNET	1	504.09
log_R constraint:	1	0.29
Recr Devs :	1	14.55
Total Likelihood :		11006.90
AIC :		22431.90

Table 23. Parameter estimates and associated standard deviations of base model configuration.

	Bay			Ocean			Commercial Discards			Total		
Year	Full F	SD	CV	Full F	SD	CV	Full F	SD	CV	Full F	SD	CV
1982	0.817	0.119	0.15	0.158	0.003	0.02	0.010	0.003	0.35	0.873	0.118	0.13
1983	0.068	0.045	0.66	0.120	0.007	0.05	0.006	0.005	0.77	0.155	0.049	0.31
1984	0.137	0.003	0.02	0.061	0.005	0.08	0.008	0.018	2.16	0.161	0.044	0.27
1985	0.009	0.013	1.55	0.095	0.003	0.03	0.017	0.006	0.34	0.099	0.045	0.45
1986	0.004	0.048	13.48	0.056	0.006	0.10	0.031	0.006	0.18	0.062	0.017	0.27
1987	0.001	0.002	1.30	0.026	0.006	0.22	0.017	0.022	1.33	0.030	0.007	0.23
1988	0.002	0.043	18.12	0.036	0.006	0.17	0.030	0.001	0.05	0.046	0.008	0.18
1989	0.001	0.019	23.21	0.024	0.008	0.31	0.038	0.006	0.16	0.048	0.010	0.21
1990	0.015	0.002	0.15	0.017	0.006	0.34	0.057	0.019	0.34	0.086	0.014	0.17
1991	0.023	0.003	0.11	0.022	0.006	0.26	0.032	0.004	0.14	0.073	0.009	0.13
1992	0.021	0.044	2.11	0.026	0.003	0.10	0.016	0.004	0.26	0.058	0.006	0.10
1993	0.029	0.005	0.17	0.027	0.006	0.22	0.025	0.022	0.85	0.077	0.008	0.10
1994	0.040	0.001	0.03	0.034	0.015	0.44	0.023	0.002	0.10	0.091	0.008	0.09
1995	0.048	0.018	0.38	0.057	0.001	0.02	0.031	0.005	0.16	0.125	0.011	0.09
1996	0.056	0.009	0.16	0.056	0.005	0.09	0.010	0.015	1.52	0.115	0.008	0.07
1997	0.066	0.000	0.01	0.158	0.014	0.09	0.005	0.005	0.95	0.191	0.017	0.09
1998	0.060	0.008	0.13	0.143	0.002	0.01	0.008	0.006	0.75	0.173	0.016	0.09
1999	0.051	0.004	0.09	0.123	0.004	0.03	0.005	0.016	3.03	0.149	0.014	0.09
2000	0.058	0.001	0.02	0.155	0.012	0.08	0.015	0.002	0.15	0.188	0.017	0.09
2001	0.051	0.011	0.21	0.151	0.001	0.01	0.008	0.005	0.69	0.177	0.015	0.09
2002	0.041	0.007	0.18	0.149	0.004	0.03	0.004	0.019	4.18	0.170	0.015	0.09
2003	0.068	0.000	0.00	0.158	0.015	0.10	0.009	0.006	0.66	0.196	0.016	0.08
2004	0.060	0.006	0.11	0.192	0.004	0.02	0.016	0.005	0.35	0.230	0.021	0.09
2005	0.064	0.010	0.15	0.192	0.004	0.02	0.026	0.015	0.56	0.241	0.022	0.09
2006	0.078	0.003	0.04	0.234	0.014	0.06	0.007	0.008	1.19	0.275	0.026	0.09
2007	0.071	0.002	0.03	0.191	0.002	0.01	0.020	0.006	0.30	0.239	0.023	0.10
2008	0.054	0.015	0.27	0.209	0.003	0.02	0.011	0.023	2.12	0.242	0.025	0.10
2009	0.064	0.003	0.05	0.148	0.013	0.09	0.023	0.006	0.25	0.195	0.018	0.09
2010	0.060	0.003	0.05	0.152	0.001	0.01	0.010	0.007	0.71	0.188	0.019	0.10
2011	0.060	0.008	0.14	0.176	0.005	0.03	0.026	0.018	0.69	0.223	0.023	0.10
2012	0.054	0.003	0.05	0.131	0.014	0.11	0.036	0.010	0.29	0.185	0.020	0.11
2013	0.063	0.003	0.05	0.192	0.002	0.01	0.025	0.006	0.26	0.239	0.027	0.11
2014	0.067	0.004	0.06	0.148	0.004	0.03	0.043	0.015	0.34	0.213	0.025	0.12
2015	0.058	0.004	0.06	0.118	0.018	0.15	0.013	0.003	0.23	0.156	0.018	0.11

Recruitment	SD	CV
18,937,700	2,184,800	0.115
45,647,100	4,145,160	0.091
40,602,600	3,826,390	0.094
39,613,900	3,645,120	0.092
31,837,100	3,185,880	0.100
42,430,500	3,832,180	0.090
55,693,500	4,594,430	0.082
62,026,500	4,969,340	0.080
82,973,200	6,074,540	0.073
68,115,600	5,436,900	0.080
69,594,600	5,662,710	0.081
90,178,800	6,770,640	0.075
179,709,000	10,302,200	0.057
114,180,000	7,952,840	0.070
124,405,000	8,427,760	0.068
153,781,000	9,400,610	0.061
98,373,300	7,159,260	0.073
100,528,000	7,115,250	0.071
79,407,400	6,210,780	0.078
117,650,000	7,845,320	0.067
137,115,000	8,624,990	0.063
75,886,100	6,181,140	0.081
165,979,000	9,927,350	0.060
94,659,300	7,179,380	0.076
87,635,000	6,871,180	0.078
65,002,600	5,900,970	0.091
84,421,500	7,125,200	0.084
60,278,400	6,007,460	0.100
73,808,000	7,202,880	0.098
94,237,700	8,676,700	0.092
123,892,000	12,810,900	0.103
31,214,800	5,058,120	0.162
69,750,600	8,529,480	0.122
122,739,000	12,780,400	0.104

Table 23 cont.

Catch Selectivtiy Parameters

Bay				Ocean				Commercial Discards			
	Estimate	SD	CV		Estimate	SD	CV		Estimate	SD	CV
1982-1984				1982-1984				1982-1984			
α	-5.630	0.425	0.08	α	-2.480	0.331	0.133	α	0.017	0.008	0.49
β	2.259	0.063	0.03	β	3.364	0.248	0.073	β	1.239	0.196	0.16
ϒ	0.922	0.020	0.02	ϒ	0.990	0.022	0.023				
1985-1989				1985-1989				1985-1989			
α	-3.819	0.473	0.12	α	5.111	0.596	0.116	α	-2.135	0.245	0.12
β	2.011	0.124	0.06	β	0.436	0.064	0.145	β	4.098	0.391	0.10
ϒ	0.951	0.022	0.02					ϒ	0.879	0.067	0.08
1990-1995				1990-1995				1990-1995			
α	-2.288	0.226	0.10	α	3.106	0.173	0.055	α	-1.906	0.159	-0.08
β	3.467	0.244	0.07	β	0.915	0.108	0.118	β	4.673	0.372	0.08
ϒ	0.890	0.037	0.04					ϒ	0.816	0.063	0.08
1996-2015				1997-2015				1996-2002			
α	-1.893	0.111	-0.059	α	5.366	0.244	0.045	α	-2.744	0.513	0.19
β	3.764	0.140	0.04	β	0.429	0.028	0.065	β	2.814	0.284	0.10
ϒ	0.942	0.016	0.02					ϒ	0.958	0.028	0.03
								2003-2015			
								α	-2.430	0.298	0.12
								β	3.703	0.187	0.05
								ϒ	0.982	0.015	0.02

Survey Selectivity Parameters			
NYOHS	Estimate	SD	CV
α	-5.691	0.087	0.02
β	2.288	0.034	0.02
ϒ	0.963	0.006	0.01
NJ Trawl			
α	3.372	0.591	0.18
β	0.584	0.132	0.23
DE SSN			
α	3.392	0.194	0.06
β	0.753	0.103	0.14
MDSSN			
s_2	0.136	0.021	0.16
VAPNET			
α	2.916	0.126	0.04
β	1.269	0.158	0.12

Catchability Coefficients			
Survey	Estimate	SD	CV
NYYOY	2.96E-07	4.11E-08	0.14
NJYOY	1.28E-08	8.26E-10	0.06
MDYOY	4.36E-08	3.30E-09	0.08
VAYOY	1.09E-07	7.73E-09	0.07
NYAge1	4.54E-08	3.86E-09	0.08
MDAge1	9.48E-09	8.11E-10	0.09
MRFSS	3.20E-08	1.87E-09	0.06
CTTRL	3.49E-08	2.66E-09	0.08
NEFSC	1.01E-08	1.02E-09	0.10
NYOHS	1.60E-07	1.40E-08	0.09
NJTRAWL	8.67E-08	1.32E-08	0.15
MDSSN	1.28E-07	1.45E-08	0.11
DESSN	8.12E-08	9.59E-09	0.12
VAPNET	5.25E-07	5.79E-08	0.11

Table 24. Total fishing mortality-at-age and fishing mortality-at-age by fleet.

Total Fishing Mortality

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	0.0028	0.2506	0.8727	0.6820	0.5137	0.3898	0.3072	0.2525	0.2160	0.1912	0.1740	0.1618	0.1551
1983	0.0009	0.0258	0.1092	0.1543	0.1549	0.1437	0.1345	0.1274	0.1220	0.1175	0.1138	0.1105	0.1078
1984	0.0010	0.0446	0.1615	0.1504	0.1268	0.1057	0.0911	0.0811	0.0742	0.0693	0.0657	0.0629	0.0611
1985	0.0006	0.0077	0.0195	0.0380	0.0575	0.0697	0.0793	0.0866	0.0918	0.0953	0.0974	0.0986	0.0993
1986	0.0004	0.0042	0.0136	0.0353	0.0542	0.0588	0.0605	0.0616	0.0622	0.0623	0.0621	0.0617	0.0613
1987	0.0002	0.0019	0.0065	0.0178	0.0273	0.0292	0.0295	0.0297	0.0297	0.0295	0.0293	0.0290	0.0287
1988	0.0003	0.0031	0.0104	0.0291	0.0444	0.0461	0.0455	0.0447	0.0440	0.0432	0.0424	0.0416	0.0409
1989	0.0003	0.0021	0.0093	0.0311	0.0477	0.0466	0.0428	0.0395	0.0369	0.0347	0.0329	0.0314	0.0301
1990	0.0005	0.0037	0.0192	0.0532	0.0861	0.0848	0.0687	0.0545	0.0441	0.0365	0.0311	0.0272	0.0243
1991	0.0004	0.0039	0.0210	0.0522	0.0731	0.0708	0.0598	0.0501	0.0428	0.0374	0.0335	0.0306	0.0284
1992	0.0003	0.0036	0.0194	0.0449	0.0577	0.0560	0.0495	0.0437	0.0391	0.0357	0.0332	0.0313	0.0299
1993	0.0005	0.0046	0.0247	0.0590	0.0770	0.0738	0.0636	0.0546	0.0476	0.0425	0.0386	0.0358	0.0337
1994	0.0006	0.0057	0.0311	0.0726	0.0905	0.0860	0.0748	0.0650	0.0574	0.0516	0.0473	0.0441	0.0417
1995	0.0007	0.0079	0.0429	0.0988	0.1252	0.1212	0.1076	0.0954	0.0858	0.0786	0.0732	0.0692	0.0661
1996	0.0007	0.0078	0.0406	0.0881	0.1125	0.1149	0.1113	0.1063	0.1014	0.0968	0.0926	0.0888	0.0854
1997	0.0009	0.0065	0.0313	0.0815	0.1215	0.1446	0.1616	0.1742	0.1827	0.1877	0.1901	0.1907	0.1902
1998	0.0008	0.0062	0.0305	0.0767	0.1127	0.1332	0.1483	0.1594	0.1668	0.1710	0.1730	0.1734	0.1728
1999	0.0007	0.0052	0.0252	0.0644	0.0954	0.1133	0.1265	0.1362	0.1427	0.1465	0.1484	0.1488	0.1484
2000	0.0009	0.0074	0.0368	0.0859	0.1228	0.1446	0.1609	0.1729	0.1810	0.1856	0.1878	0.1882	0.1876
2001	0.0008	0.0059	0.0290	0.0720	0.1070	0.1291	0.1460	0.1587	0.1675	0.1729	0.1758	0.1769	0.1769
2002	0.0007	0.0050	0.0239	0.0611	0.0936	0.1160	0.1339	0.1476	0.1573	0.1635	0.1671	0.1689	0.1695
2003	0.0009	0.0061	0.0295	0.0841	0.1272	0.1507	0.1675	0.1799	0.1882	0.1930	0.1953	0.1957	0.1950
2004	0.0009	0.0063	0.0309	0.0889	0.1369	0.1660	0.1883	0.2052	0.2169	0.2243	0.2283	0.2300	0.2302
2005	0.0009	0.0067	0.0339	0.1001	0.1522	0.1813	0.2029	0.2190	0.2300	0.2367	0.2401	0.2412	0.2408
2006	0.0011	0.0077	0.0368	0.1032	0.1598	0.1953	0.2226	0.2434	0.2578	0.2669	0.2719	0.2742	0.2746
2007	0.0010	0.0070	0.0345	0.1005	0.1526	0.1813	0.2024	0.2182	0.2288	0.2351	0.2383	0.2392	0.2386
2008	0.0008	0.0062	0.0296	0.0840	0.1319	0.1641	0.1897	0.2095	0.2235	0.2326	0.2380	0.2408	0.2418
2009	0.0009	0.0060	0.0304	0.0899	0.1344	0.1563	0.1715	0.1825	0.1896	0.1935	0.1951	0.1950	0.1938
2010	0.0008	0.0056	0.0276	0.0788	0.1197	0.1424	0.1591	0.1714	0.1797	0.1846	0.1870	0.1877	0.1872
2011	0.0009	0.0063	0.0318	0.0943	0.1429	0.1695	0.1890	0.2036	0.2135	0.2194	0.2223	0.2232	0.2227
2012	0.0008	0.0055	0.0291	0.0896	0.1327	0.1521	0.1652	0.1746	0.1805	0.1836	0.1846	0.1841	0.1827
2013	0.0009	0.0067	0.0334	0.0983	0.1498	0.1788	0.2005	0.2168	0.2280	0.2347	0.2382	0.2394	0.2392
2014	0.0009	0.0065	0.0346	0.1068	0.1574	0.1791	0.1932	0.2031	0.2092	0.2122	0.2128	0.2118	0.2099
2015	0.0007	0.0051	0.0253	0.0735	0.1095	0.1268	0.1384	0.1467	0.1520	0.1548	0.1557	0.1554	0.1543

Chesapeake Bay

	Age												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	0.0017	0.2429	0.8169	0.5353	0.3455	0.2229	0.1439	0.0928	0.0599	0.0387	0.0250	0.0161	0.0127
1983	0.0001	0.0201	0.0677	0.0444	0.0286	0.0185	0.0119	0.0077	0.0050	0.0032	0.0021	0.0013	0.0011
1984	0.0003	0.0407	0.1370	0.0898	0.0579	0.0374	0.0241	0.0156	0.0101	0.0065	0.0042	0.0027	0.0021
1985	0.0003	0.0052	0.0086	0.0073	0.0061	0.0050	0.0042	0.0035	0.0029	0.0024	0.0020	0.0016	0.0014
1986	0.0001	0.0021	0.0036	0.0030	0.0025	0.0021	0.0017	0.0014	0.0012	0.0010	0.0008	0.0007	0.0006
1987	0.0000	0.0009	0.0014	0.0012	0.0010	0.0008	0.0007	0.0006	0.0005	0.0004	0.0003	0.0003	0.0002
1988	0.0001	0.0015	0.0024	0.0020	0.0017	0.0014	0.0012	0.0010	0.0008	0.0007	0.0006	0.0005	0.0004
1989	0.0000	0.0005	0.0008	0.0007	0.0006	0.0005	0.0004	0.0003	0.0003	0.0002	0.0002	0.0002	0.0001
1990	0.0002	0.0011	0.0066	0.0154	0.0150	0.0120	0.0094	0.0073	0.0057	0.0044	0.0034	0.0027	0.0021
1991	0.0002	0.0016	0.0096	0.0226	0.0221	0.0176	0.0137	0.0107	0.0083	0.0065	0.0050	0.0039	0.0030
1992	0.0002	0.0015	0.0090	0.0211	0.0206	0.0165	0.0128	0.0100	0.0078	0.0060	0.0047	0.0037	0.0028
1993	0.0003	0.0021	0.0125	0.0294	0.0288	0.0230	0.0179	0.0139	0.0108	0.0084	0.0066	0.0051	0.0040
1994	0.0004	0.0029	0.0169	0.0397	0.0388	0.0310	0.0241	0.0188	0.0146	0.0114	0.0088	0.0069	0.0053
1995	0.0005	0.0034	0.0202	0.0475	0.0465	0.0371	0.0289	0.0225	0.0175	0.0136	0.0106	0.0082	0.0064
1996	0.0005	0.0029	0.0146	0.0419	0.0562	0.0544	0.0494	0.0443	0.0397	0.0356	0.0319	0.0286	0.0256
1997	0.0006	0.0034	0.0171	0.0490	0.0656	0.0636	0.0577	0.0518	0.0464	0.0416	0.0373	0.0334	0.0299
1998	0.0005	0.0031	0.0155	0.0445	0.0597	0.0578	0.0524	0.0471	0.0422	0.0378	0.0339	0.0304	0.0272
1999	0.0005	0.0027	0.0132	0.0380	0.0509	0.0493	0.0447	0.0401	0.0360	0.0322	0.0289	0.0259	0.0232
2000	0.0005	0.0031	0.0152	0.0436	0.0585	0.0566	0.0514	0.0461	0.0414	0.0371	0.0332	0.0298	0.0267
2001	0.0005	0.0027	0.0133	0.0382	0.0513	0.0496	0.0450	0.0404	0.0362	0.0325	0.0291	0.0261	0.0234
2002	0.0004	0.0022	0.0108	0.0309	0.0415	0.0401	0.0364	0.0327	0.0293	0.0263	0.0235	0.0211	0.0189
2003	0.0006	0.0035	0.0176	0.0504	0.0676	0.0655	0.0594	0.0533	0.0478	0.0428	0.0384	0.0344	0.0308
2004	0.0005	0.0031	0.0155	0.0444	0.0595	0.0577	0.0523	0.0470	0.0421	0.0377	0.0338	0.0303	0.0271
2005	0.0006	0.0033	0.0166	0.0477	0.0639	0.0619	0.0561	0.0504	0.0452	0.0405	0.0363	0.0325	0.0291
2006	0.0007	0.0041	0.0202	0.0579	0.0776	0.0751	0.0681	0.0612	0.0548	0.0491	0.0440	0.0395	0.0354
2007	0.0006	0.0037	0.0184	0.0527	0.0706	0.0683	0.0620	0.0557	0.0499	0.0447	0.0401	0.0359	0.0322
2008	0.0005	0.0028	0.0140	0.0400	0.0536	0.0519	0.0471	0.0423	0.0379	0.0340	0.0304	0.0273	0.0244
2009	0.0006	0.0034	0.0167	0.0478	0.0641	0.0621	0.0563	0.0505	0.0453	0.0406	0.0364	0.0326	0.0292
2010	0.0006	0.0032	0.0157	0.0450	0.0603	0.0584	0.0530	0.0476	0.0427	0.0382	0.0343	0.0307	0.0275
2011	0.0005	0.0031	0.0156	0.0447	0.0599	0.0580	0.0526	0.0473	0.0424	0.0380	0.0340	0.0305	0.0273
2012	0.0005	0.0028	0.0142	0.0406	0.0544	0.0527	0.0478	0.0429	0.0385	0.0345	0.0309	0.0277	0.0248
2013	0.0006	0.0033	0.0164	0.0470	0.0630	0.0610	0.0553	0.0497	0.0445	0.0399	0.0358	0.0320	0.0287
2014	0.0006	0.0035	0.0174	0.0498	0.0667	0.0646	0.0586	0.0526	0.0471	0.0423	0.0379	0.0339	0.0304
2015	0.0005	0.0031	0.0152	0.0436	0.0584	0.0566	0.0513	0.0461	0.0413	0.0370	0.0332	0.0297	0.0266

Table 24 cont.

Ocean

Year	Age 1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	0.0005	0.0057	0.0488	0.1368	0.1584	0.1570	0.1534	0.1497	0.1461	0.1426	0.1391	0.1358	0.1325
1983	0.0004	0.0043	0.0369	0.1035	0.1198	0.1188	0.1160	0.1133	0.1105	0.1079	0.1053	0.1027	0.1002
1984	0.0002	0.0022	0.0187	0.0523	0.0606	0.0600	0.0587	0.0573	0.0559	0.0545	0.0532	0.0519	0.0507
1985	0.0003	0.0020	0.0080	0.0195	0.0345	0.0500	0.0636	0.0742	0.0821	0.0876	0.0913	0.0938	0.0955
1986	0.0001	0.0012	0.0047	0.0115	0.0203	0.0294	0.0374	0.0437	0.0483	0.0515	0.0537	0.0552	0.0562
1987	0.0001	0.0006	0.0022	0.0053	0.0094	0.0136	0.0173	0.0202	0.0223	0.0238	0.0249	0.0255	0.0260
1988	0.0001	0.0008	0.0031	0.0074	0.0131	0.0190	0.0242	0.0282	0.0312	0.0333	0.0347	0.0357	0.0363
1989	0.0001	0.0005	0.0021	0.0050	0.0089	0.0128	0.0163	0.0190	0.0210	0.0224	0.0234	0.0240	0.0245
1990	0.0000	0.0011	0.0056	0.0109	0.0142	0.0158	0.0165	0.0168	0.0169	0.0170	0.0170	0.0170	0.0170
1991	0.0000	0.0014	0.0075	0.0144	0.0188	0.0209	0.0218	0.0222	0.0223	0.0224	0.0224	0.0224	0.0224
1992	0.0000	0.0016	0.0085	0.0165	0.0214	0.0238	0.0249	0.0253	0.0255	0.0255	0.0256	0.0256	0.0256
1993	0.0000	0.0018	0.0091	0.0176	0.0229	0.0255	0.0266	0.0270	0.0272	0.0273	0.0273	0.0274	0.0274
1994	0.0000	0.0022	0.0114	0.0220	0.0286	0.0318	0.0332	0.0338	0.0340	0.0341	0.0341	0.0342	0.0342
1995	0.0001	0.0036	0.0189	0.0366	0.0476	0.0530	0.0553	0.0562	0.0566	0.0567	0.0568	0.0568	0.0568
1996	0.0001	0.0036	0.0186	0.0360	0.0470	0.0522	0.0545	0.0554	0.0558	0.0559	0.0560	0.0560	0.0560
1997	0.0003	0.0024	0.0105	0.0273	0.0511	0.0768	0.1001	0.1190	0.1332	0.1434	0.1504	0.1552	0.1584
1998	0.0002	0.0022	0.0094	0.0246	0.0460	0.0692	0.0903	0.1073	0.1202	0.1293	0.1356	0.1399	0.1428
1999	0.0002	0.0019	0.0081	0.0213	0.0397	0.0597	0.0779	0.0926	0.1037	0.1116	0.1171	0.1208	0.1232
2000	0.0002	0.0023	0.0102	0.0268	0.0500	0.0752	0.0981	0.1167	0.1306	0.1405	0.1474	0.1521	0.1552
2001	0.0002	0.0023	0.0099	0.0260	0.0486	0.0730	0.0952	0.1132	0.1267	0.1364	0.1431	0.1476	0.1506
2002	0.0002	0.0023	0.0098	0.0257	0.0480	0.0722	0.0942	0.1120	0.1254	0.1349	0.1415	0.1460	0.1490
2003	0.0003	0.0024	0.0104	0.0272	0.0508	0.0764	0.0997	0.1185	0.1327	0.1428	0.1498	0.1545	0.1577
2004	0.0003	0.0029	0.0126	0.0330	0.0618	0.0929	0.1211	0.1440	0.1612	0.1735	0.1820	0.1878	0.1916
2005	0.0003	0.0029	0.0127	0.0332	0.0620	0.0932	0.1216	0.1445	0.1618	0.1741	0.1827	0.1884	0.1923
2006	0.0004	0.0035	0.0155	0.0404	0.0755	0.1135	0.1481	0.1760	0.1971	0.2121	0.2225	0.2295	0.2342
2007	0.0003	0.0029	0.0126	0.0330	0.0617	0.0928	0.1211	0.1439	0.1611	0.1734	0.1819	0.1876	0.1915
2008	0.0003	0.0032	0.0138	0.0361	0.0675	0.1015	0.1324	0.1574	0.1762	0.1896	0.1989	0.2052	0.2094
2009	0.0002	0.0022	0.0098	0.0255	0.0477	0.0717	0.0935	0.1112	0.1244	0.1339	0.1405	0.1449	0.1479
2010	0.0002	0.0023	0.0100	0.0262	0.0490	0.0737	0.0962	0.1143	0.1280	0.1377	0.1445	0.1490	0.1521
2011	0.0003	0.0027	0.0116	0.0304	0.0568	0.0853	0.1113	0.1323	0.1481	0.1594	0.1672	0.1725	0.1760
2012	0.0002	0.0020	0.0087	0.0227	0.0424	0.0637	0.0831	0.0988	0.1106	0.1190	0.1249	0.1288	0.1315
2013	0.0003	0.0029	0.0127	0.0331	0.0619	0.0931	0.1215	0.1444	0.1616	0.1740	0.1825	0.1883	0.1921
2014	0.0002	0.0022	0.0097	0.0255	0.0476	0.0716	0.0934	0.1110	0.1242	0.1337	0.1403	0.1447	0.1477
2015	0.0002	0.0018	0.0078	0.0203	0.0380	0.0572	0.0746	0.0887	0.0993	0.1068	0.1121	0.1156	0.1180

Commercial Discards

Year	Age 1	2	3	4	5	6	7	8	9	10	11	12	13+
1982	0.0006	0.0020	0.0070	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099
1983	0.0004	0.0013	0.0046	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065
1984	0.0005	0.0017	0.0058	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083
1985	0.0001	0.0005	0.0028	0.0112	0.0169	0.0147	0.0115	0.0089	0.0069	0.0053	0.0041	0.0032	0.0024
1986	0.0001	0.0009	0.0053	0.0209	0.0314	0.0273	0.0214	0.0165	0.0128	0.0099	0.0076	0.0059	0.0045
1987	0.0001	0.0005	0.0029	0.0112	0.0169	0.0147	0.0115	0.0089	0.0069	0.0053	0.0041	0.0032	0.0024
1988	0.0001	0.0008	0.0050	0.0197	0.0296	0.0257	0.0201	0.0156	0.0120	0.0093	0.0072	0.0055	0.0043
1989	0.0002	0.0011	0.0065	0.0255	0.0383	0.0333	0.0261	0.0202	0.0156	0.0120	0.0093	0.0072	0.0055
1990	0.0003	0.0015	0.0070	0.0269	0.0568	0.0569	0.0428	0.0305	0.0215	0.0151	0.0107	0.0075	0.0053
1991	0.0002	0.0009	0.0040	0.0153	0.0323	0.0323	0.0243	0.0173	0.0122	0.0086	0.0061	0.0043	0.0030
1992	0.0001	0.0004	0.0019	0.0074	0.0157	0.0157	0.0118	0.0084	0.0059	0.0042	0.0029	0.0021	0.0015
1993	0.0001	0.0007	0.0031	0.0120	0.0253	0.0254	0.0191	0.0136	0.0096	0.0067	0.0048	0.0034	0.0024
1994	0.0001	0.0006	0.0028	0.0110	0.0231	0.0232	0.0174	0.0124	0.0088	0.0062	0.0043	0.0031	0.0022
1995	0.0002	0.0008	0.0038	0.0147	0.0311	0.0312	0.0235	0.0167	0.0118	0.0083	0.0058	0.0041	0.0029
1996	0.0001	0.0013	0.0074	0.0101	0.0093	0.0083	0.0074	0.0066	0.0059	0.0052	0.0047	0.0042	0.0037
1997	0.0001	0.0007	0.0038	0.0052	0.0048	0.0043	0.0038	0.0034	0.0030	0.0027	0.0024	0.0022	0.0019
1998	0.0001	0.0010	0.0055	0.0076	0.0070	0.0063	0.0056	0.0050	0.0044	0.0039	0.0035	0.0031	0.0028
1999	0.0001	0.0007	0.0038	0.0052	0.0048	0.0043	0.0039	0.0034	0.0031	0.0027	0.0024	0.0022	0.0019
2000	0.0002	0.0020	0.0113	0.0155	0.0143	0.0128	0.0114	0.0101	0.0090	0.0080	0.0072	0.0064	0.0057
2001	0.0001	0.0010	0.0057	0.0078	0.0072	0.0064	0.0057	0.0051	0.0045	0.0041	0.0036	0.0032	0.0029
2002	0.0000	0.0006	0.0032	0.0044	0.0041	0.0037	0.0033	0.0029	0.0026	0.0023	0.0021	0.0018	0.0016
2003	0.0000	0.0002	0.0015	0.0065	0.0088	0.0088	0.0084	0.0081	0.0077	0.0074	0.0071	0.0068	0.0065
2004	0.0000	0.0003	0.0027	0.0114	0.0156	0.0155	0.0149	0.0142	0.0136	0.0131	0.0125	0.0120	0.0115
2005	0.0001	0.0005	0.0046	0.0193	0.0263	0.0262	0.0252	0.0241	0.0231	0.0221	0.0212	0.0203	0.0194
2006	0.0000	0.0001	0.0012	0.0049	0.0067	0.0067	0.0064	0.0062	0.0059	0.0057	0.0054	0.0052	0.0050
2007	0.0000	0.0004	0.0035	0.0149	0.0203	0.0202	0.0194	0.0186	0.0178	0.0170	0.0163	0.0156	0.0150
2008	0.0000	0.0002	0.0019	0.0079	0.0108	0.0107	0.0103	0.0099	0.0094	0.0090	0.0086	0.0083	0.0079
2009	0.0000	0.0004	0.0040	0.0166	0.0227	0.0226	0.0217	0.0208	0.0199	0.0190	0.0182	0.0174	0.0167
2010	0.0000	0.0002	0.0018	0.0076	0.0104	0.0103	0.0099	0.0095	0.0091	0.0087	0.0083	0.0080	0.0076
2011	0.0001	0.0005	0.0046	0.0193	0.0263	0.0262	0.0251	0.0241	0.0230	0.0221	0.0211	0.0202	0.0194
2012	0.0001	0.0007	0.0063	0.0263	0.0359	0.0357	0.0343	0.0328	0.0314	0.0301	0.0288	0.0276	0.0264
2013	0.0000	0.0005	0.0043	0.0182	0.0249	0.0247	0.0238	0.0228	0.0218	0.0209	0.0200	0.0191	0.0183
2014	0.0001	0.0008	0.0075	0.0316	0.0432	0.0429	0.0412	0.0395	0.0378	0.0362	0.0347	0.0332	0.0318
2015	0.0000	0.0002	0.0023	0.0096	0.0131	0.0130	0.0125	0.0120	0.0115	0.0110	0.0105	0.0101	0.0096

Table 25. Estimates of population abundance by age.

	Age														
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total	8+
1982	18,937,700	5,844,810	4,235,230	2,456,170	597,337	197,508	168,737	114,695	87,977	99,003	77,782	153,578	79,516	33,050,042	612,550
1983	45,647,100	6,100,700	2,304,620	1,128,340	892,786	278,312	110,602	106,820	76,692	61,016	70,385	56,254	171,045	57,004,672	542,212
1984	40,602,600	14,732,200	3,012,110	1,317,490	695,173	595,520	199,343	83,220	80,941	58,430	46,693	54,065	175,532	61,653,316	498,880
1985	39,613,900	13,103,400	7,138,020	1,634,200	814,930	476,927	443,061	156,637	66,046	64,682	46,923	37,633	185,823	63,782,183	557,745
1986	31,837,100	12,789,100	6,587,420	4,463,560	1,131,050	599,209	367,829	352,289	123,635	51,860	50,615	36,639	174,171	58,564,477	789,209
1987	42,430,500	10,280,500	6,451,940	4,143,780	3,097,570	834,392	467,232	298,010	285,098	99,995	41,939	40,940	170,653	68,642,550	936,636
1988	55,693,500	13,703,900	5,198,420	4,087,440	2,926,640	2,347,390	670,182	390,454	248,997	238,208	83,562	35,056	176,964	85,800,713	1,173,241
1989	62,026,500	17,985,600	6,921,510	3,280,280	2,854,310	2,180,330	1,853,710	551,196	321,362	205,088	196,356	68,936	175,149	98,620,327	1,518,087
1990	82,973,200	20,031,500	9,092,900	4,372,470	2,285,970	2,119,340	1,720,960	1,528,690	456,035	266,586	170,504	163,543	203,782	125,385,480	2,789,140
1991	68,115,600	26,790,000	10,110,700	5,687,860	2,980,640	1,633,500	1,610,180	1,382,950	1,245,940	375,598	221,230	142,266	308,170	120,604,634	3,676,154
1992	69,594,600	21,994,200	13,519,100	6,312,800	3,881,000	2,157,720	1,258,490	1,305,430	1,132,120	1,027,450	311,407	184,148	376,570	123,055,035	4,337,125
1993	90,178,800	22,474,200	11,102,900	8,454,580	4,339,010	2,853,080	1,687,210	1,030,900	1,075,600	937,026	853,296	259,283	468,198	145,714,083	4,624,303
1994	179,709,000	29,117,400	11,334,100	6,906,570	5,729,910	3,128,760	2,191,470	1,362,750	840,198	882,709	772,968	706,605	604,962	243,287,402	5,170,192
1995	114,180,000	58,020,000	14,668,000	7,005,760	4,617,690	4,076,200	2,374,210	1,750,310	1,099,160	682,853	721,532	634,557	1,081,410	210,911,682	5,969,822
1996	124,405,000	36,858,100	29,162,700	8,959,640	4,562,820	3,173,070	2,986,010	1,835,020	1,369,470	868,242	543,297	577,187	1,380,900	216,681,456	6,574,116
1997	153,781,000	40,160,000	18,527,900	17,855,000	5,898,310	3,175,530	2,339,070	2,299,490	1,420,100	1,065,060	678,367	426,274	1,545,890	249,171,991	7,435,181
1998	98,373,300	49,631,800	20,214,300	11,449,500	11,831,900	4,068,100	2,272,470	1,712,860	1,662,780	1,018,220	759,846	482,801	1,403,300	204,881,177	7,039,807
1999	100,528,000	31,751,100	24,988,100	12,502,300	7,623,430	8,232,610	2,944,480	1,686,420	1,257,100	1,211,360	738,609	550,093	1,365,540	195,379,142	6,809,122
2000	79,407,400	32,450,900	16,002,500	15,536,700	8,427,230	5,396,720	6,078,680	2,233,310	1,266,710	938,102	900,506	548,070	1,421,280	170,608,108	7,307,978
2001	117,650,000	25,627,400	16,319,600	9,835,500	10,250,500	5,804,660	3,861,930	4,454,540	1,617,000	909,809	670,643	642,375	1,404,890	199,048,847	9,699,257
2002	137,115,000	37,975,400	12,906,400	10,108,800	6,579,710	7,172,980	4,218,970	2,872,520	3,271,280	1,177,110	658,734	484,177	1,476,430	226,017,511	9,940,251
2003	75,886,100	44,263,900	19,143,500	8,035,480	6,837,010	4,666,500	5,281,990	3,176,320	2,133,160	2,405,920	860,349	479,723	1,424,570	174,594,522	10,480,042
2004	165,979,000	24,492,300	22,289,000	11,851,100	5,311,030	4,688,470	3,319,280	3,845,110	2,283,730	1,521,060	1,707,300	609,161	1,348,400	249,244,941	11,314,761
2005	94,659,300	53,570,200	12,330,400	13,780,400	7,795,730	3,607,220	3,284,190	2,366,610	2,695,530	1,582,310	1,046,180	1,169,550	1,338,490	199,226,110	10,198,670
2006	87,635,000	30,549,800	26,957,500	7,600,040	8,963,050	5,214,020	2,488,440	2,307,700	1,636,270	1,843,290	1,074,850	708,256	1,696,360	178,674,576	9,266,726
2007	65,002,600	28,278,400	15,358,100	16,567,600	4,928,160	5,949,520	3,546,700	1,714,320	1,557,160	1,088,310	1,214,920	704,869	1,572,950	147,483,609	7,852,529
2008	84,421,500	20,977,500	14,227,000	9,460,290	10,771,500	3,294,890	4,104,050	2,493,230	1,186,320	1,066,190	740,451	824,013	1,544,100	155,111,034	7,854,304
2009	60,278,400	27,248,300	10,562,300	8,806,610	6,253,430	7,352,560	2,312,380	2,921,890	1,740,310	816,570	727,233	502,340	1,601,070	131,123,393	8,309,413
2010	73,808,000	19,455,400	13,721,800	6,533,210	5,786,760	4,257,580	5,200,510	1,676,690	2,095,470	1,239,200	579,159	515,004	1,491,030	136,359,813	7,596,553
2011	94,237,700	23,823,300	9,800,980	8,511,700	4,340,850	3,998,250	3,053,400	3,817,930	1,215,850	1,506,950	886,774	413,450	1,431,620	157,038,754	9,272,574
2012	123,892,000	30,415,600	11,993,800	6,053,810	5,568,490	2,930,370	2,790,930	2,175,430	2,680,750	845,316	1,041,530	611,101	1,270,870	192,269,997	8,624,997
2013	31,214,800	39,990,800	15,324,600	7,428,220	3,979,370	3,797,920	2,081,370	2,036,390	1,572,490	1,926,260	605,525	745,352	1,348,730	112,051,827	8,234,747
2014	69,750,600	10,074,200	20,125,700	9,450,390	4,840,210	2,668,080	2,626,430	1,465,940	1,411,080	1,077,580	1,311,090	410,707	1,418,870	126,630,877	7,095,267
2015	122,739,000	22,511,300	5,070,610	12,395,900	6,105,670	3,220,470	1,844,660	1,863,510	1,029,860	985,268	750,176	912,171	1,276,070	180,704,665	6,817,055

Table 26. Estimate of female spawning stock biomass-at-age by year.

						Age									
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total	SD
1982	0	0	0	59	87	195	476	465	418	720	754	1,548	1,047	5,770	1,314
1983	0	0	0	27	128	230	254	399	378	400	588	539	1,789	4,731	1,111
1984	0	0	0	34	106	502	556	305	429	370	349	585	2,056	5,292	1,183
1985	0	0	0	51	112	434	1,216	603	355	408	364	346	2,436	6,325	1,293
1986	0	0	0	163	170	467	872	1,272	560	282	349	307	2,105	6,548	1,208
1987	0	0	0	143	522	636	1,003	975	1,285	542	276	348	2,130	7,860	1,281
1988	0	0	0	138	562	2,292	1,631	1,239	1,061	1,162	602	312	2,226	11,225	1,455
1989	0	0	0	114	532	2,460	5,701	2,270	1,521	1,369	1,409	599	2,220	18,195	1,939
1990	0	0	0	146	359	2,090	5,086	6,397	2,216	1,392	1,188	1,362	2,438	22,675	2,162
1991	0	0	0	195	498	1,311	4,497	5,432	6,578	1,999	1,681	1,057	4,159	27,406	2,504
1992	0	0	0	205	694	1,989	3,403	5,206	6,237	6,893	2,451	1,969	4,992	34,037	2,940
1993	0	0	0	281	744	2,622	4,653	4,296	6,004	6,318	7,043	2,505	6,462	40,927	3,312
1994	0	0	0	248	1,009	2,813	6,130	5,706	4,632	5,691	6,447	6,746	7,299	46,721	3,528
1995	0	0	0	265	815	3,796	7,017	7,323	6,376	4,919	4,896	5,660	17,033	58,101	4,261
1996	0	0	0	336	901	3,446	10,143	8,724	8,356	6,531	4,475	4,963	17,852	65,728	4,543
1997	0	0	0	715	1,065	3,038	6,422	8,797	7,968	8,062	5,867	3,861	21,335	67,129	4,696
1998	0	0	0	317	1,837	3,214	6,094	6,532	8,673	6,094	5,463	4,331	15,581	58,137	4,093
1999	0	0	0	319	944	5,462	5,847	5,958	6,562	7,921	5,423	4,611	15,340	58,387	4,173
2000	0	0	0	390	1,031	3,709	12,895	7,298	6,794	5,772	7,351	5,043	17,988	68,269	4,786
2001	0	0	0	284	1,376	4,509	8,795	14,964	8,011	5,961	4,951	5,023	14,279	68,154	4,594
2002	0	0	0	263	918	5,642	10,121	10,466	15,534	7,341	5,123	4,159	15,915	75,481	5,074
2003	0	0	0	194	922	3,671	12,348	11,137	10,412	14,232	6,297	4,048	14,626	77,887	5,191
2004	0	0	0	282	757	3,613	7,818	13,318	10,930	8,921	11,954	4,888	13,431	75,911	5,226
2005	0	0	0	353	1,036	2,928	7,725	8,759	13,355	9,344	7,516	10,023	15,159	76,197	5,638
2006	0	0	0	182	1,128	3,711	5,534	8,209	8,571	11,217	7,769	5,833	18,927	71,080	5,642
2007	0	0	0	353	623	4,405	8,316	5,960	8,244	7,016	9,493	6,170	18,666	69,244	5,849
2008	0	0	0	225	1,370	2,725	11,103	9,168	6,138	7,200	5,774	7,211	17,213	68,127	5,795
2009	0	0	0	213	751	5,876	5,917	11,557	9,298	5,228	5,590	4,275	18,293	66,997	5,876
2010	0	0	0	158	712	3,354	12,661	5,995	10,572	7,932	4,442	4,229	16,141	66,196	5,810
2011	0	0	0	224	535	2,982	7,216	13,283	6,067	9,294	6,319	3,627	17,429	66,976	6,209
2012	0	0	0	166	781	2,282	6,878	8,324	13,618	5,659	7,993	5,432	16,436	67,569	6,671
2013	0	0	0	176	562	3,146	4,916	7,322	8,338	12,013	4,818	6,767	16,468	64,527	6,713
2014	0	0	0	207	627	2,050	6,427	5,186	7,549	7,349	10,136	4,151	18,896	62,578	7,200
2015	0	0	0	316	870	2,851	4,647	7,051	5,529	6,378	5,888	8,440	16,886	58,854	7,193

Figure 1. Time series of coast-wide commercial and recreational harvest in metric tons.

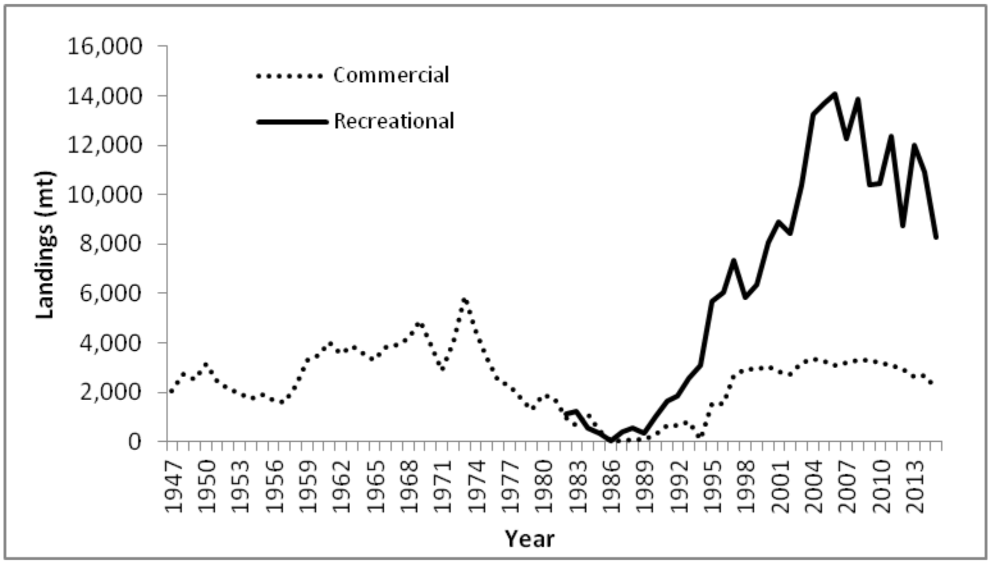


Figure 2. Time series of harvest and dead release/discard numbers from the coast-wide commercial and recreational fisheries during 1982-2015.

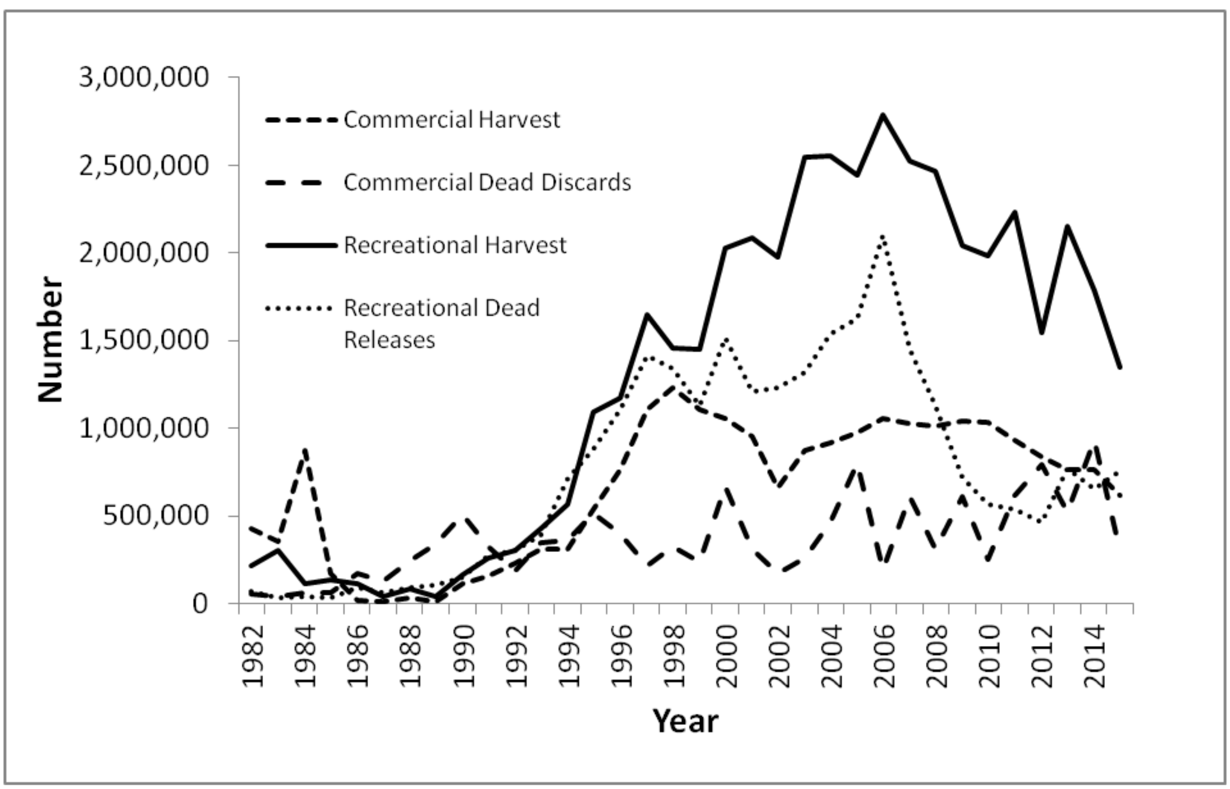


Figure 3. Percentage of total removals by fishery component in 2015.

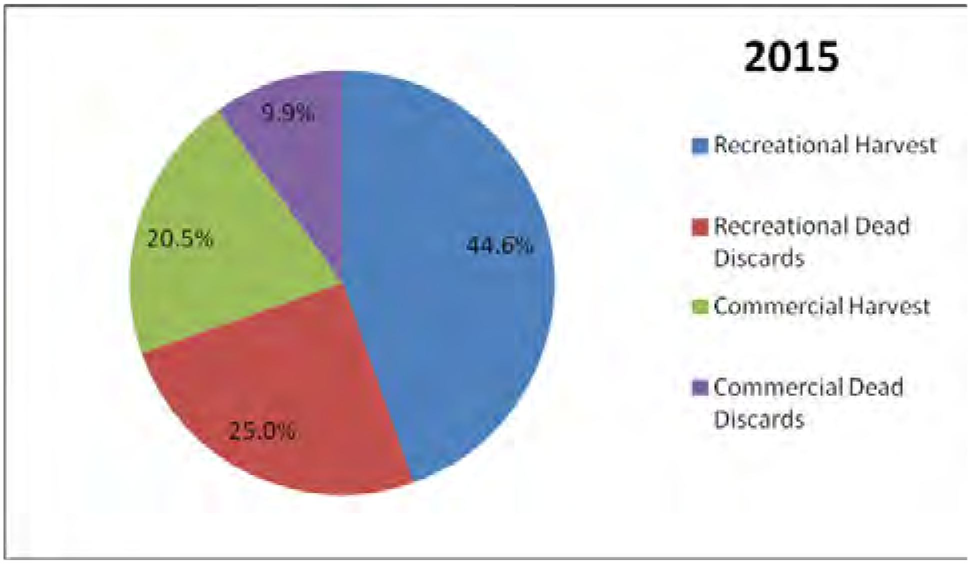


Figure 4. Total removals (numbers) of striped bass by regional fleets.

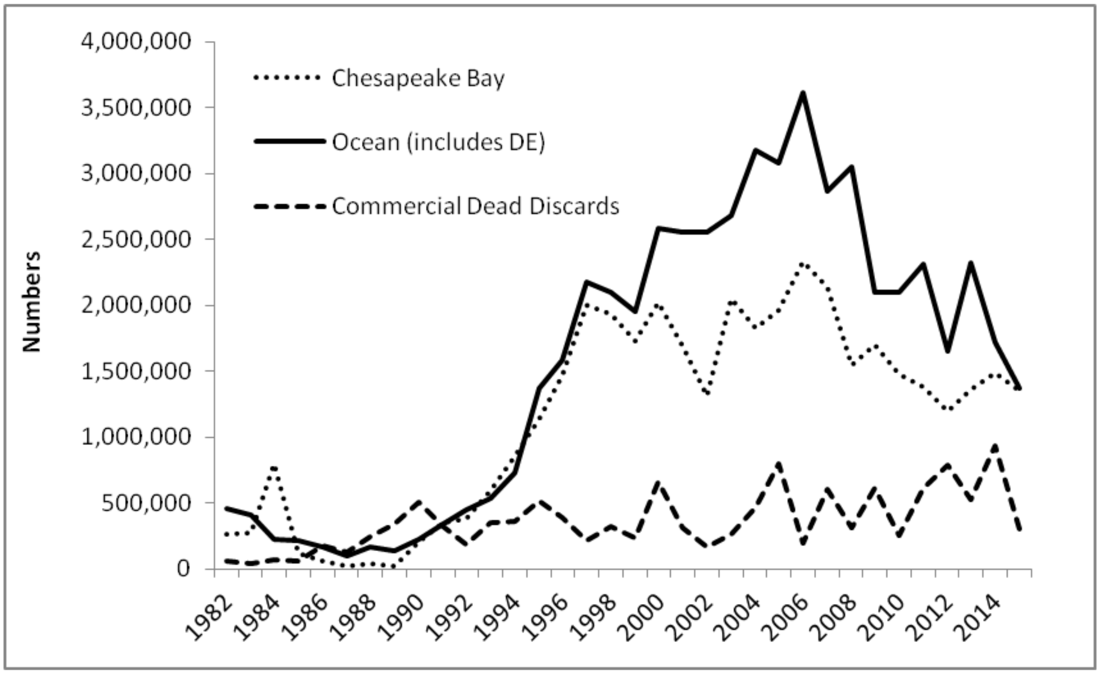


Figure 5. Fishery-independent and –dependent indices of relative abundance.

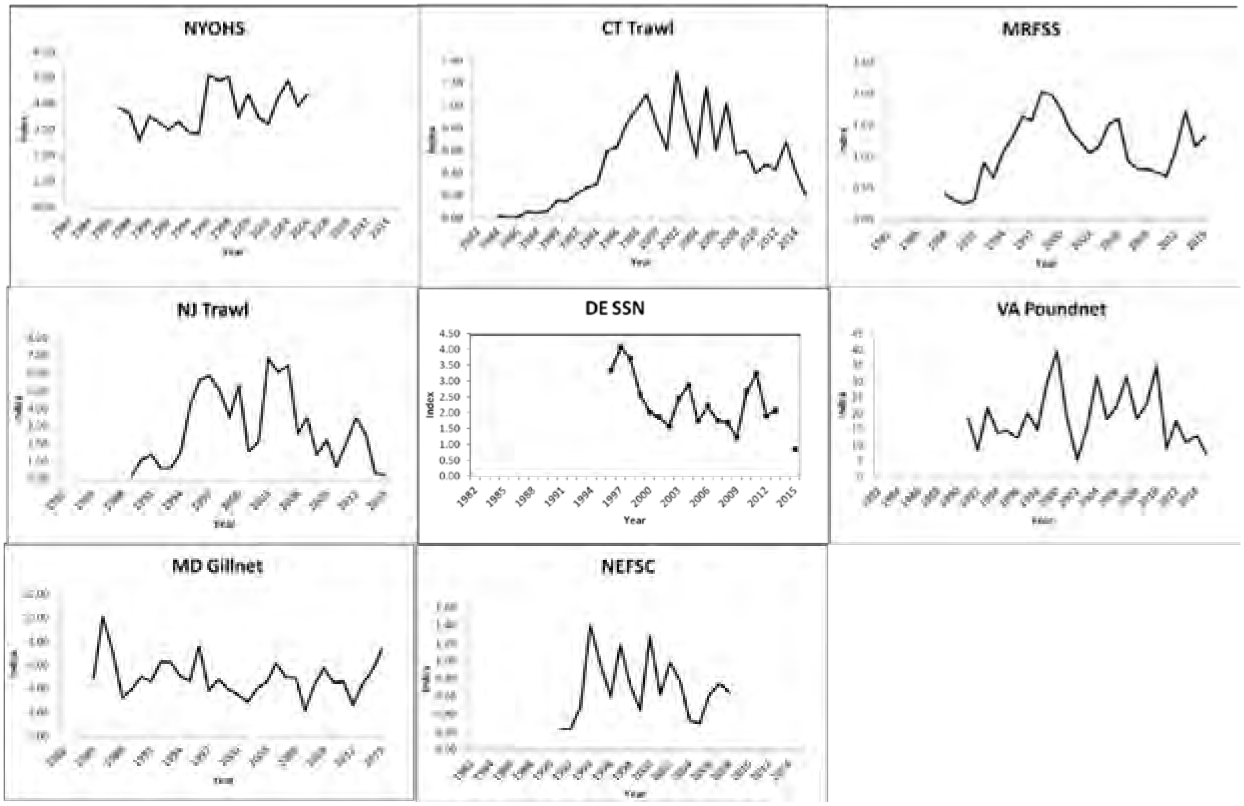


Figure 6. Young-of-the-year and age-1 indices of relative abundance.

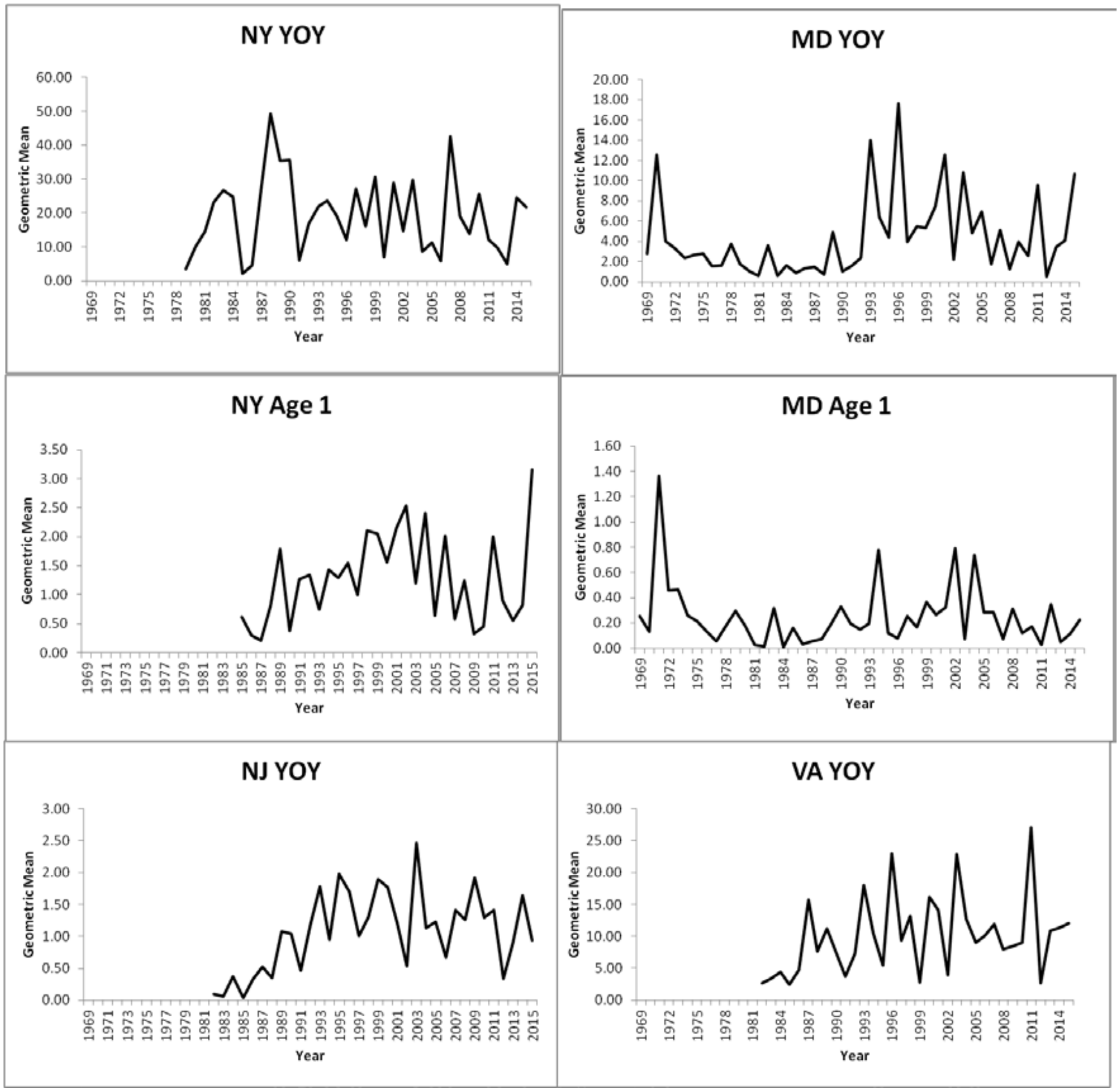


Figure 7. Observed and predicted total catch and standardized residuals by fleet (Fleet 1 = Bay, Fleet 2 = Ocean, Fleet 3 = Commercial Discards).

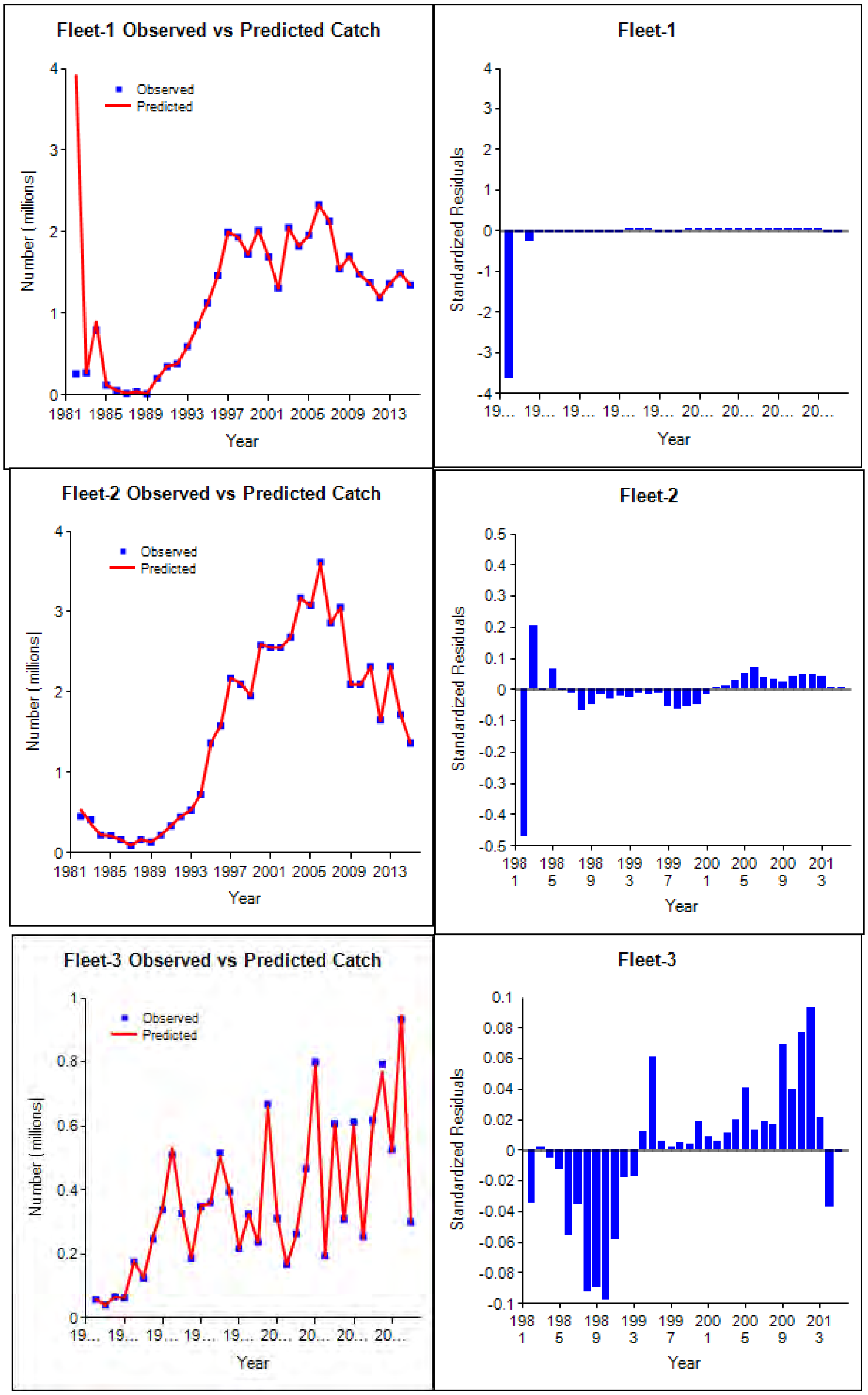


Figure 8. Catch selectivity patterns by fleet (Fleet 1 = Bay, Fleet 2 = Ocean, Fleet 3 = Commercial Discards).

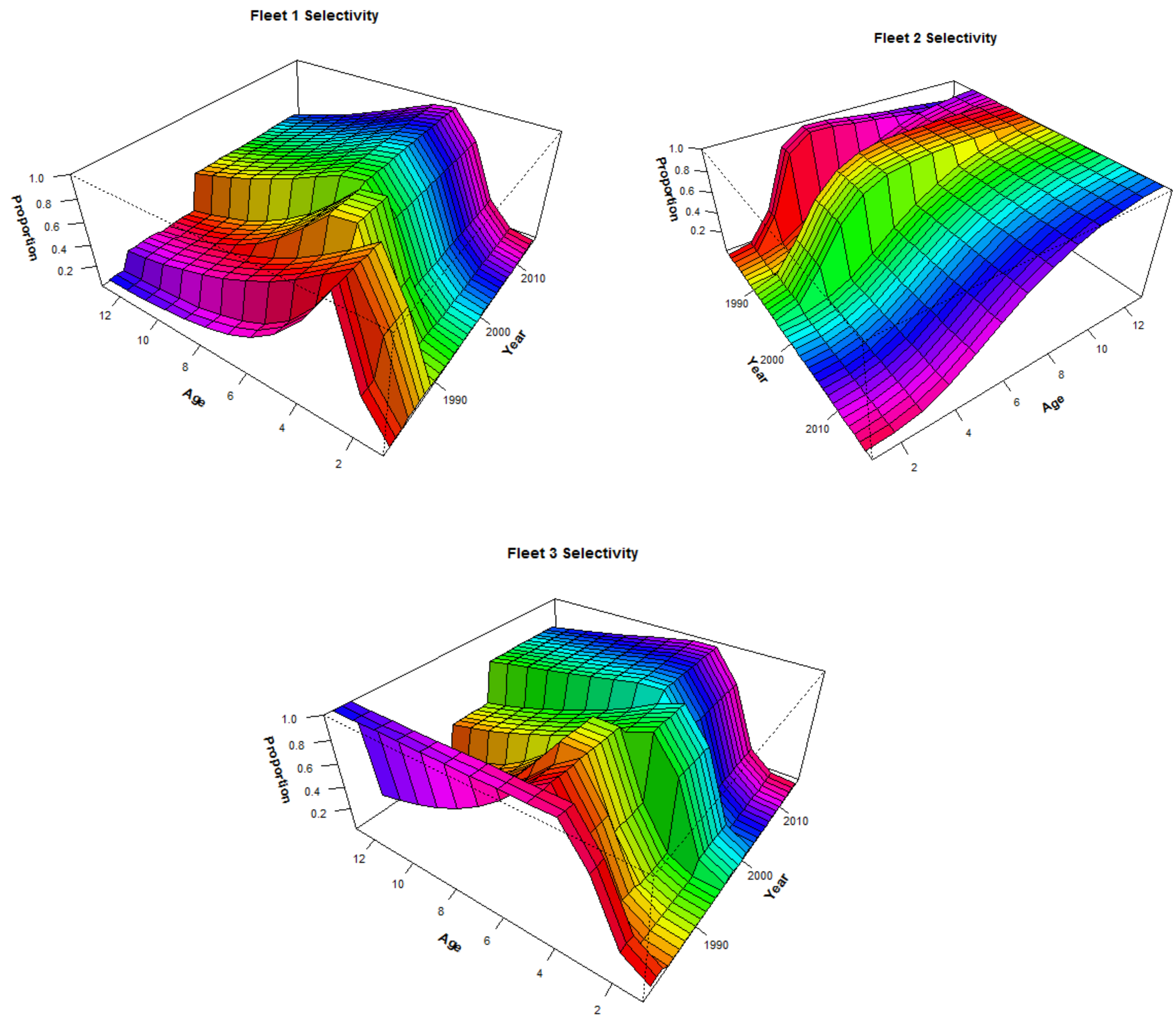
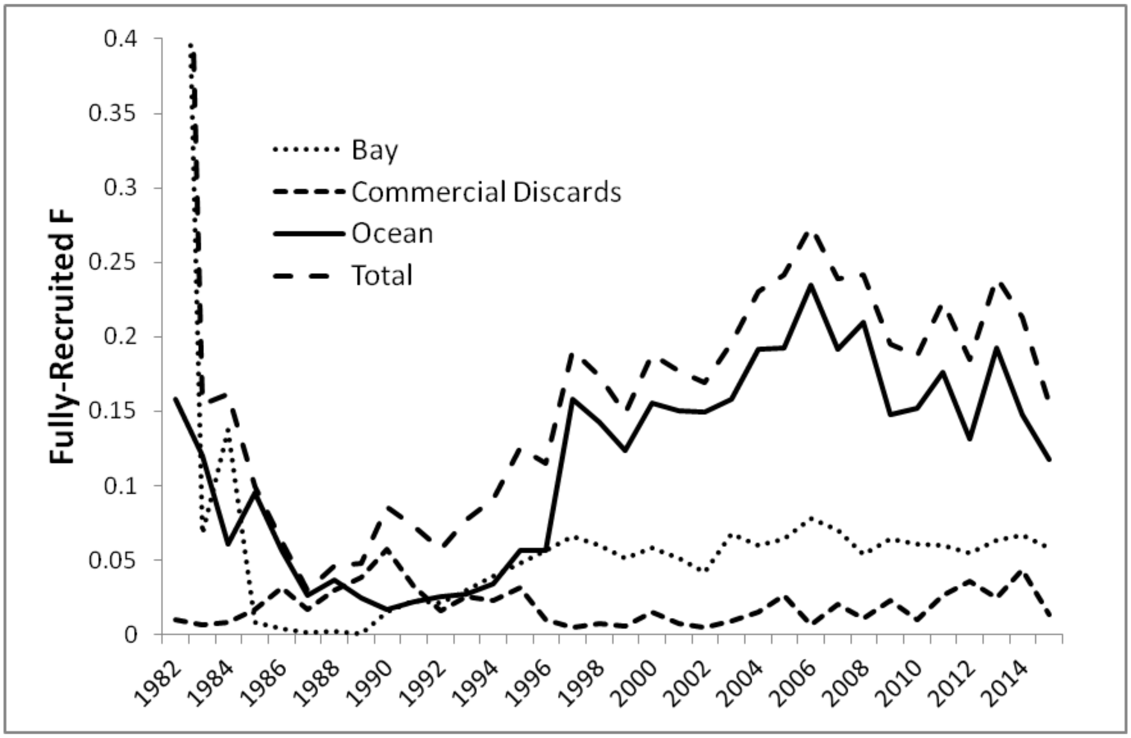


Figure 9. Estimates of total and fleet-specific fully-recruited fishing mortality and from the SCA base model run.



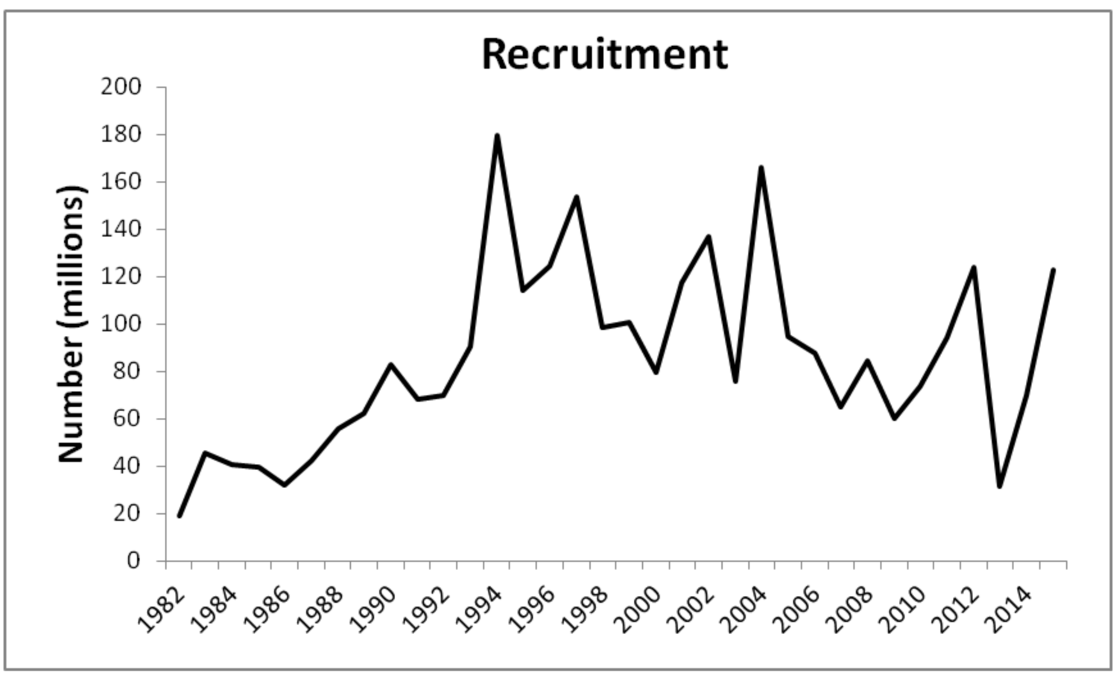


Figure 10. Comparison of fishing mortality-at-age in 2015 from the SCA model partitioned into fleets.

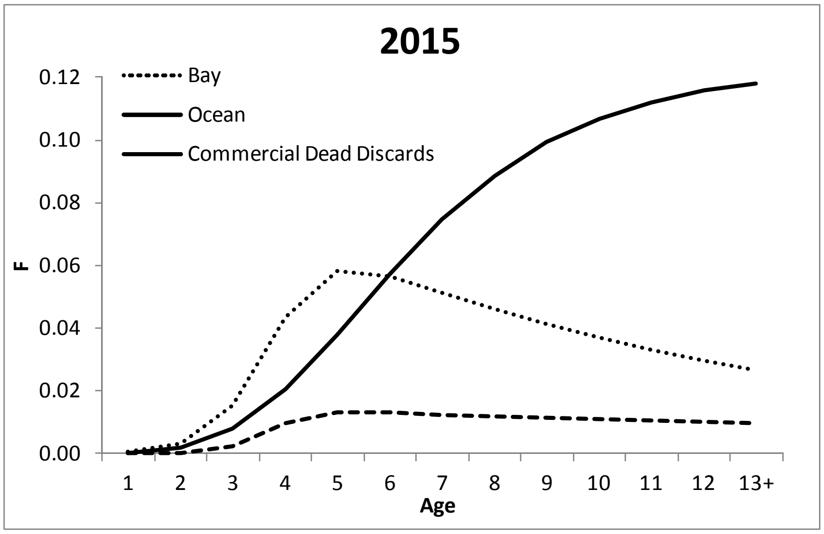


Figure 11. Estimates of January-1 total (age 1+) and 8+ abundance for 1982-2016. January-1 abundance for age 1 in 2016 was estimated from the 2015 observed values of the YOY indices and SCA model catchability coefficients, while older ages were projected from January-1 abundances and fishing and natural mortalities-at-age for 2015.

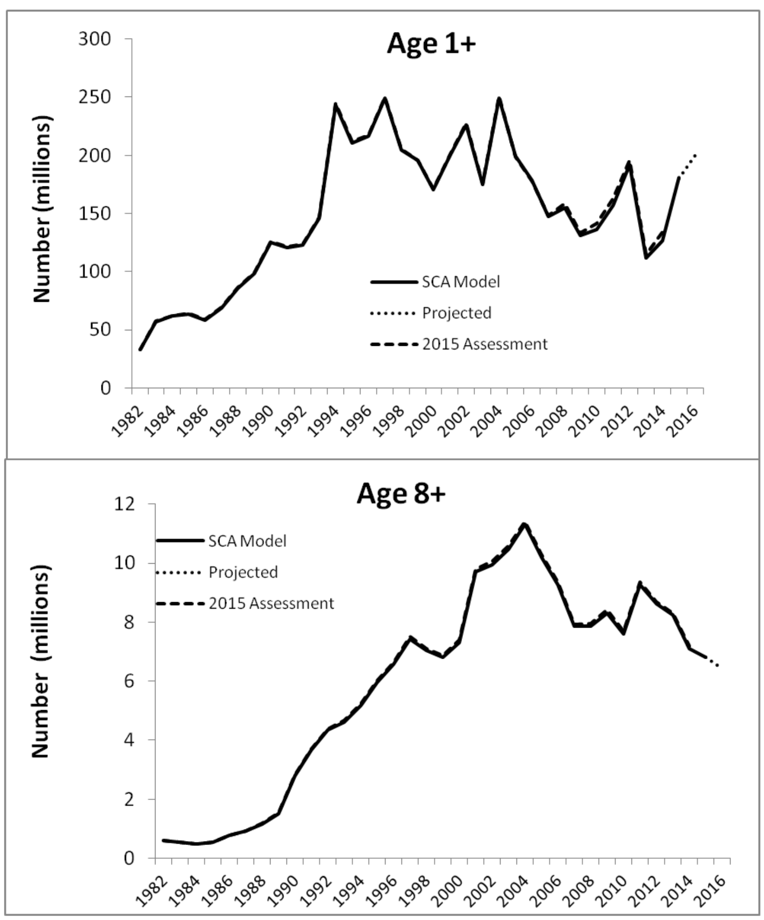


Figure 12. Estimates of A) female spawning stock biomass by year (solid line), B) female spawning stock numbers, and C) exploitable biomass. Dotted lines equal 95% confidence intervals. Dashed line is the female spawning stock reference point (1995 value).

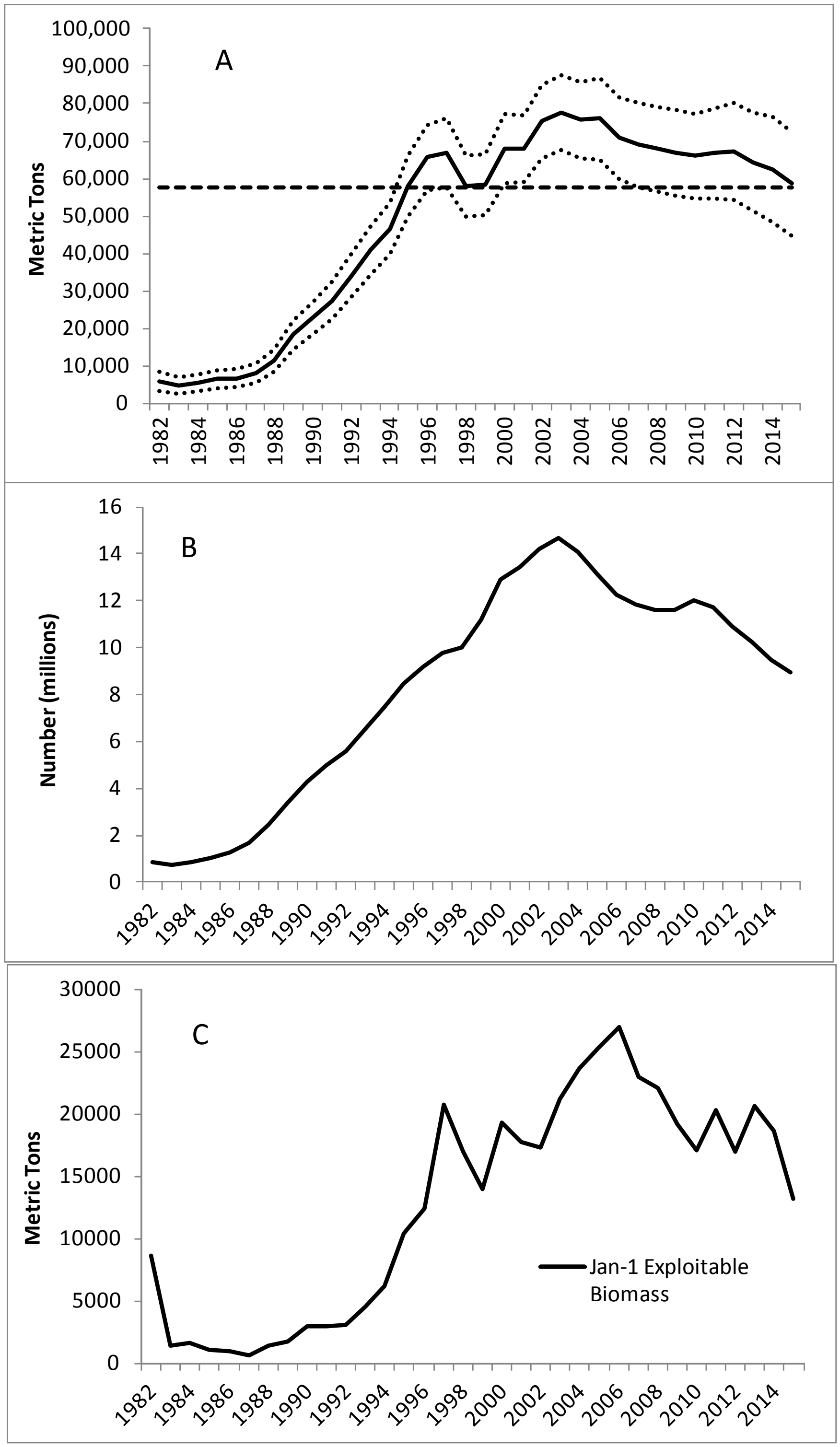


Figure 13. Retrospective analysis of fully-recruited F, female spawning stock biomass, 8+ abundance and Age 1 recruits.

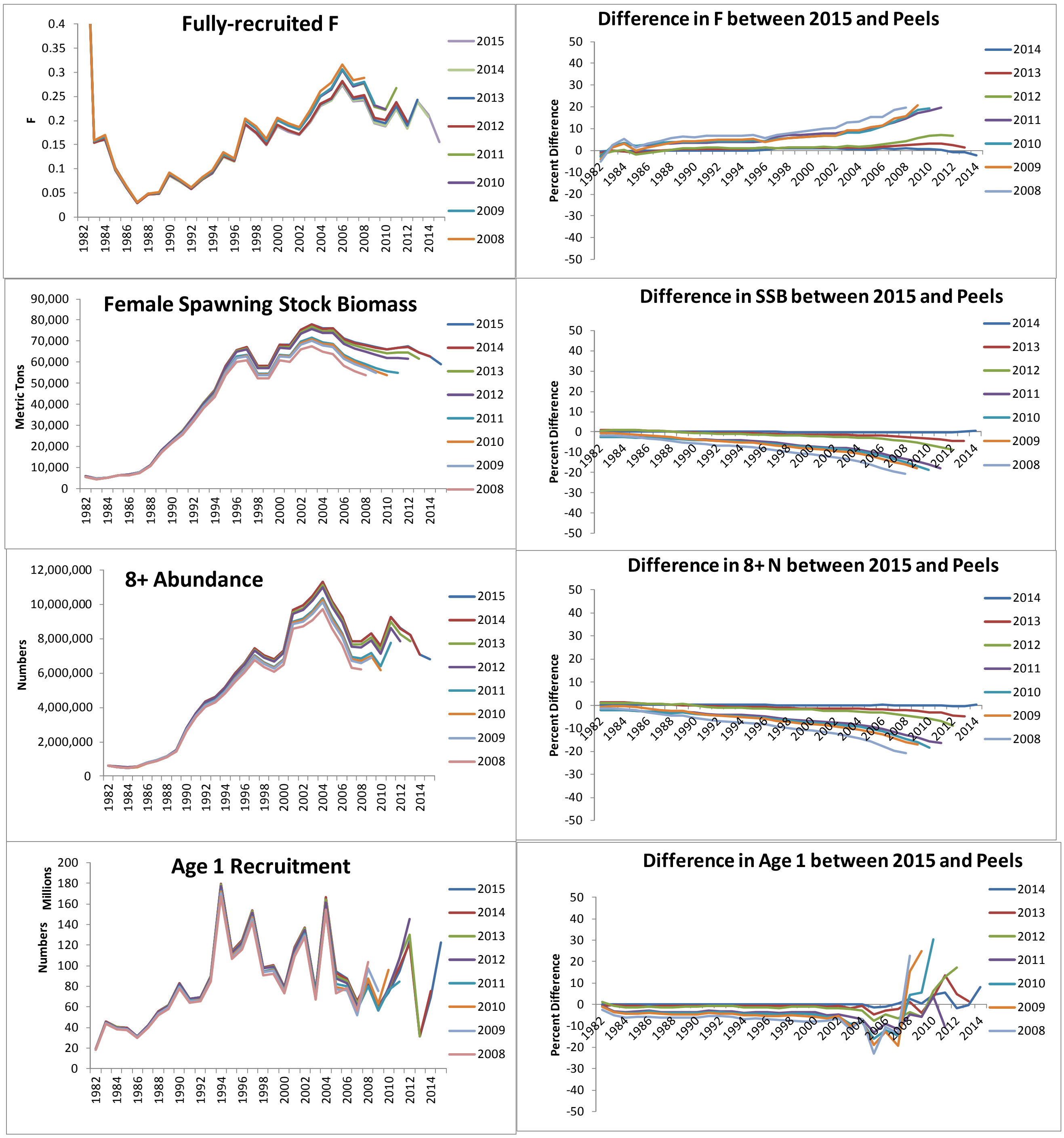


Table 14. Comparison of coast-wide fully-recruited (age-11) fishing mortality and female spawning stock biomass estimates between the 2016 and 2015 assessments.

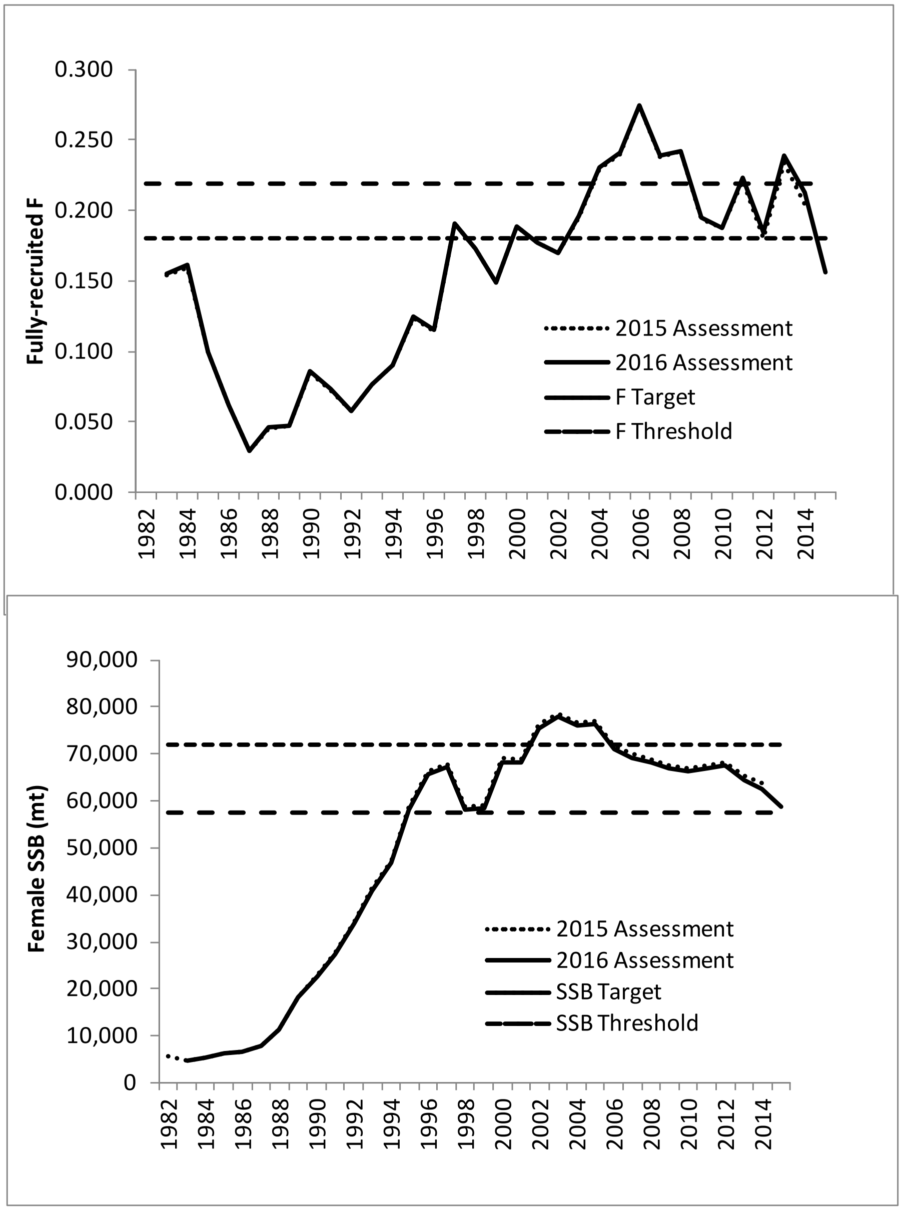
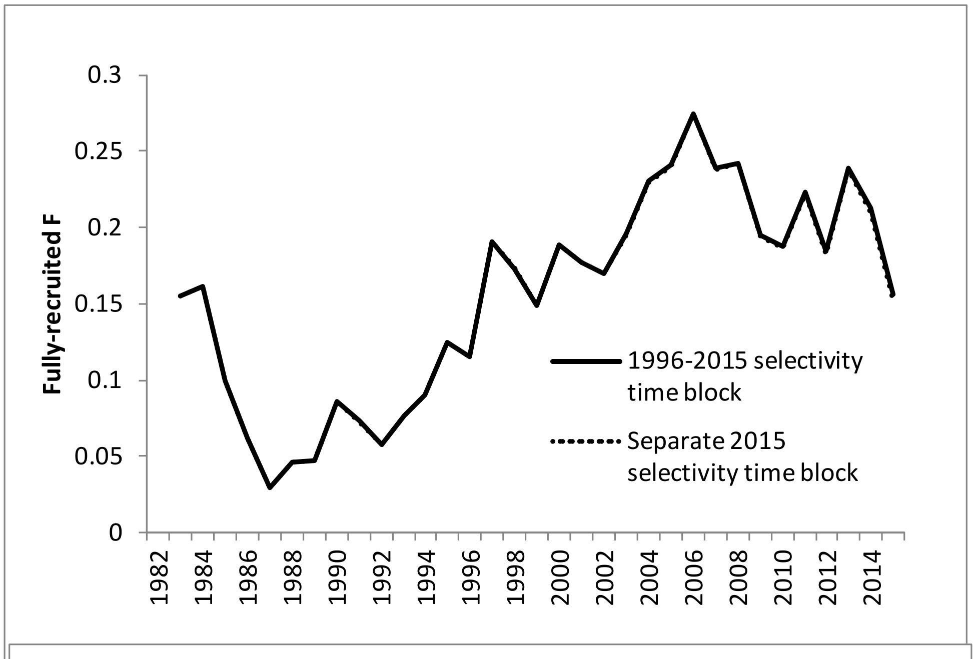


Figure 15. Comparison of estimates of total fully-recruited fishing mortality and spawning stock biomass from the 2016 update assessment with estimates from a model run using separate fleet selectivity time blocks for 2015.



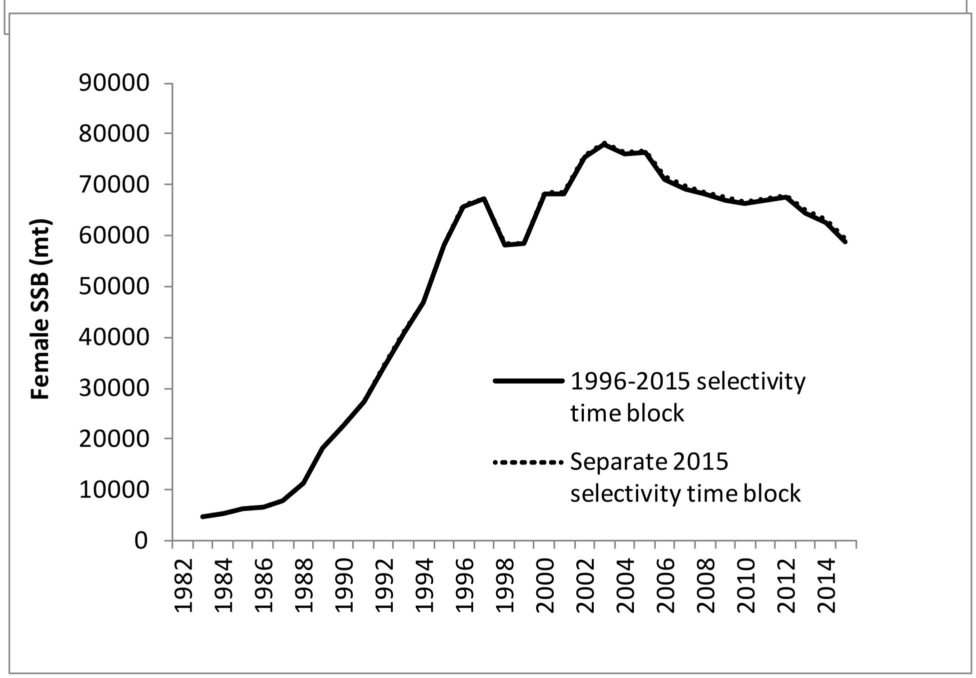


Figure 16. Projections of female spawning stock biomass and estimated fishing mortality assuming constant catch during 2016-2018 compared to the reference threshold values. The projections using the 2015 estimates of abundance and F are shown in black and the projections using the 2015 estimates adjusted for average retrospective biases are shown in red. The graph on the left contains the projected estimates (median is the solid symbols; 95% confidence intervals are dotted lines) compared to the reference threshold values (solid horizontal lines), and the graph on the right is the probability of the estimate comparison.

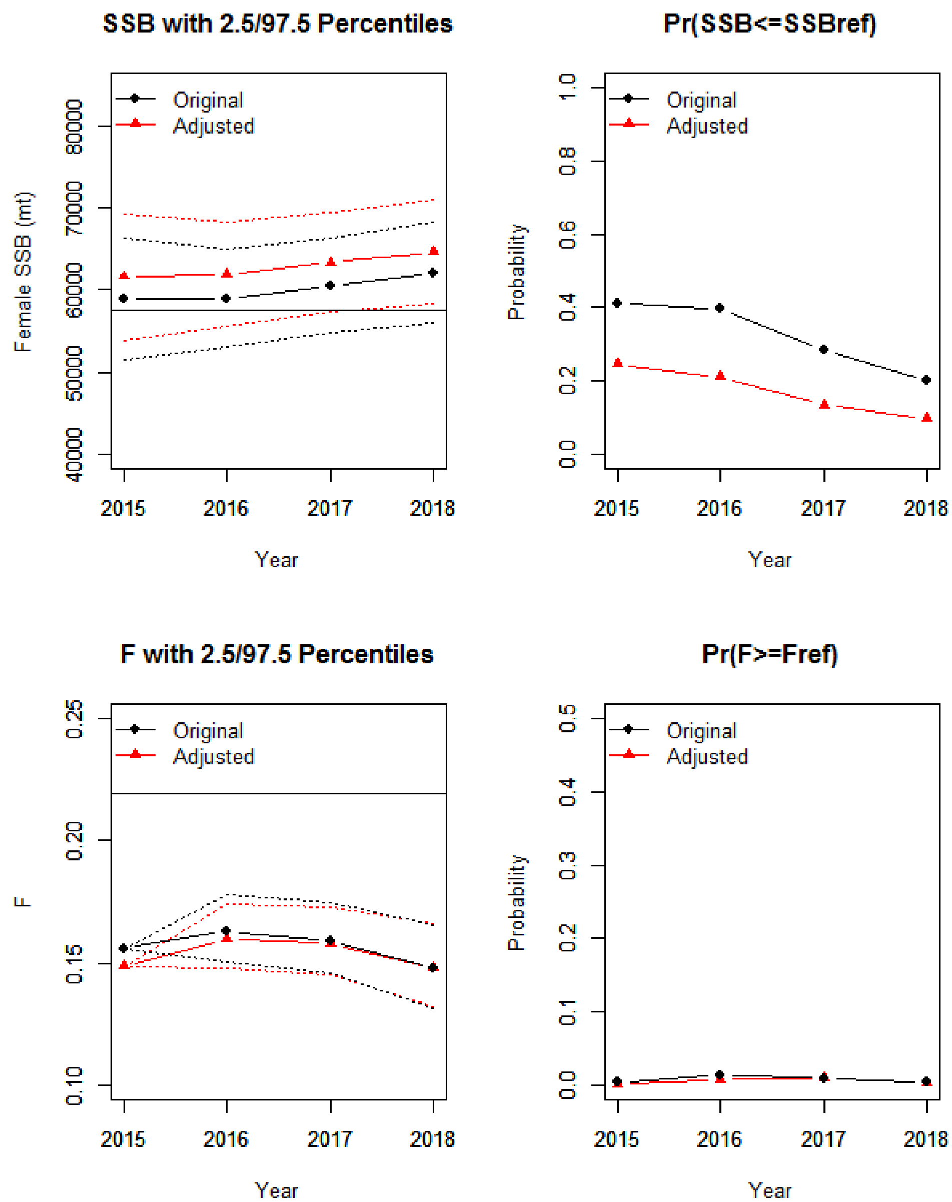


Figure 17. Projections of female spawning stock biomass and estimated fishing mortality assuming constant catch during 2016-2018 compared to target reference points. The projections using the 2015 estimates of abundance and F are shown in black and the projections using the 2015 estimates adjusted for average retrospective bias are shown in red. The graph on the left contains the projected estimates (median is the solid symbols; 95% confidence intervals are dotted lines) compared to the target values (solid horizontal lines), and the graph on the right is the probability of the estimate comparison.

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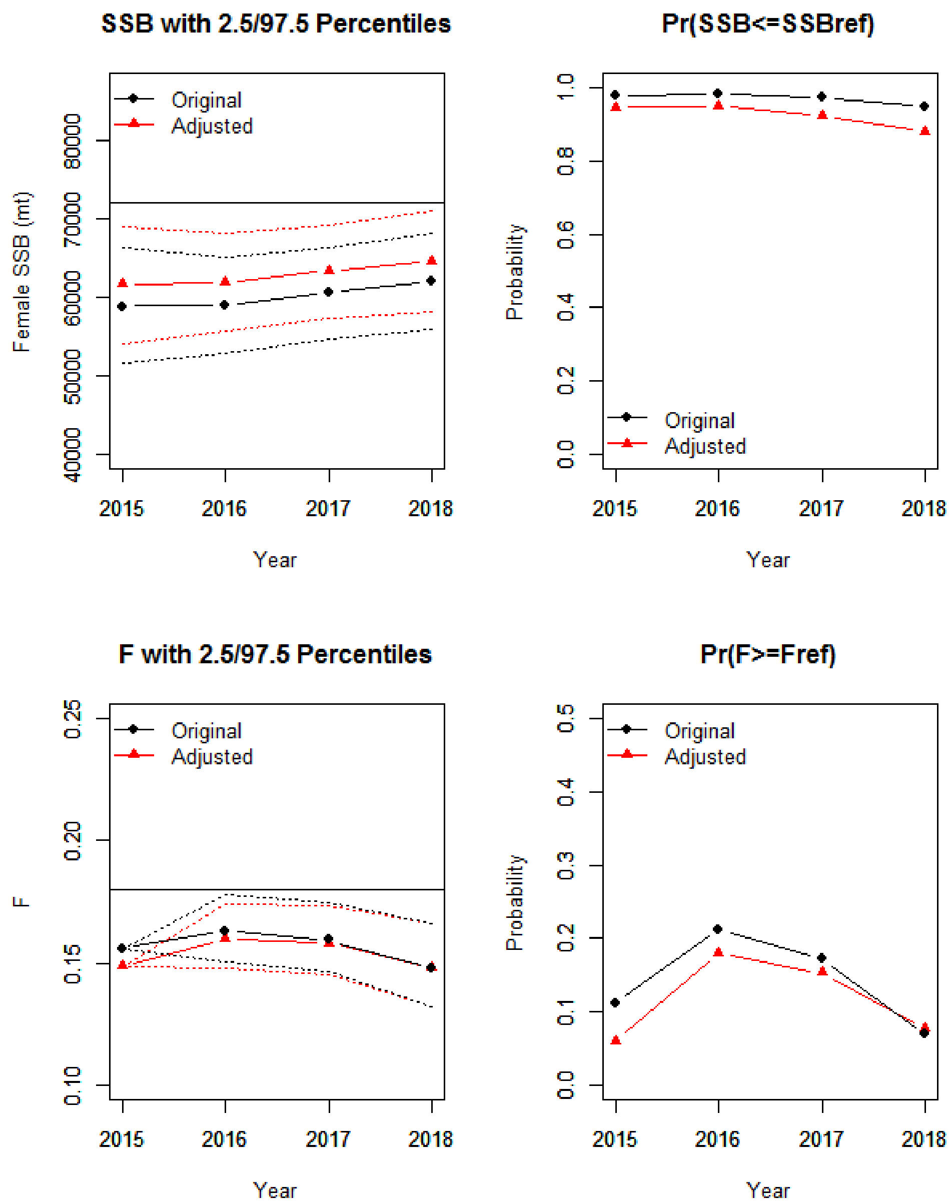


Figure 18. Projections of female spawning stock biomass and estimated catch assuming constant fully-recruited fishing mortality equal to the 2015 value (0.157) during 2016-2018 compared to threshold and target reference points. The projections using the 2015 estimates of age-specific abundances are shown in black with the solid circle and the projections using the 2015 estimates adjusted for average retrospective bias are shown in red with a triangle. The graph on the left contains the projected estimates (median is the solid symbols; 95% confidence intervals are dotted lines) and, for spawning stock biomass, is compared to the threshold (lower solid horizontal line) and target (upper solid horizontal line) reference points. The graph on the right is the probability of SSB being less than or equal to the reference points.

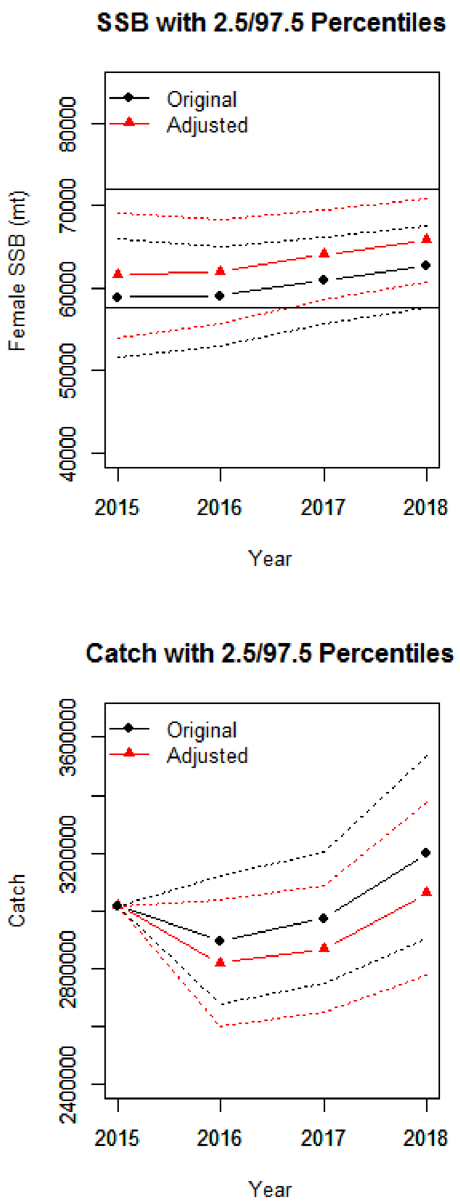
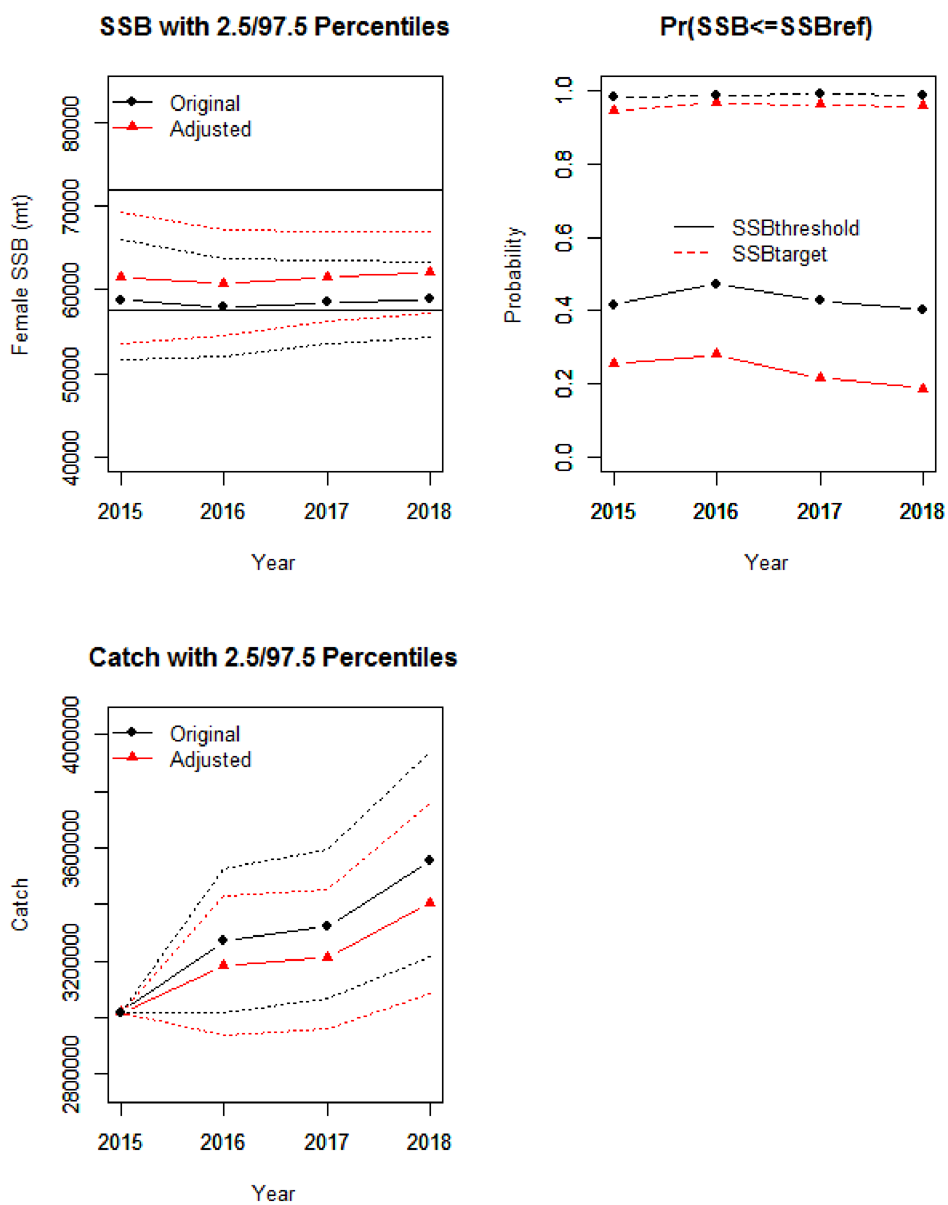


Figure 19. Projections of female spawning stock biomass and estimated catch assuming constant fully-recruited fishing mortality equal to the F_{target} (0.18) during 2016-2018 compared to threshold and target reference points. The projections using the 2015 estimates of age-specific abundances are shown in black with a solid circle and the projections using the 2015 estimates adjusted for average retrospective bias are shown in red with a triangle. The graph on the left contains the projected estimates (median is the solid symbols; 95% confidence intervals are dotted lines) and, for spawning stock biomass, is compared to the threshold (lower solid horizontal line) and target (upper solid horizontal line) reference points. The graph on the right is the probability of SSB being less than or equal to the reference points.



Appendix A. Plots of SCA model output.

Figure 1. Plots of observed and predicted catch proportions-at-age by year for each fleet.

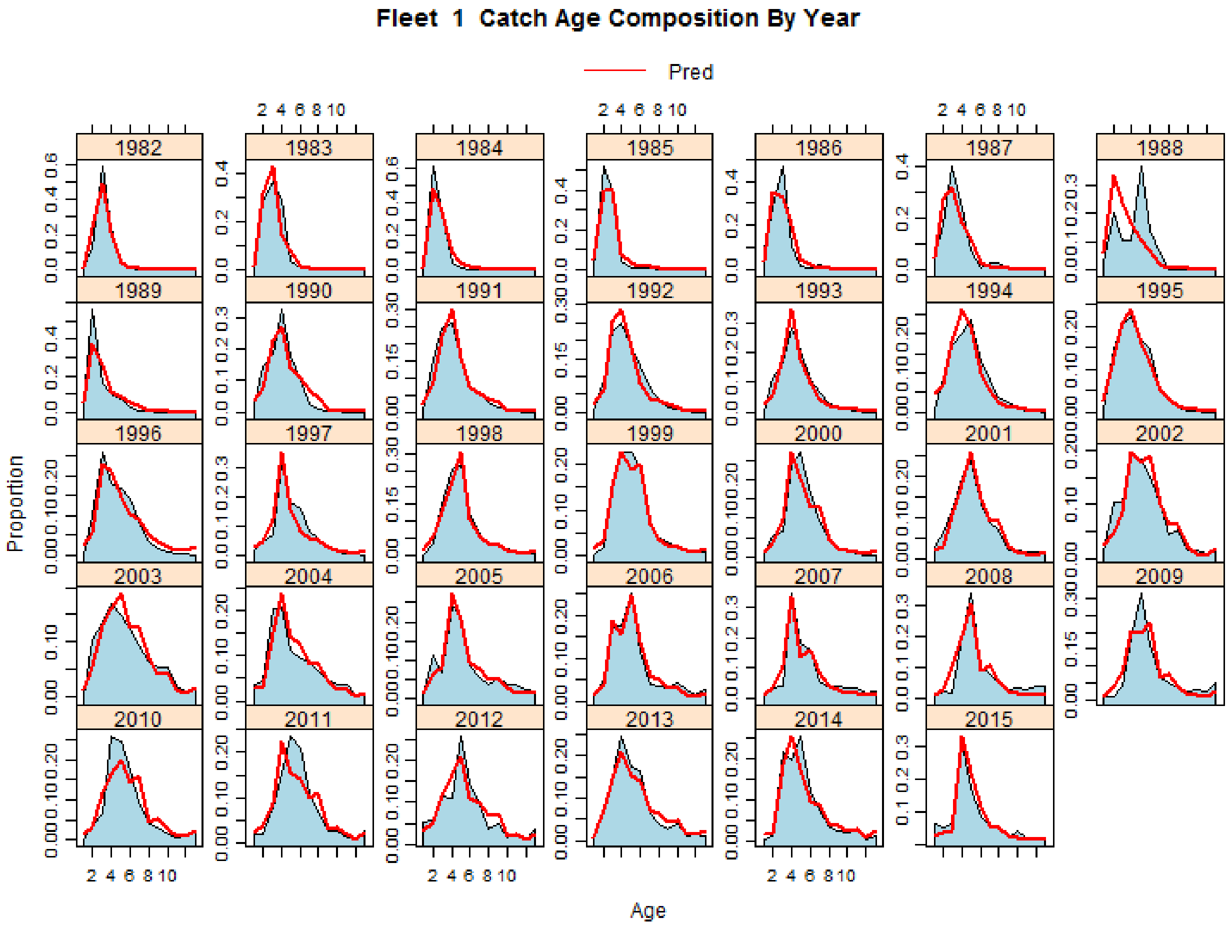


Figure 1 cont.

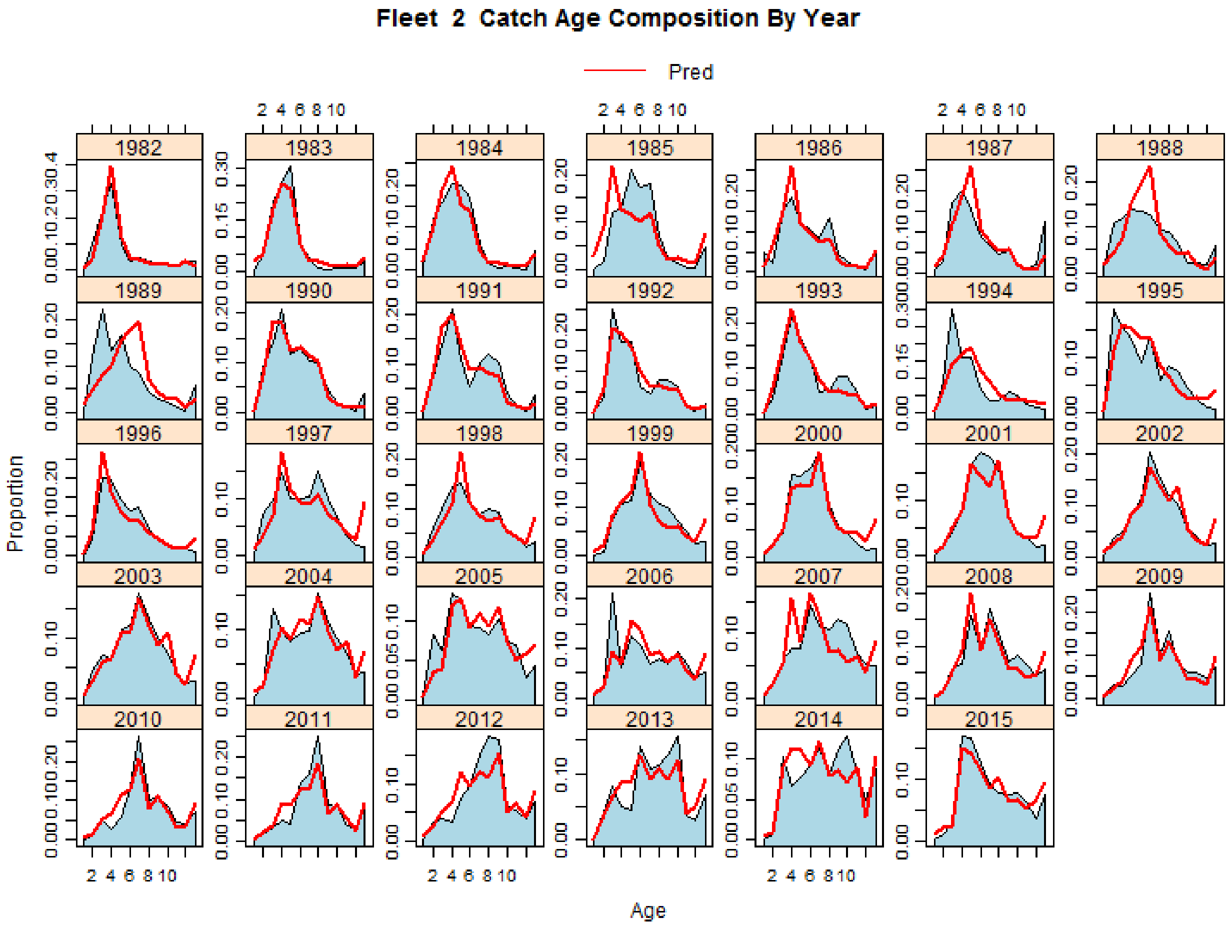


Figure 1 cont.

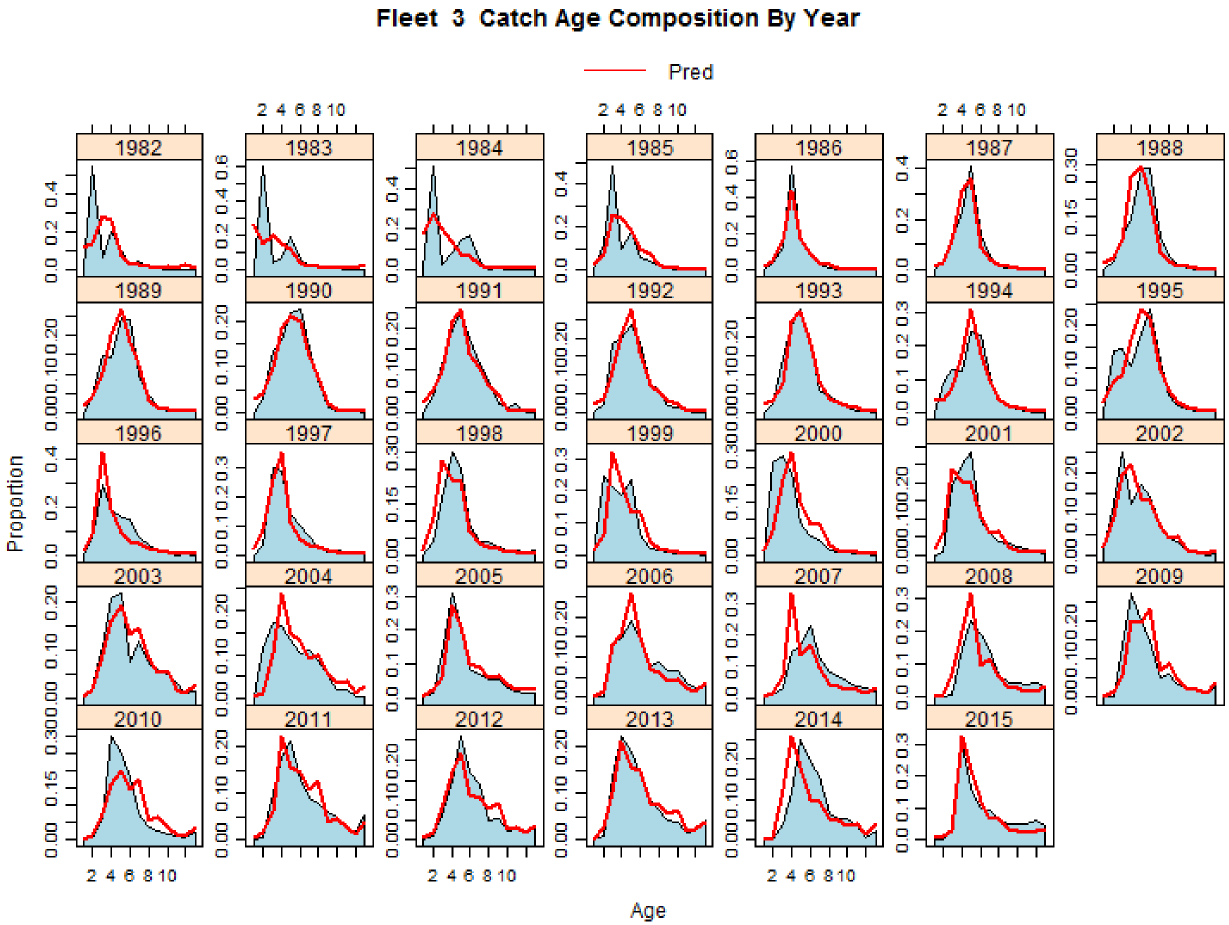


Figure 2. Standardized residuals of catch proportions-at-age by year for each fleet.

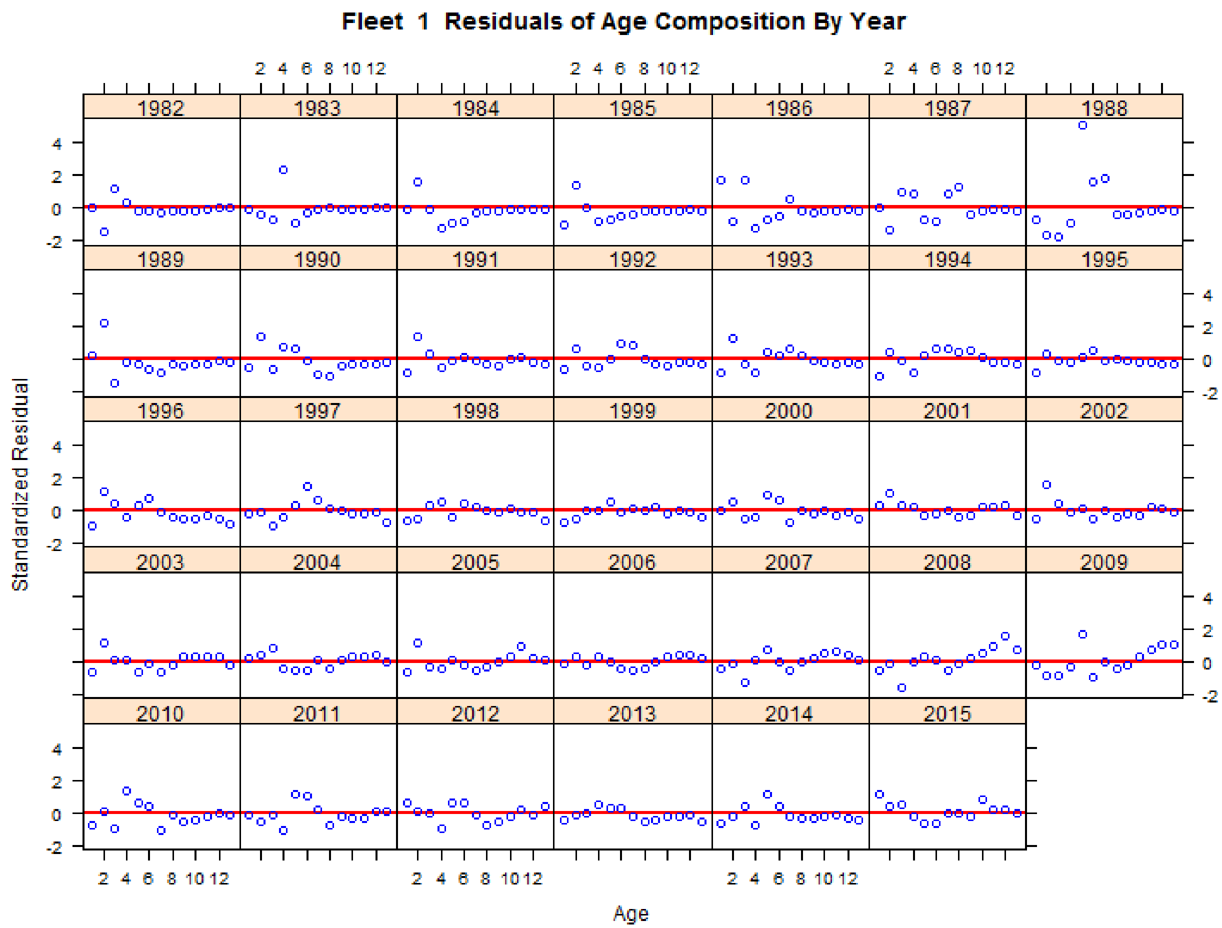


Figure 2 cont.

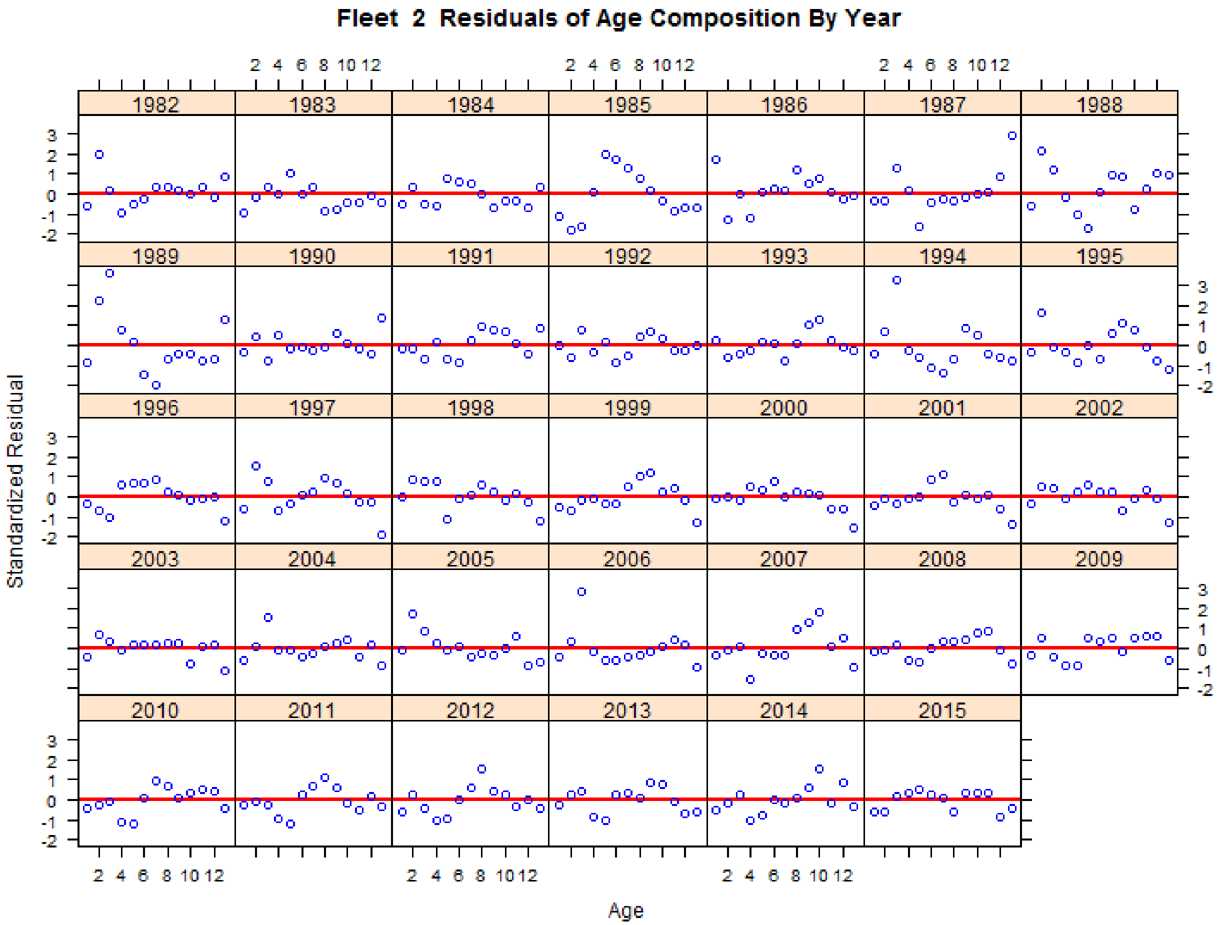


Figure 2 cont.

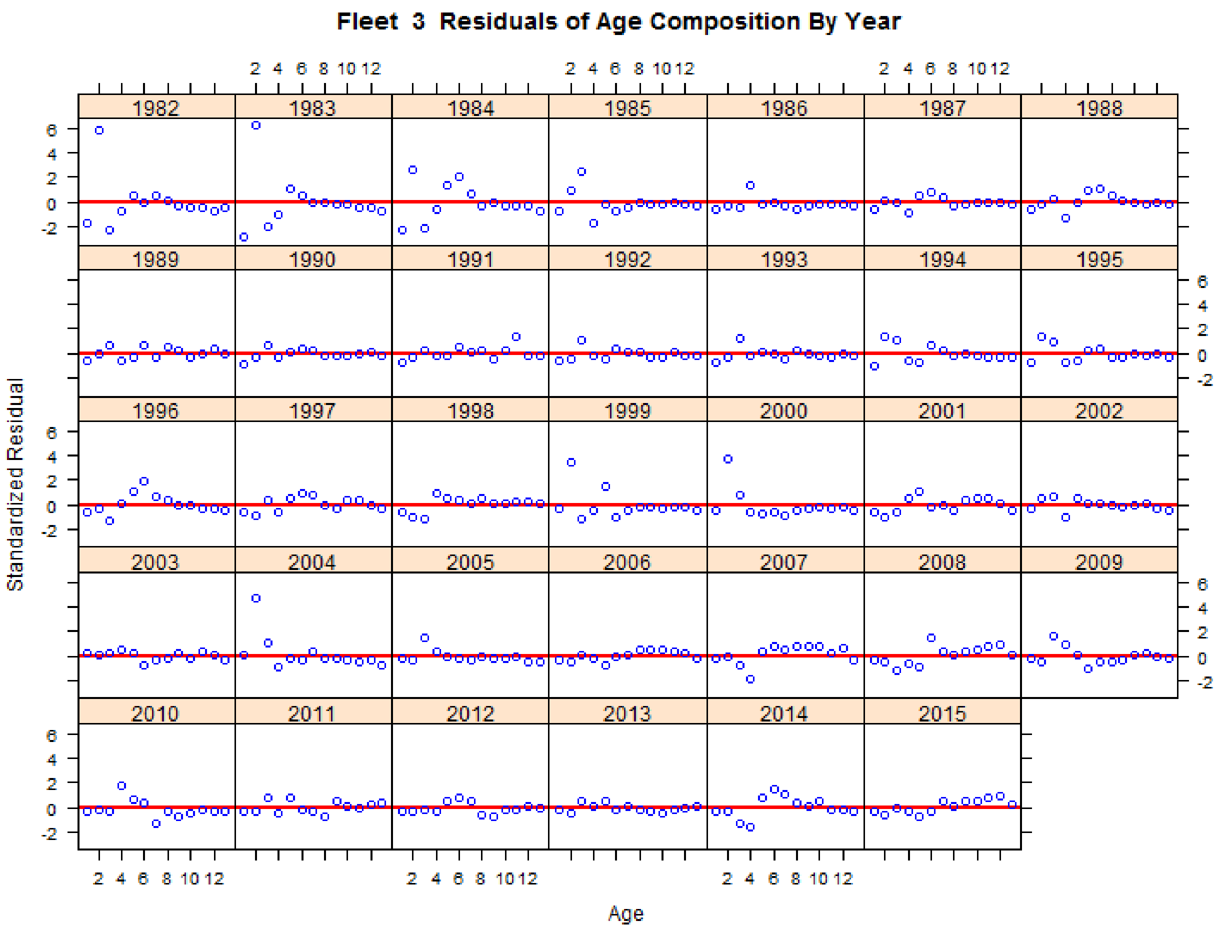


Figure 3 .Observed and predicted catch proportions-at-age by age for each fleet

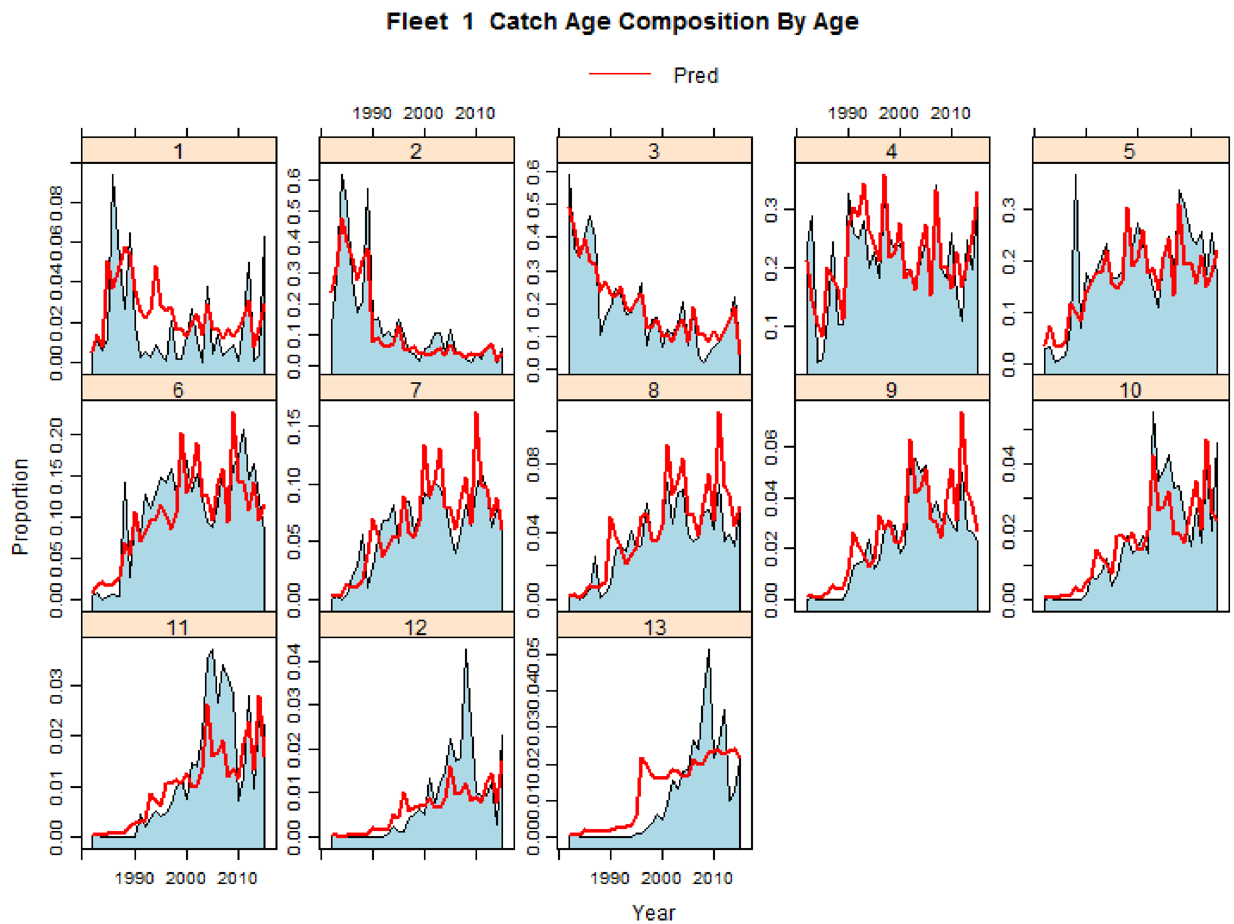


Figure 3 cont.

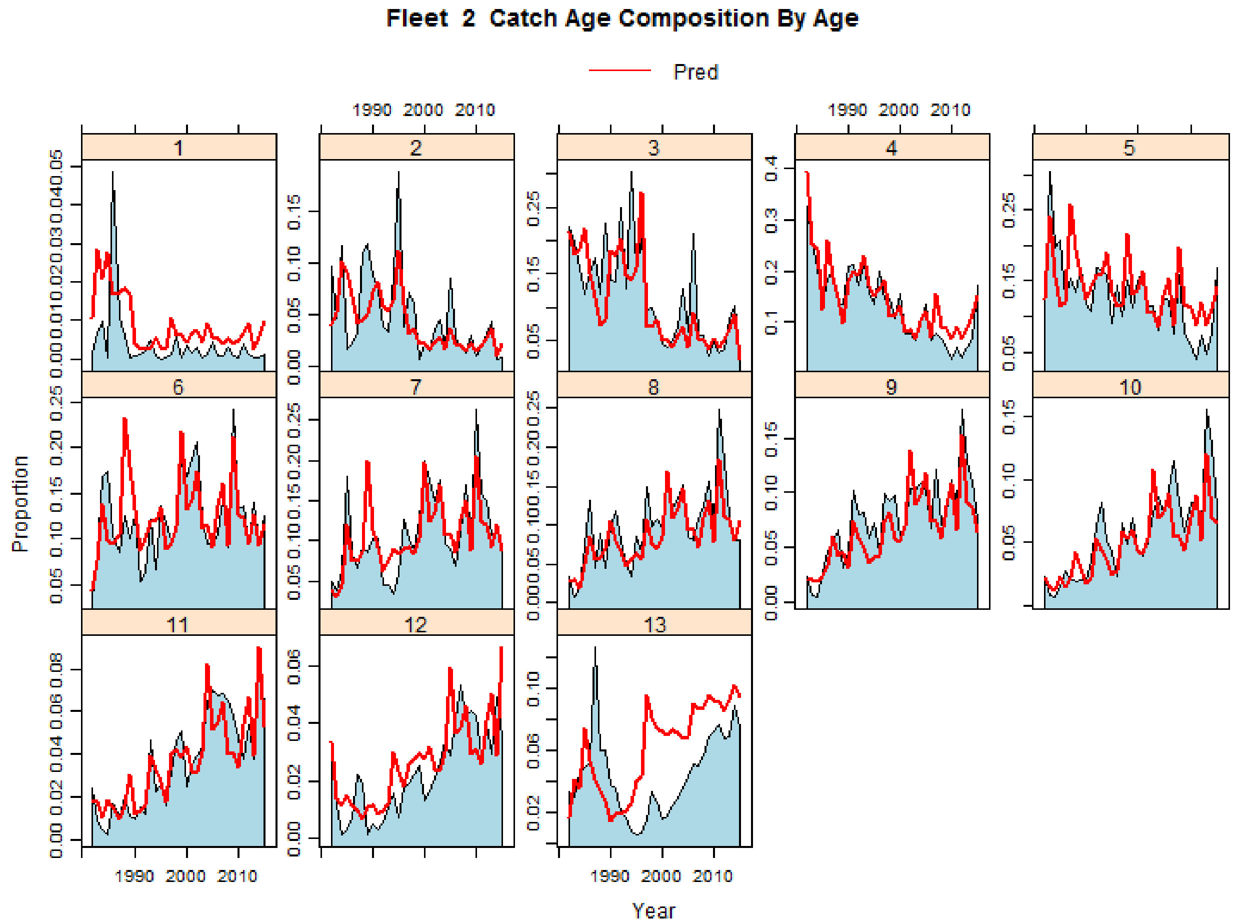


Figure 3 cont.

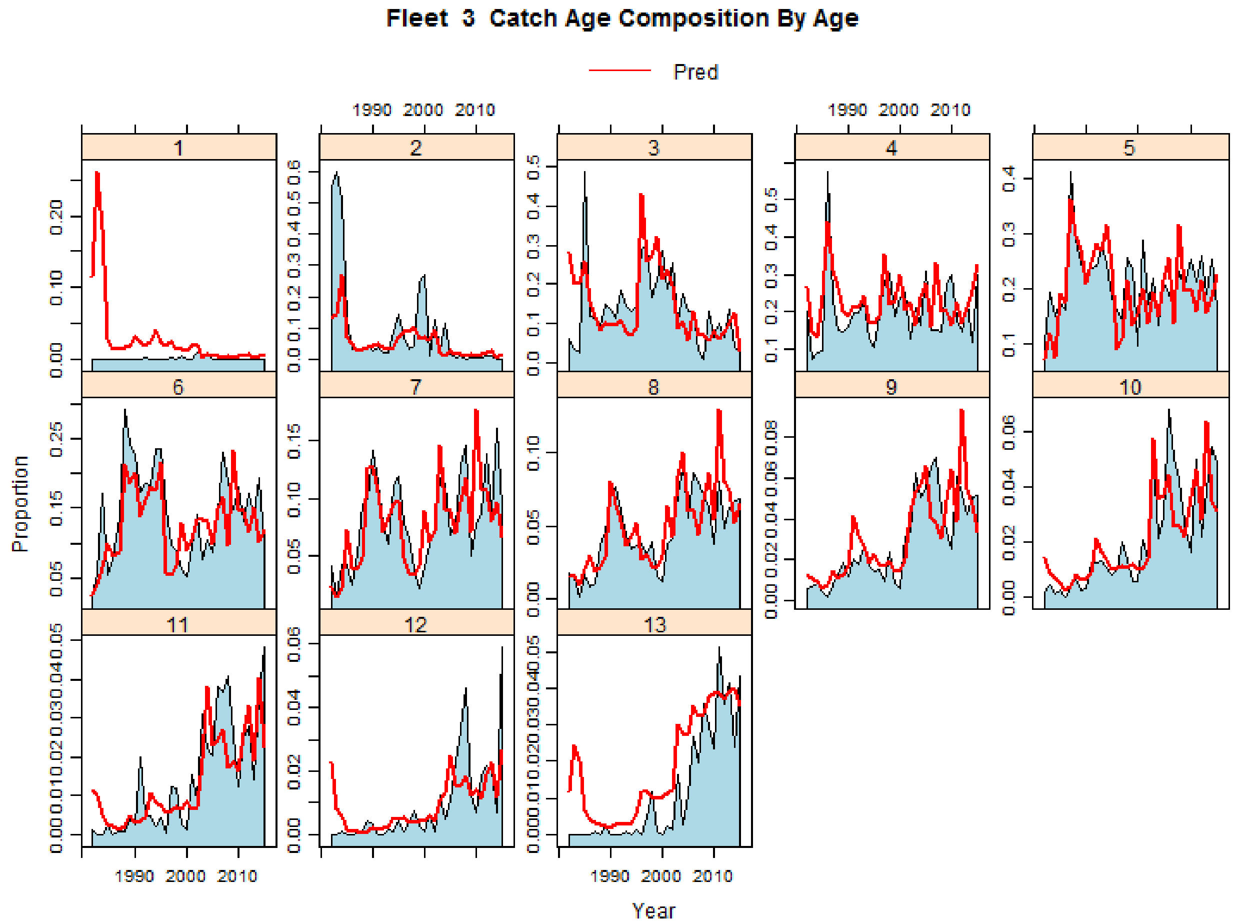


Figure 4. Standardized residuals of catch proportions-at-age by age.

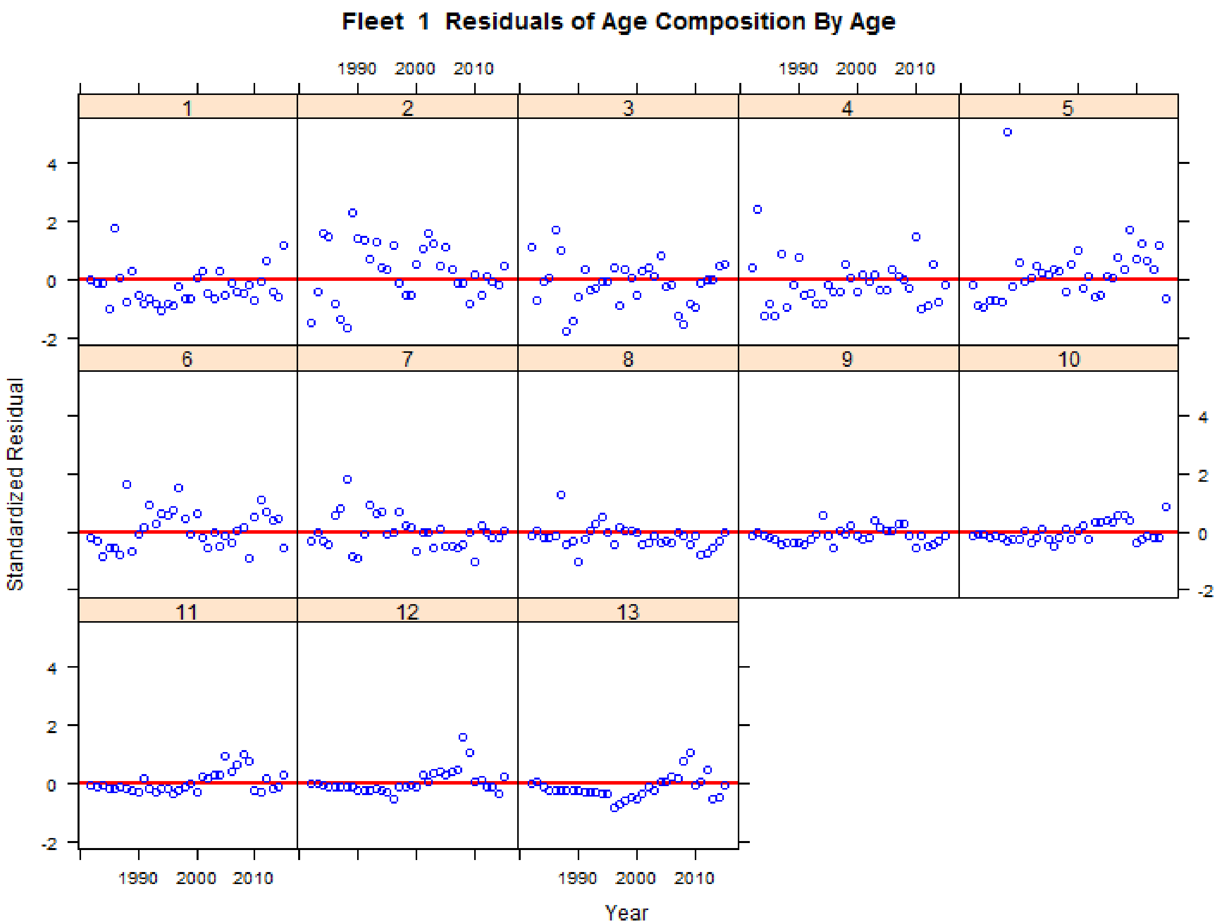


Figure 4 cont.

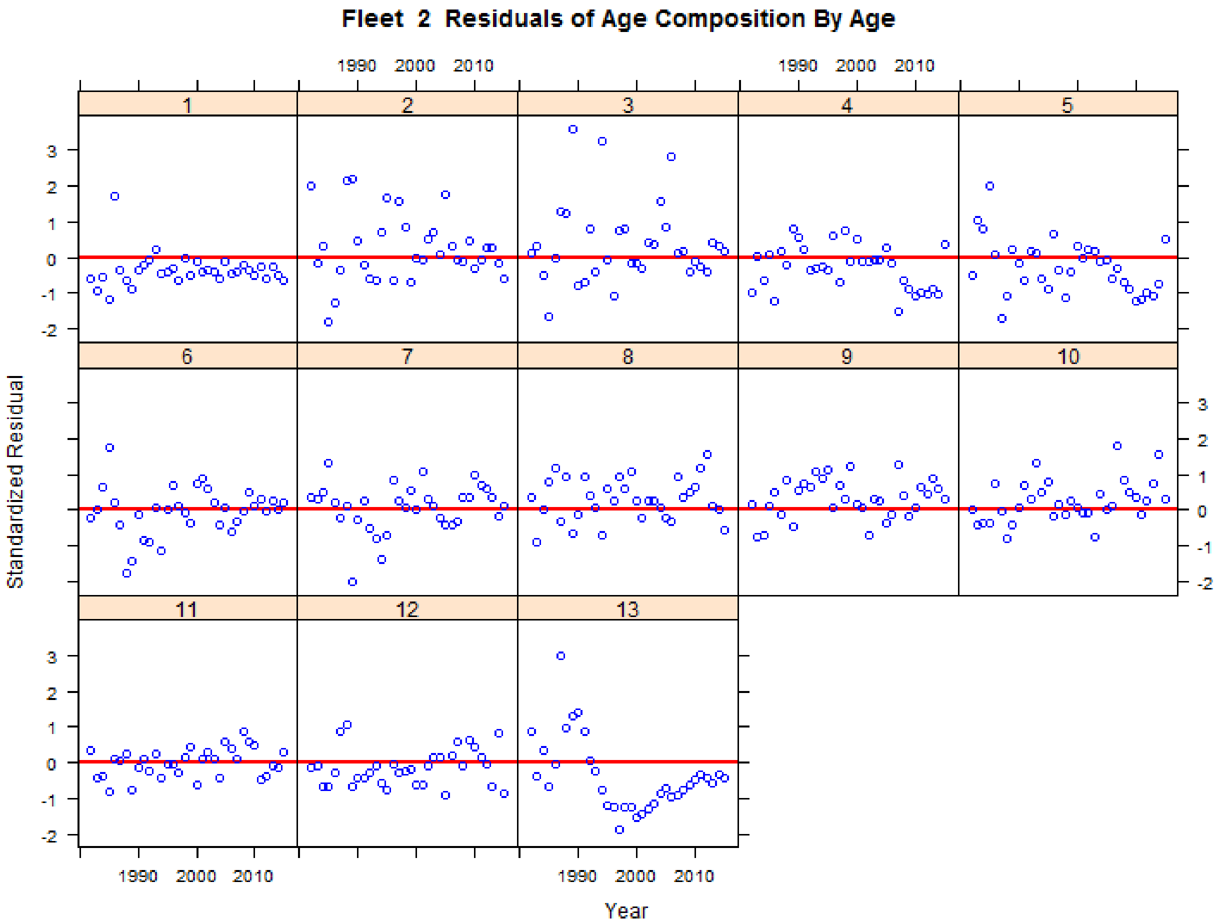


Figure 4 cont.

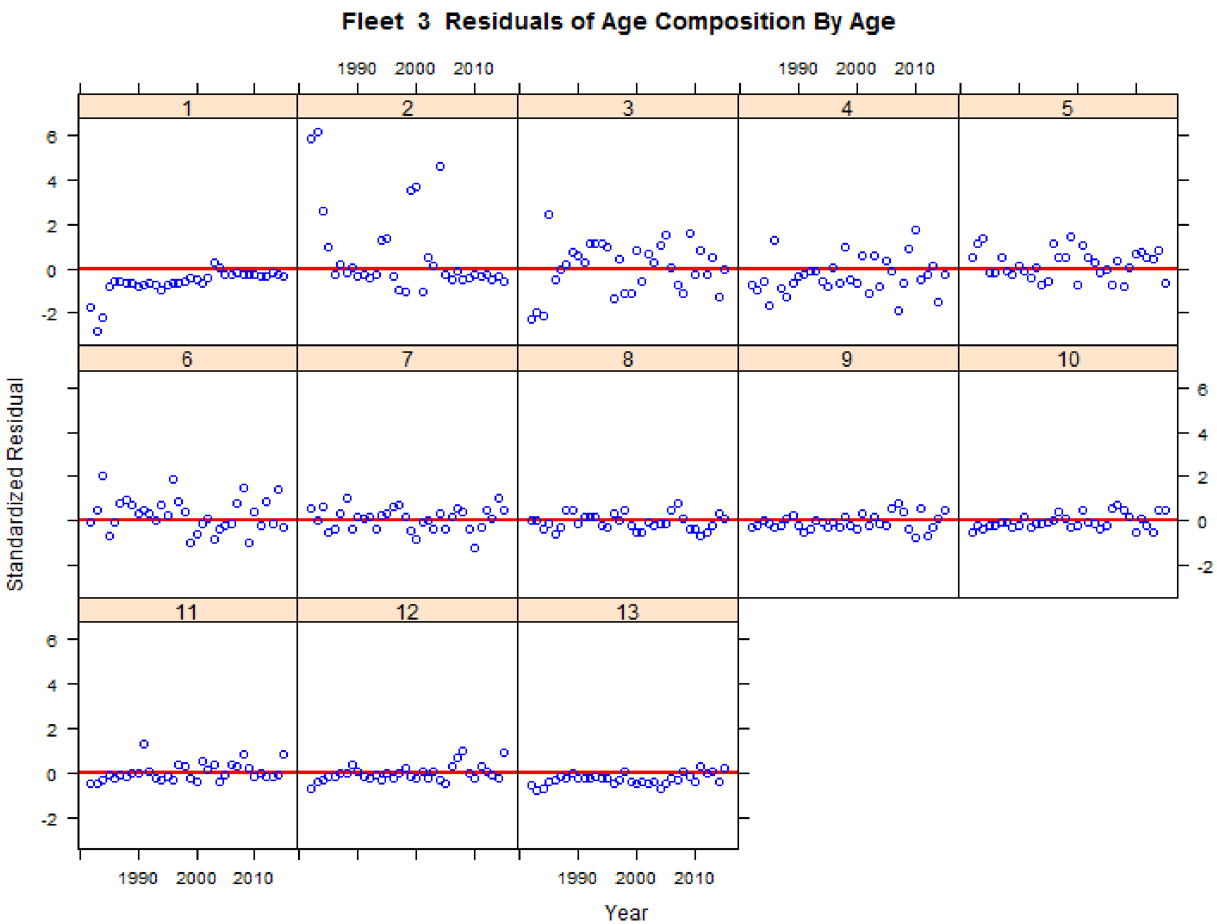


Figure 5. Observed and predicted values and standardized residuals for young-of-the-year and yearling surveys tuned to Age 1 and 2, respectively.

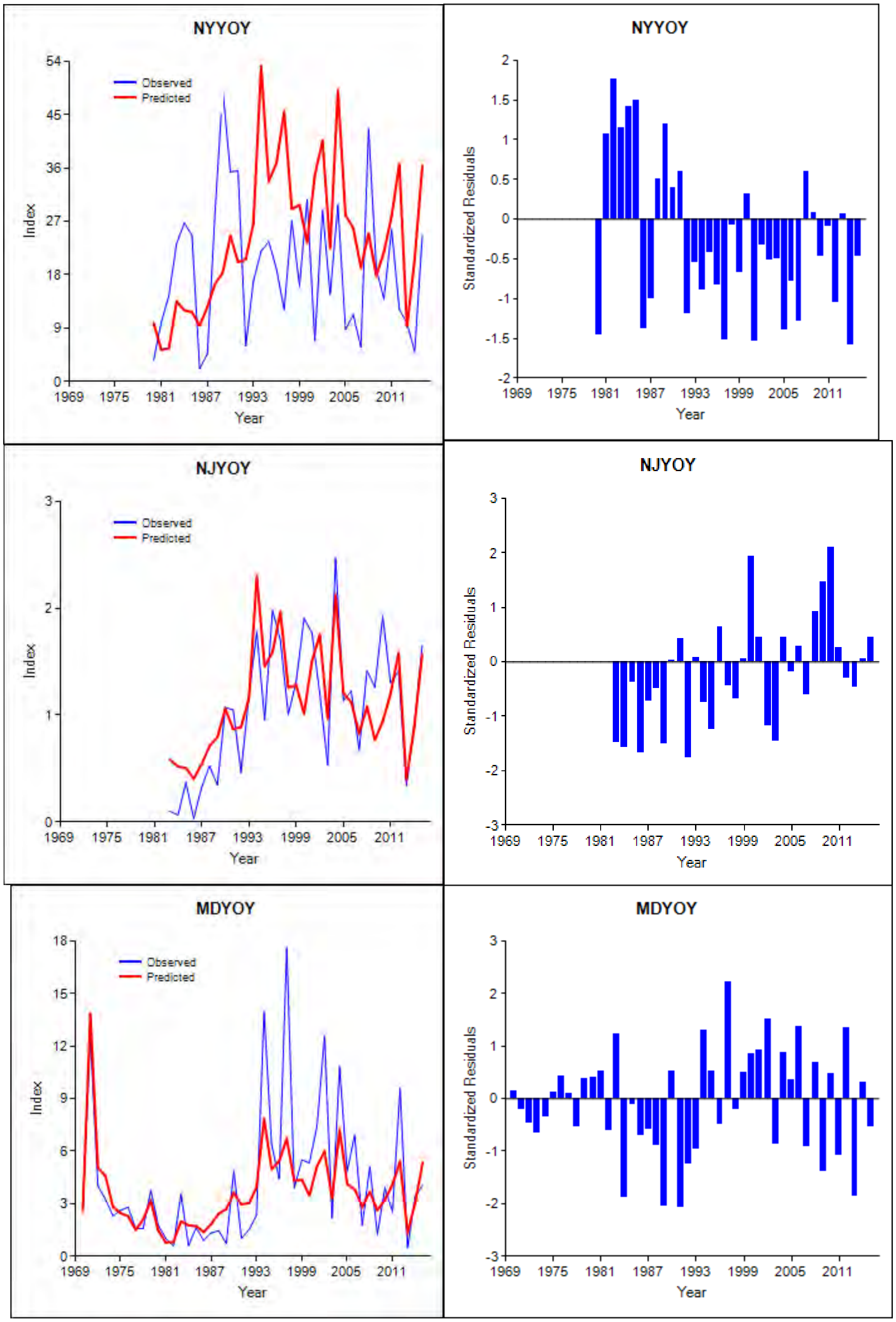


Figure 5 cont.

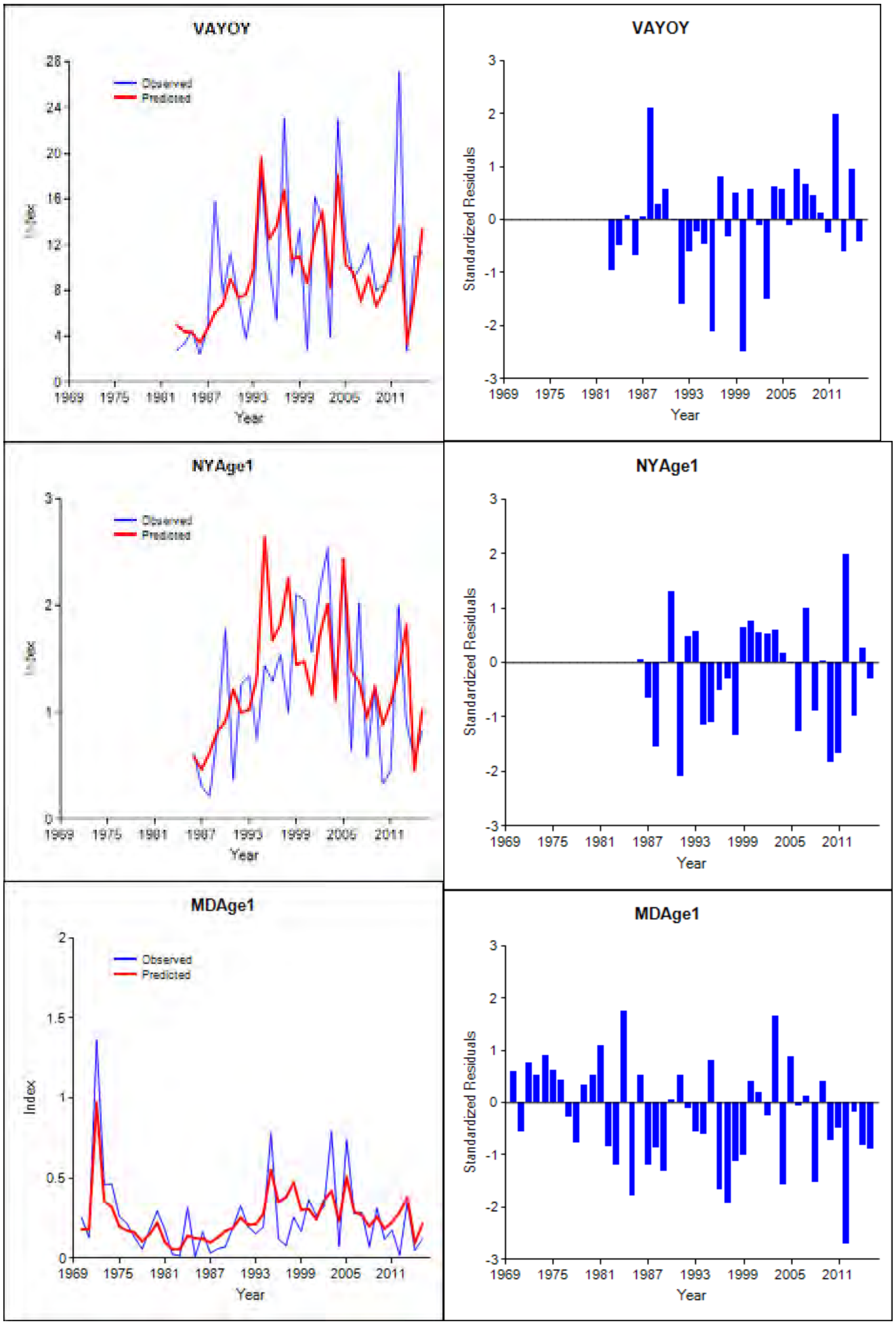


Figure 6. Observed and predicted values and standardized residuals for age-aggregated surveys.

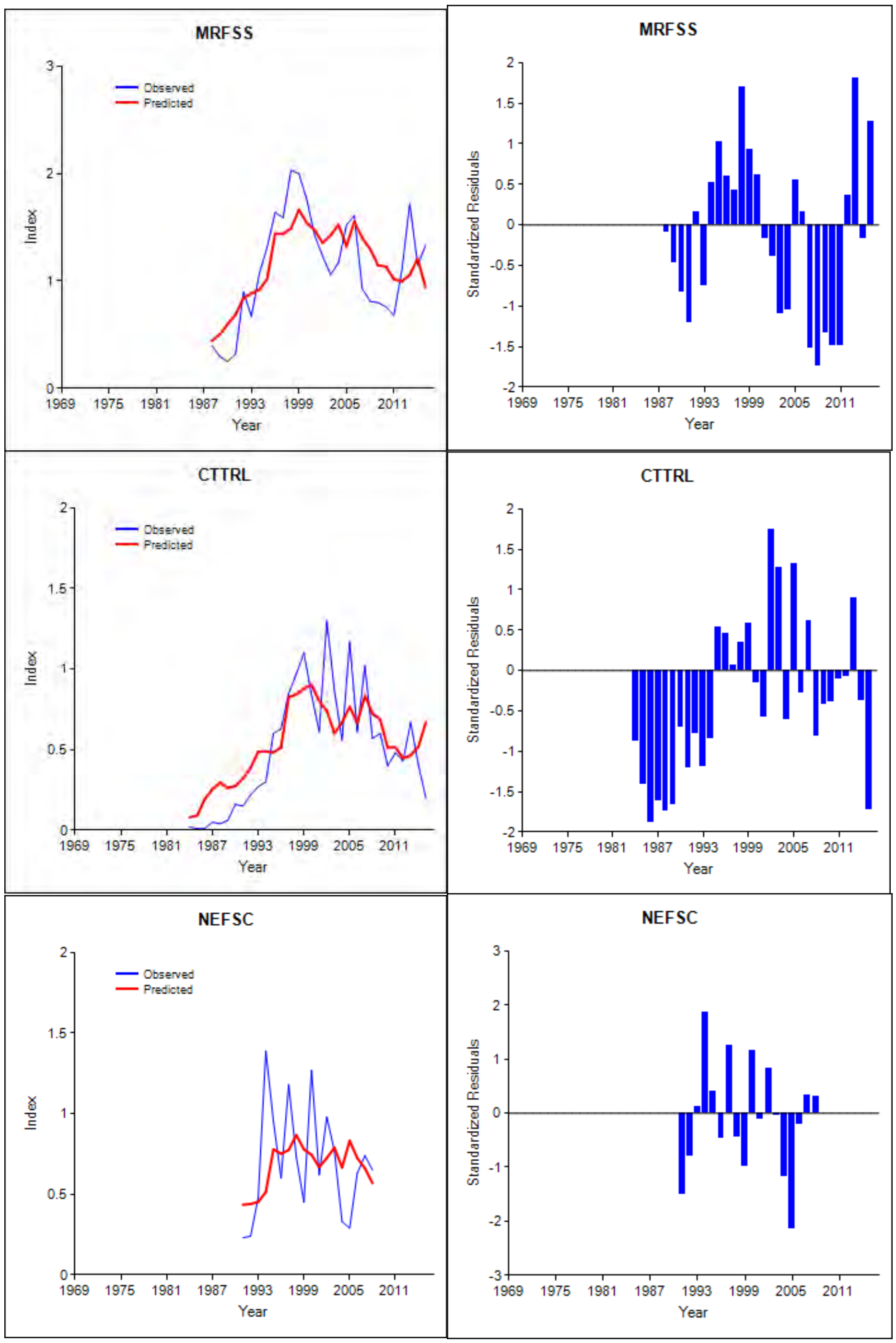


Figure 7. Observed and predicted values of the total index and standardized residuals for surveys with age composition data.

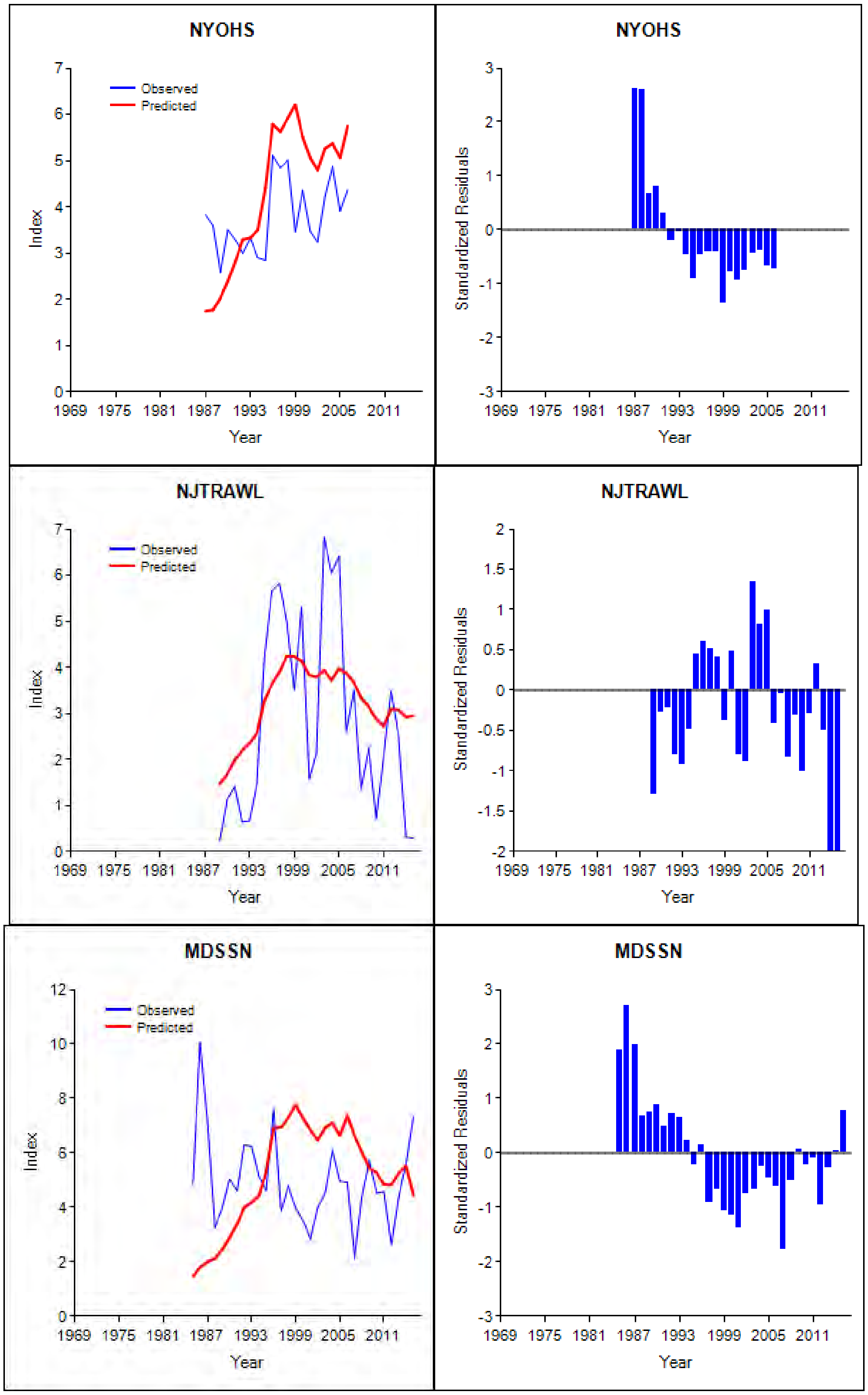


Figure 7 cont.

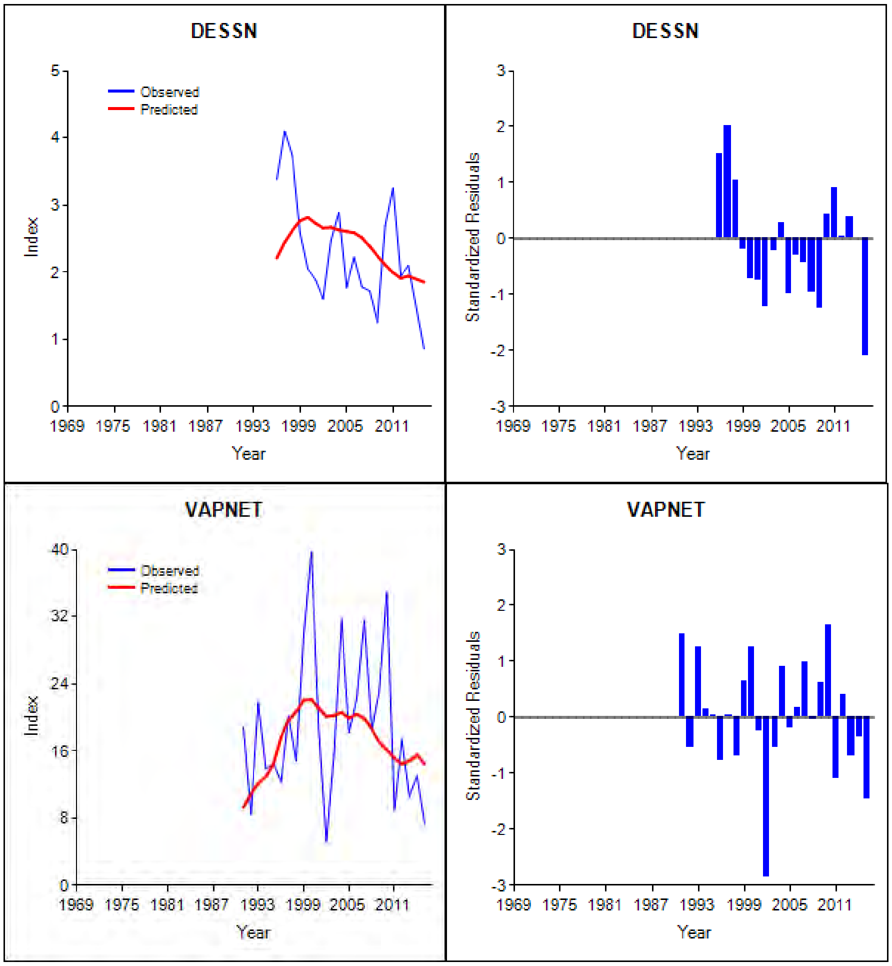


Figure 8. Selectivity patterns estimated for the NYOHS, NJ Trawl, MD SSN, DE SSN surveys and VAPNET.

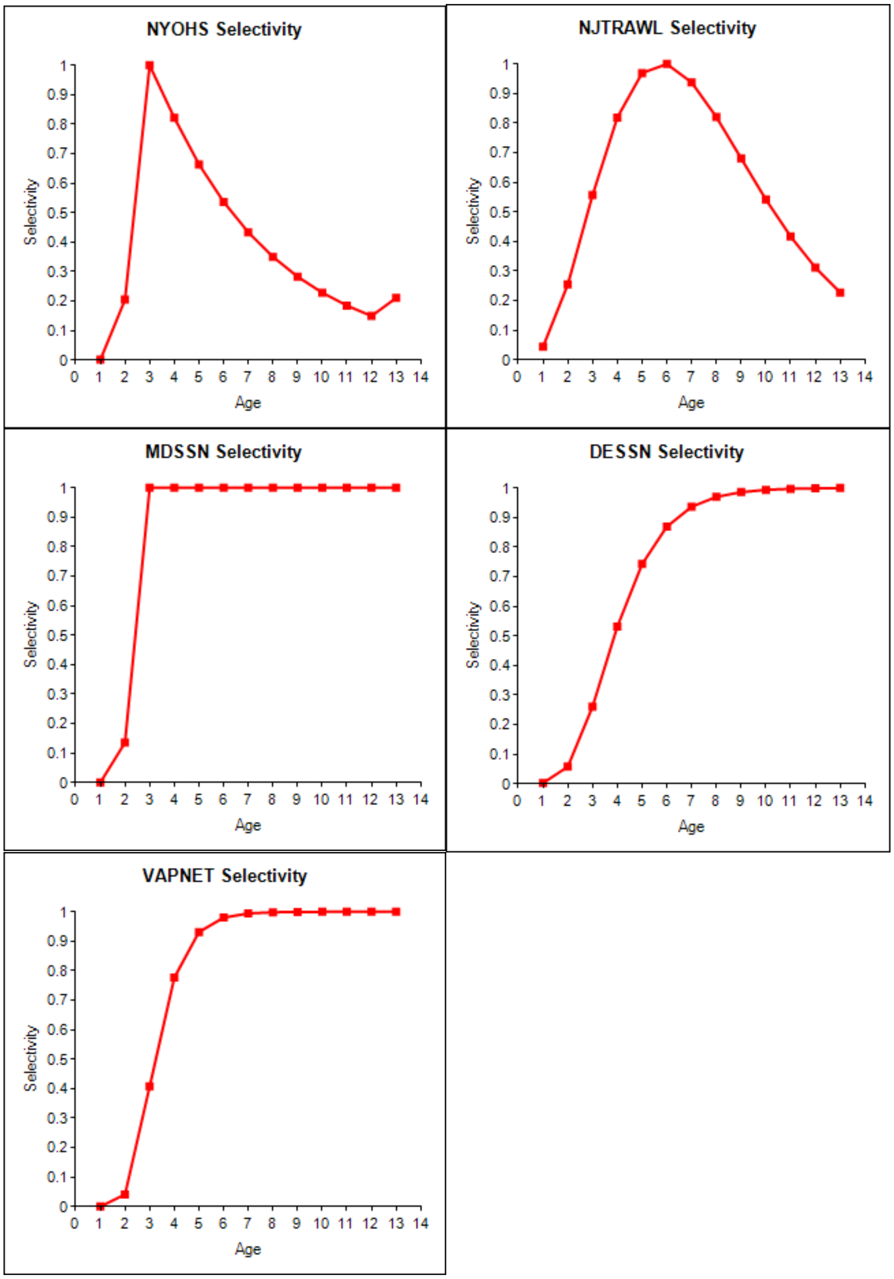


Figure 9. Observed and predicted proportions-at-age and standardized residual for each age by year for the NYOHS survey.

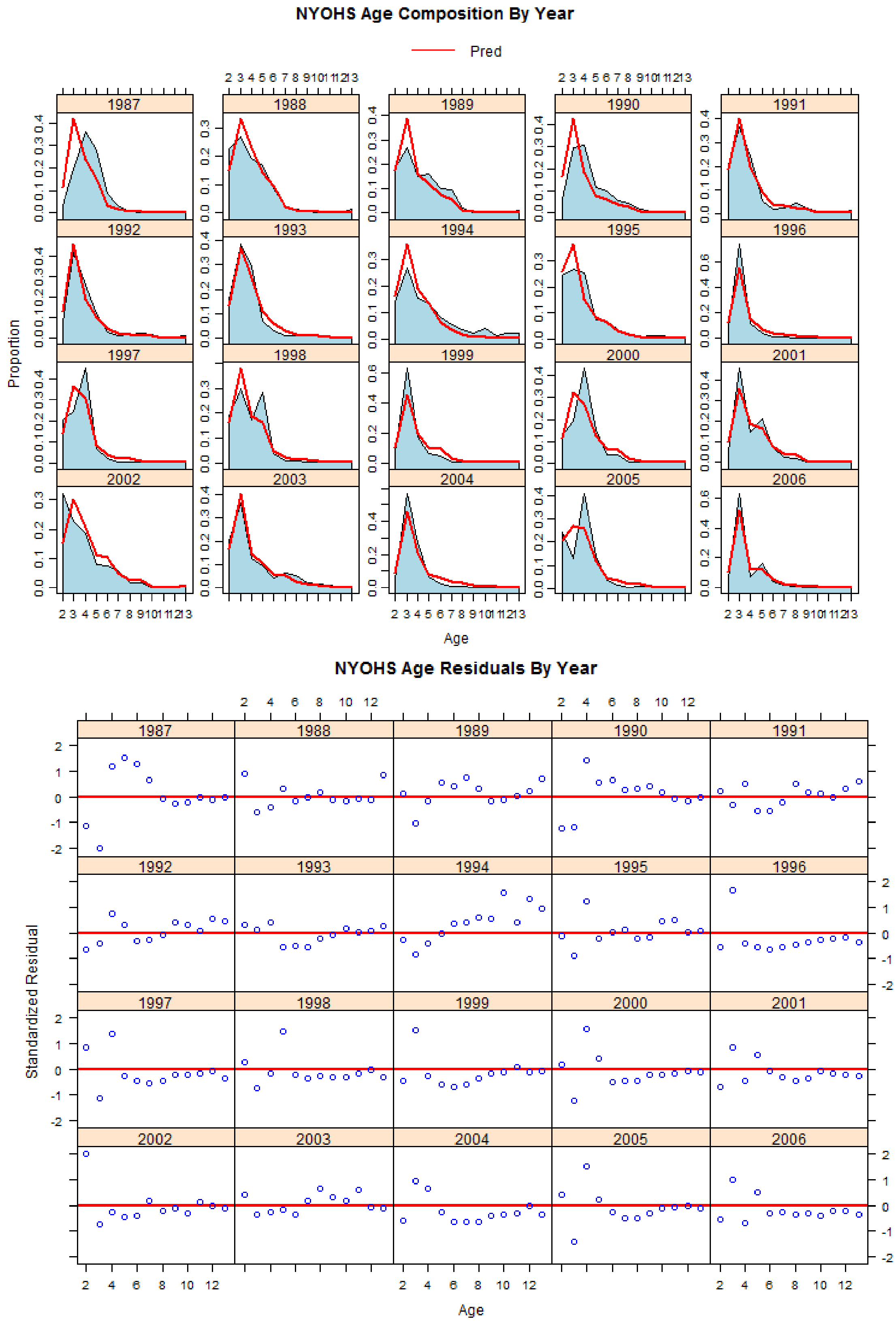
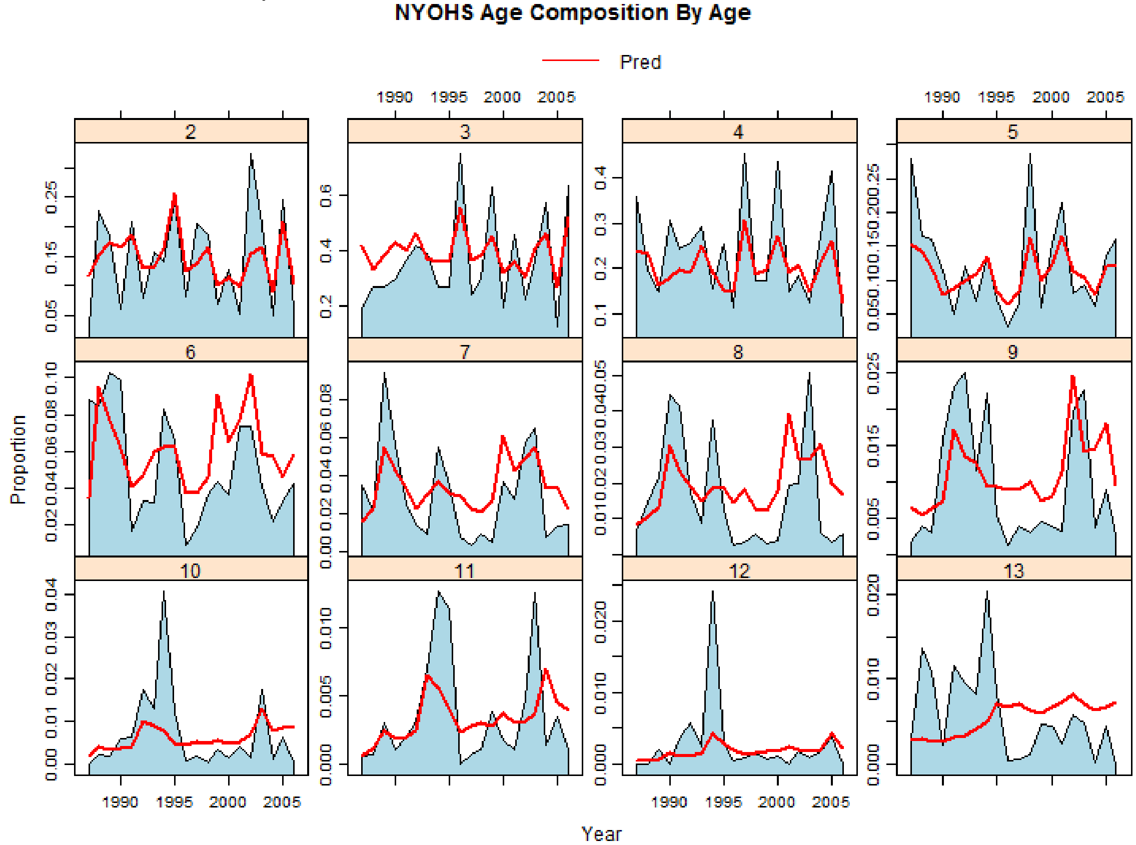


Figure 10. Observed and predicted proportions-at-age and standardized residual for each year by age for the NYOHS survey.



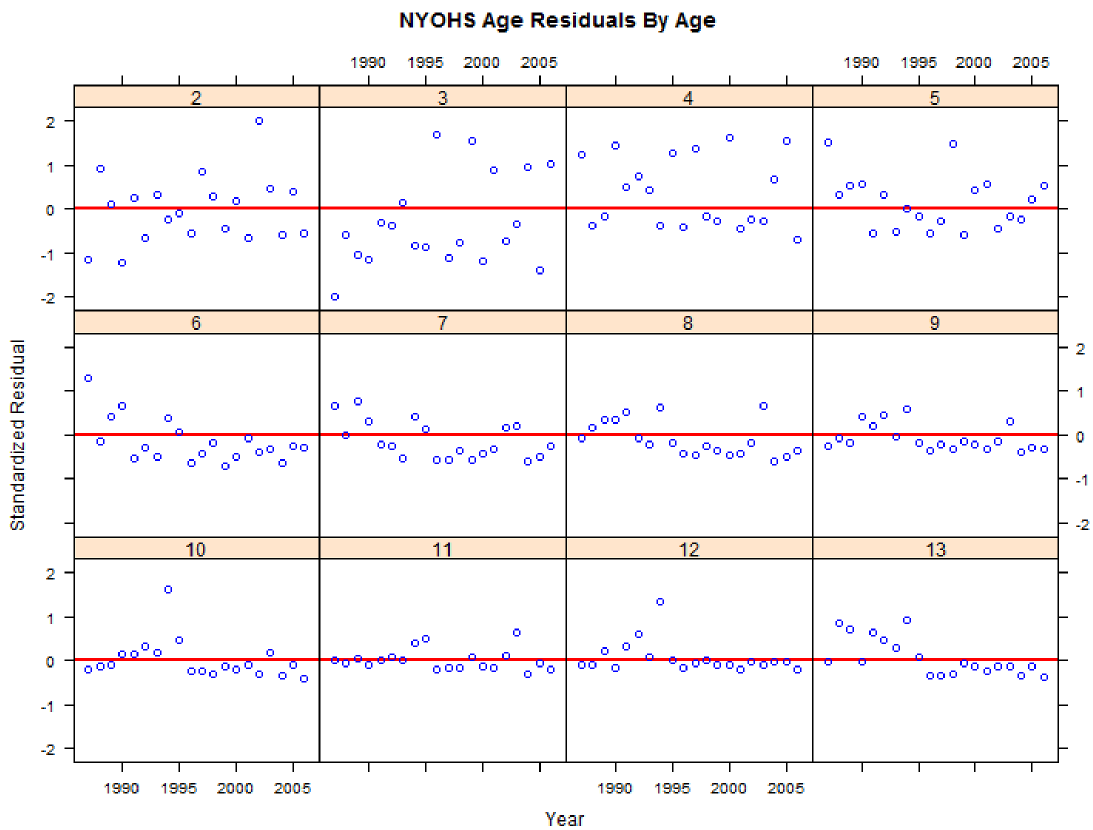


Figure 11. Observed and predicted proportions-at-age and standardized residuals for each age by year for the NJ Trawl survey.

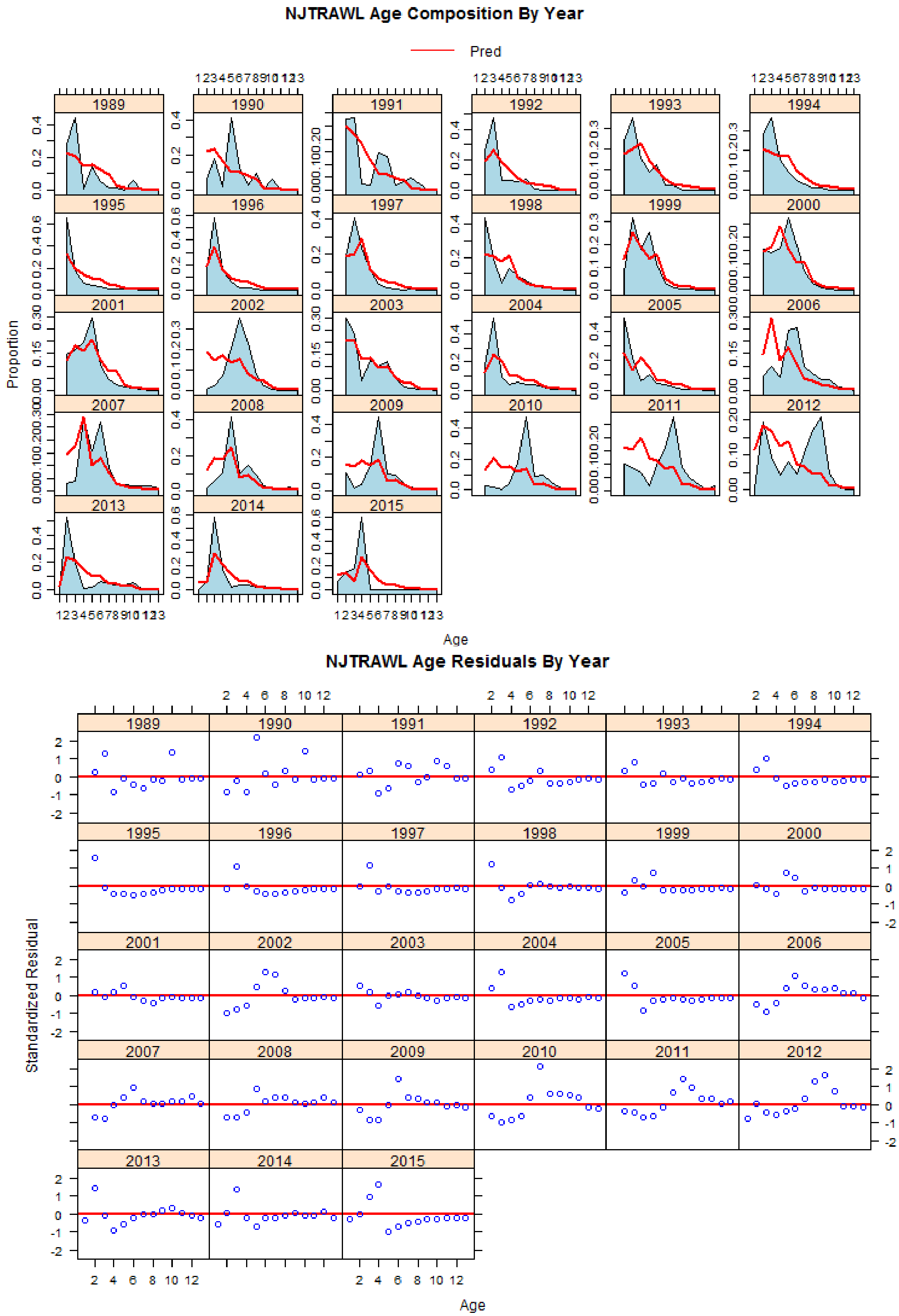
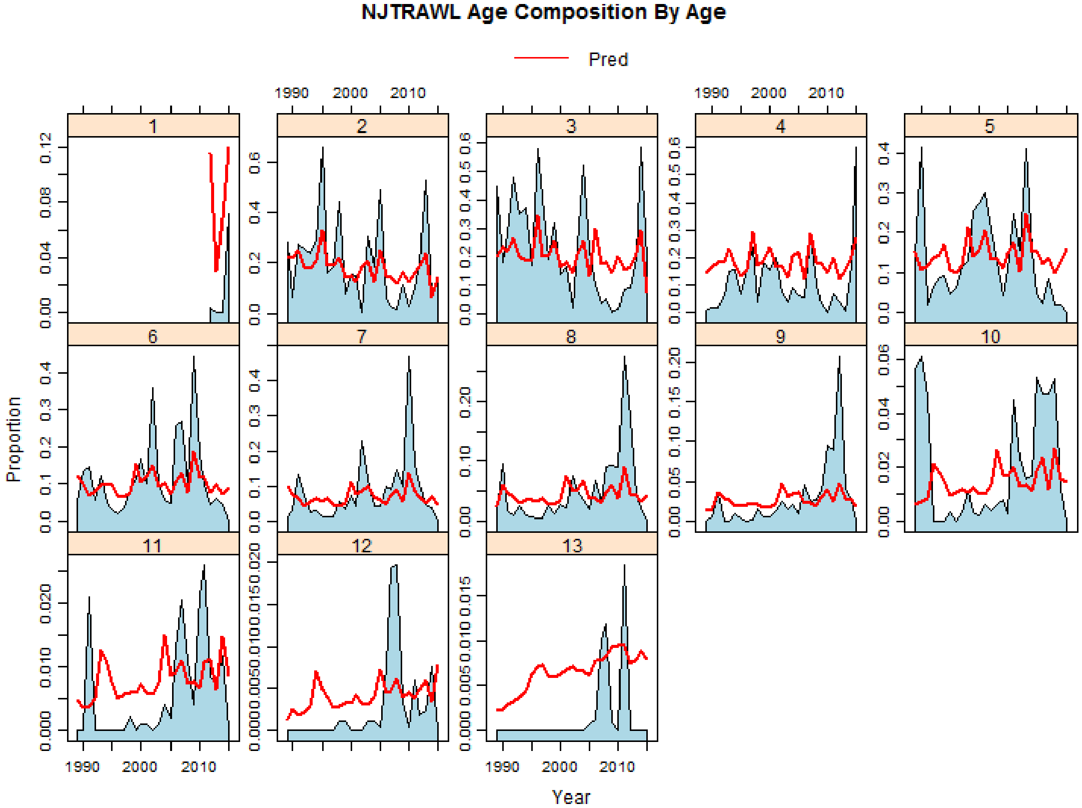


Figure 12. Observed and predicted proportions-at-age and residuals for each year by age for the NJ Trawl survey.



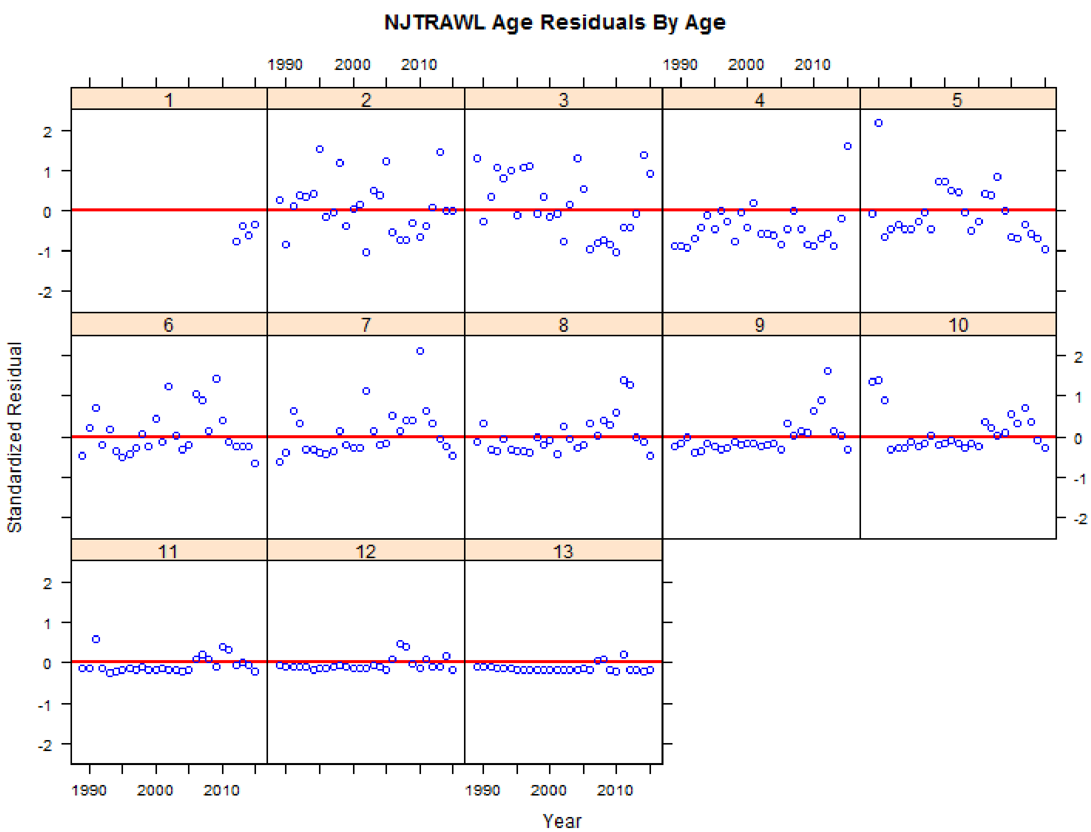
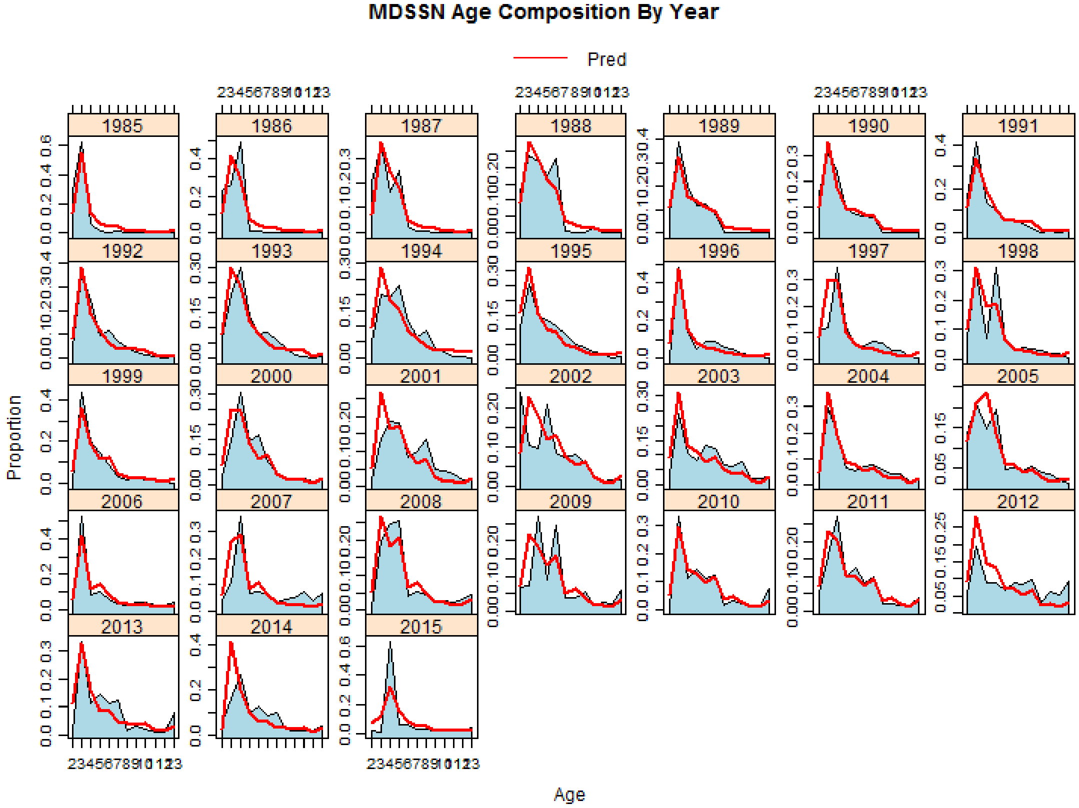


Figure 13. Observed and predicted proportions-at-age for each age by year for the MD SSN gillnet survey.



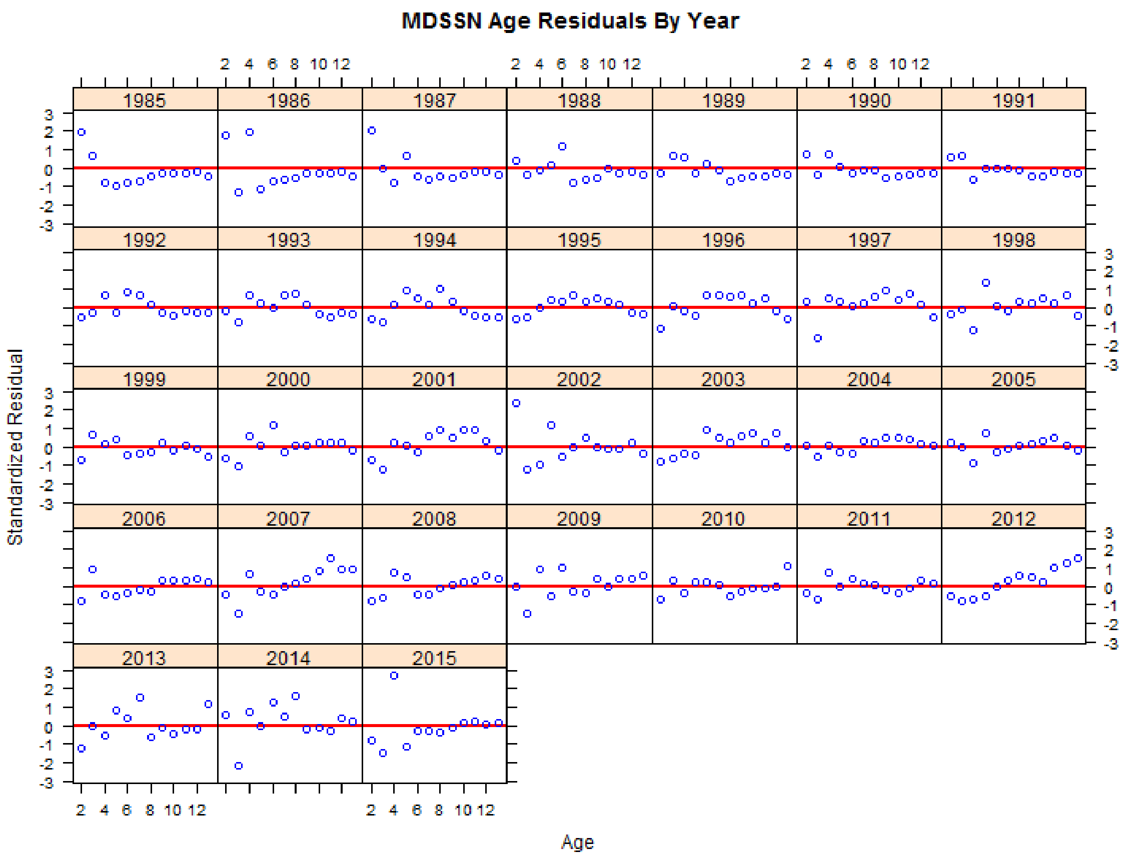


Figure 14. Observed and predicted proportions-at-age and standardized residuals for each year by age for the MD SSN gillnet survey.

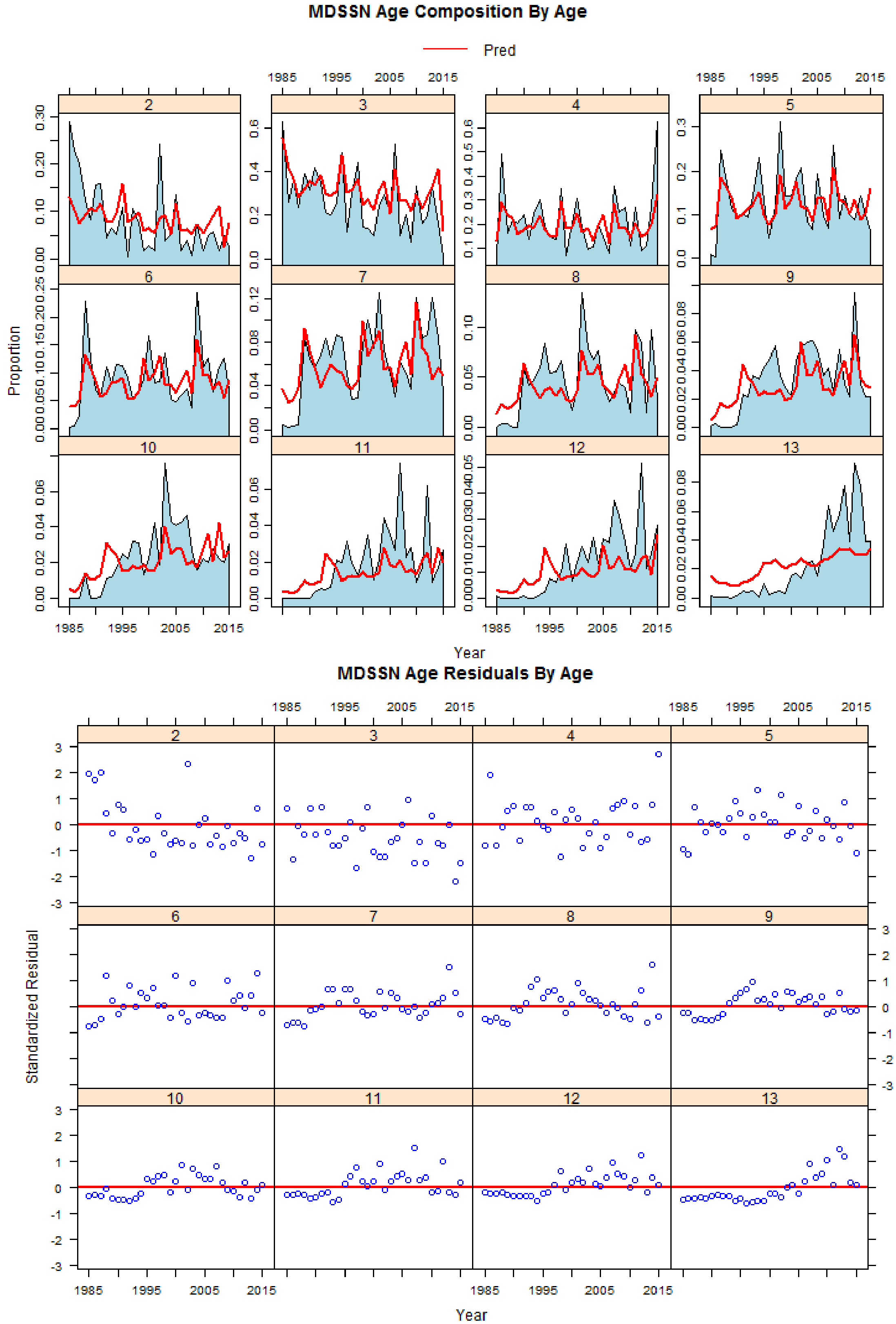
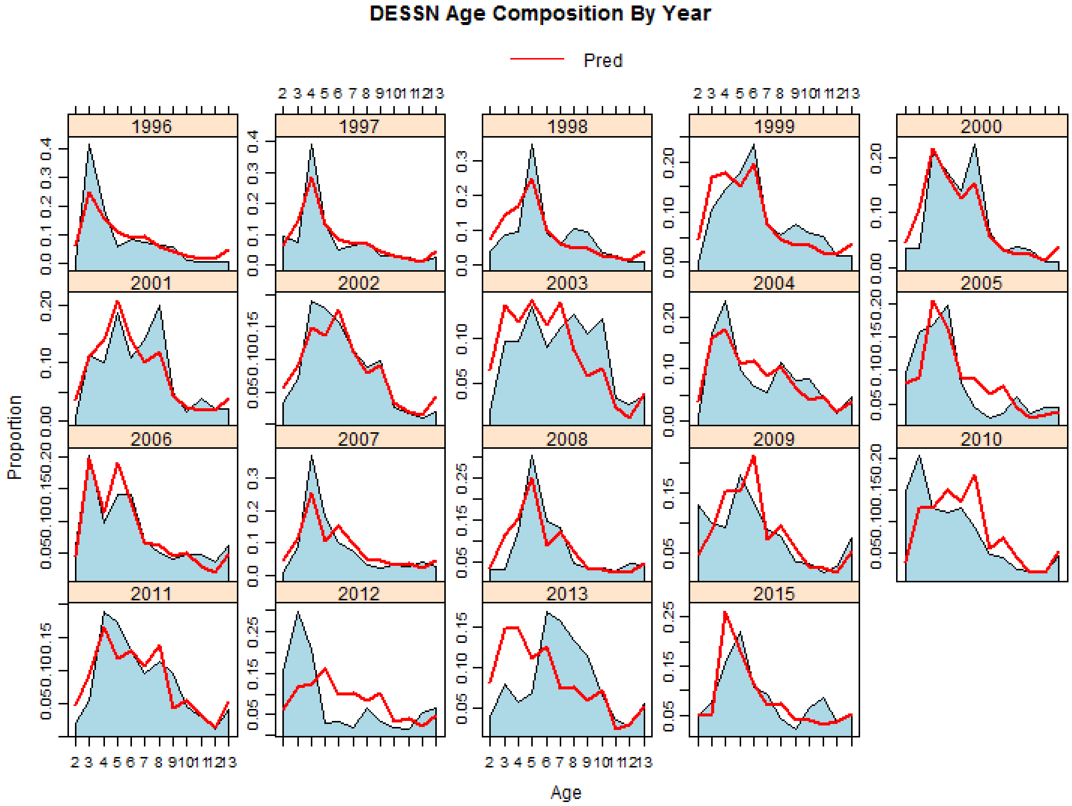


Figure 15. Observed and predicted proportions-at-age and standardized residuals for each age by year for the DE SSN electrofishing survey.



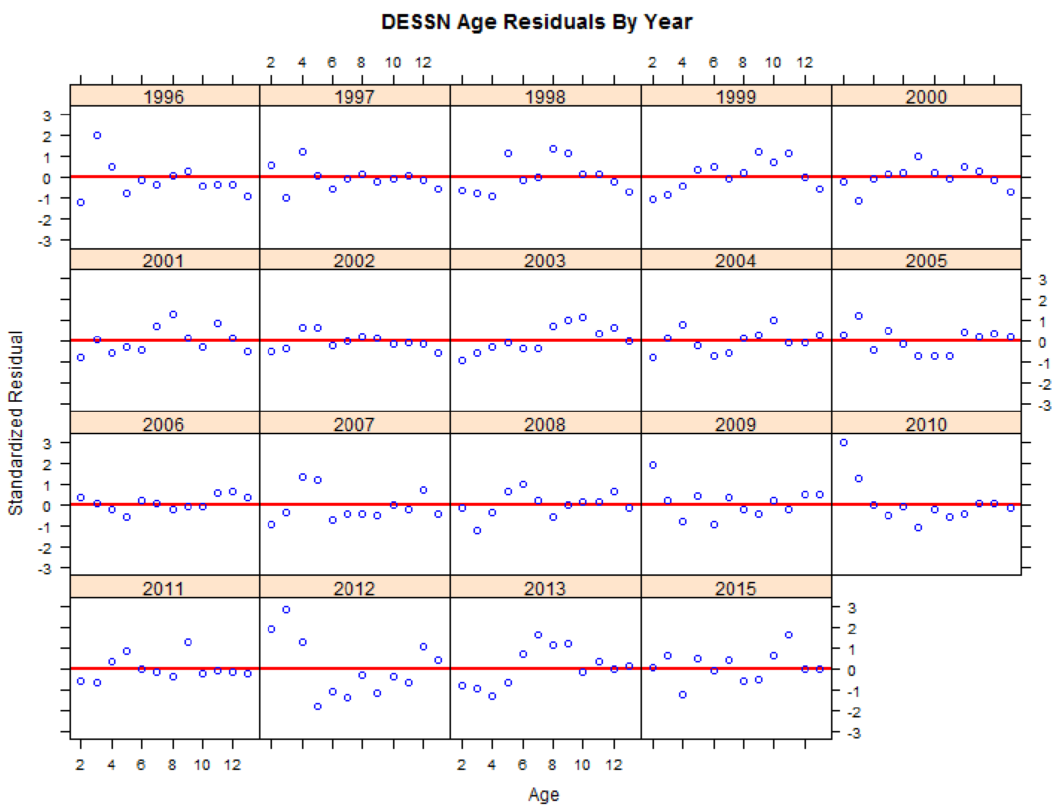
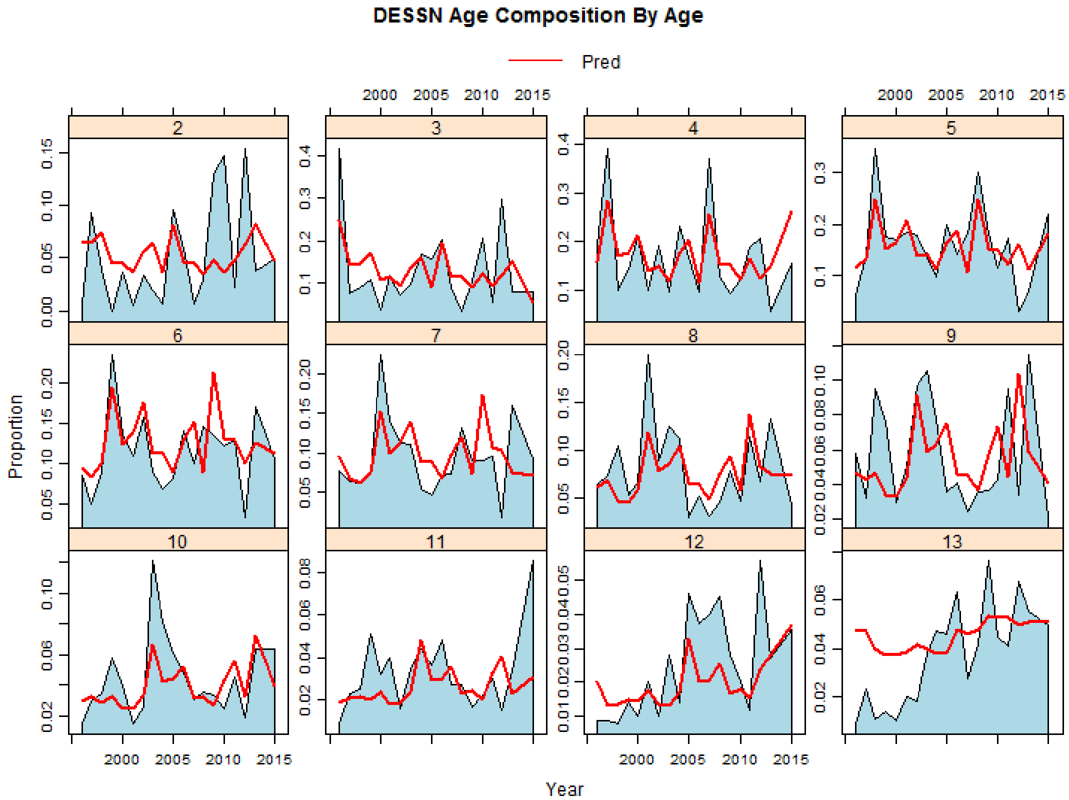


Figure 16. Observed and predicted proportions-at-age and standardized residuals for each year by age for the DE SSN electrofishing survey.



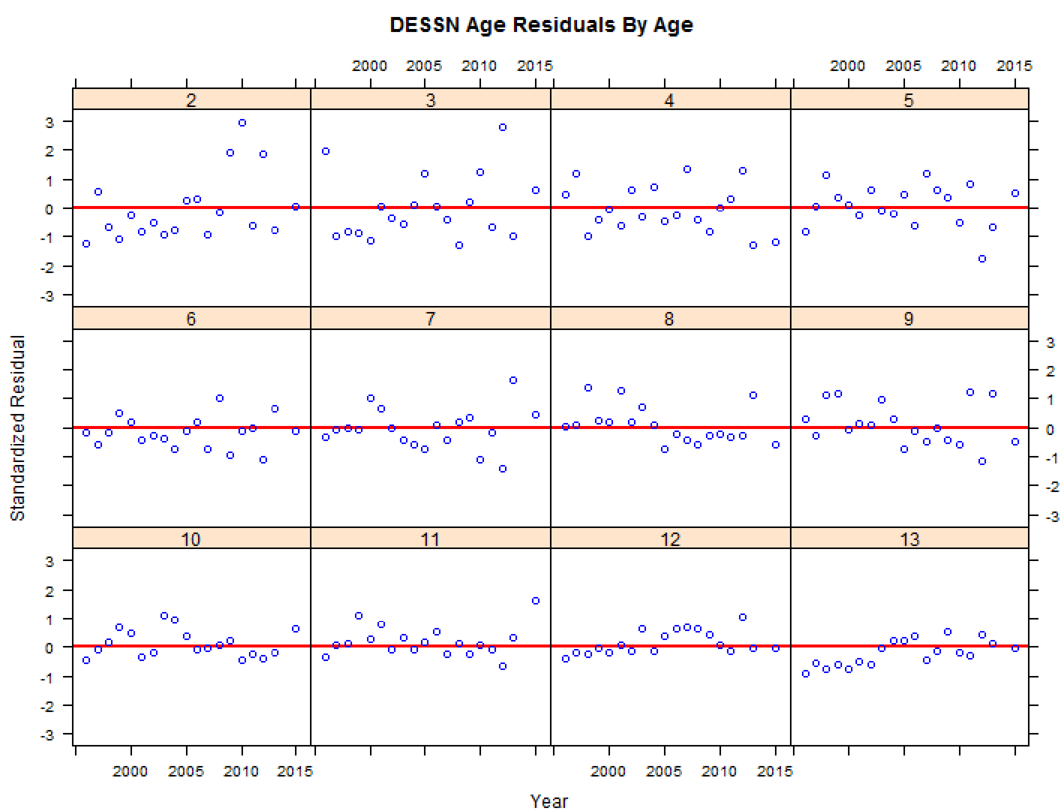
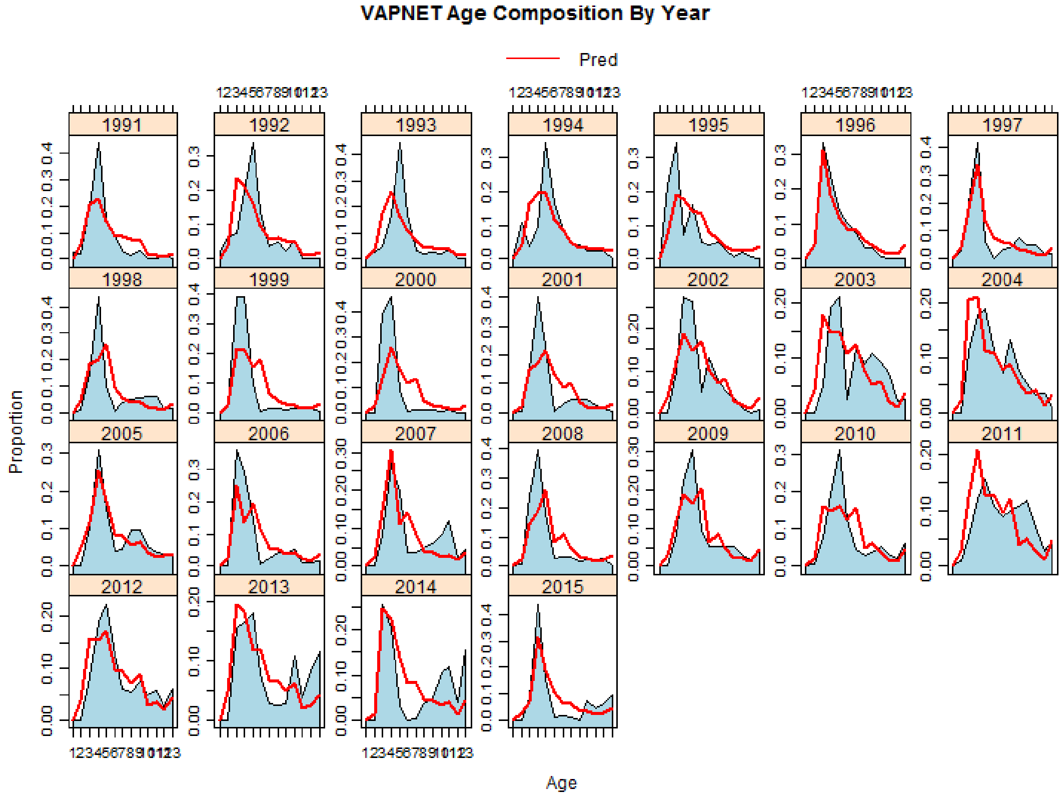


Figure 17. Observed and predicted proportions-at-age and standardized residuals for each age by year for the VAPNET survey.



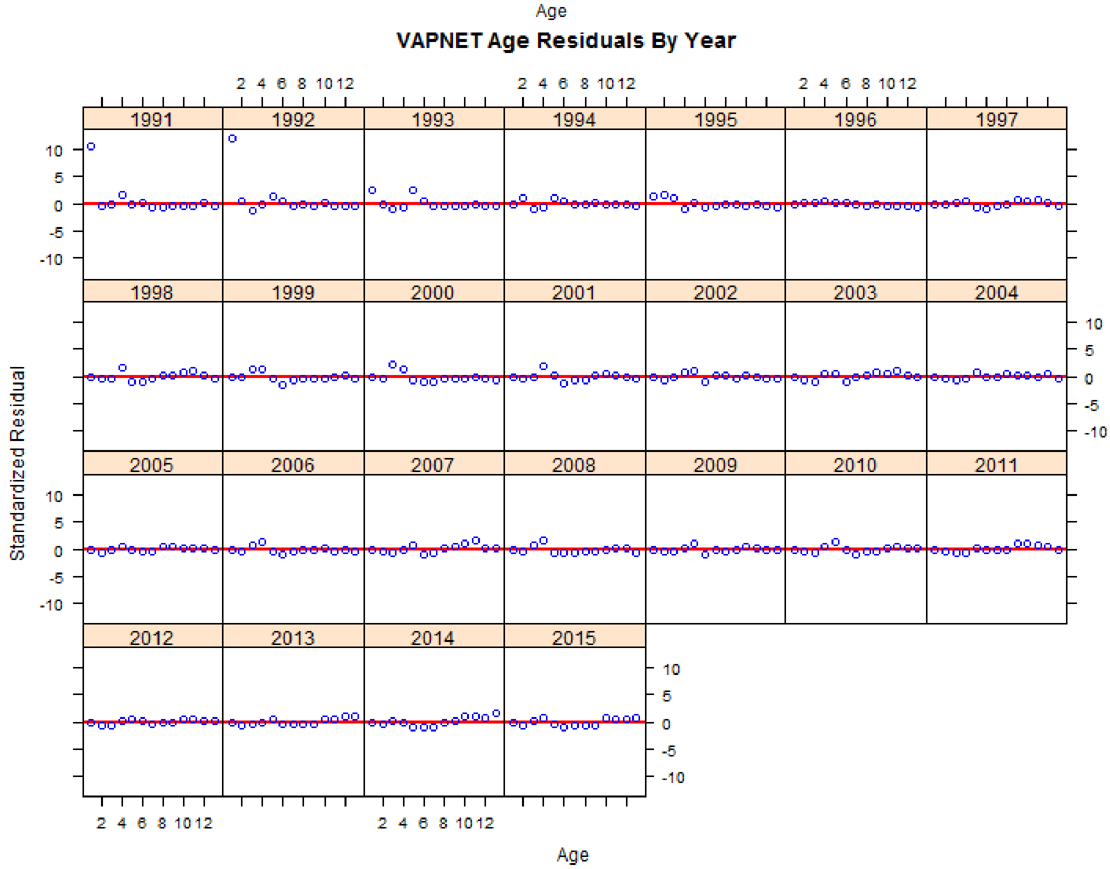
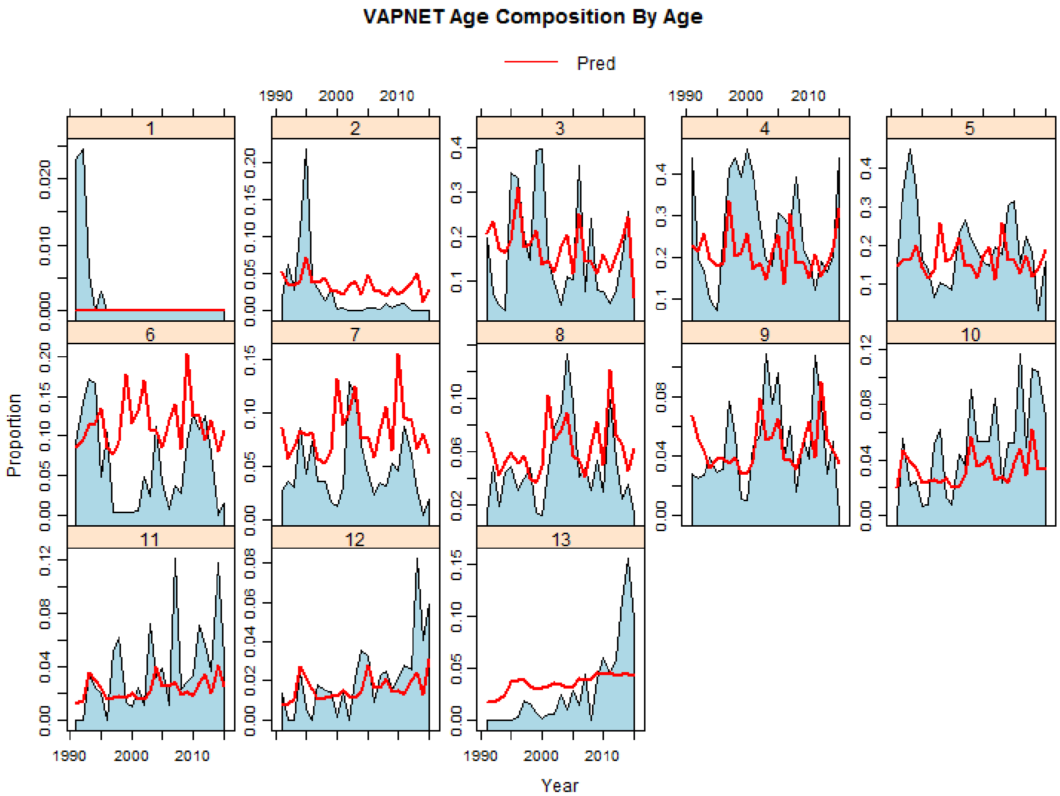
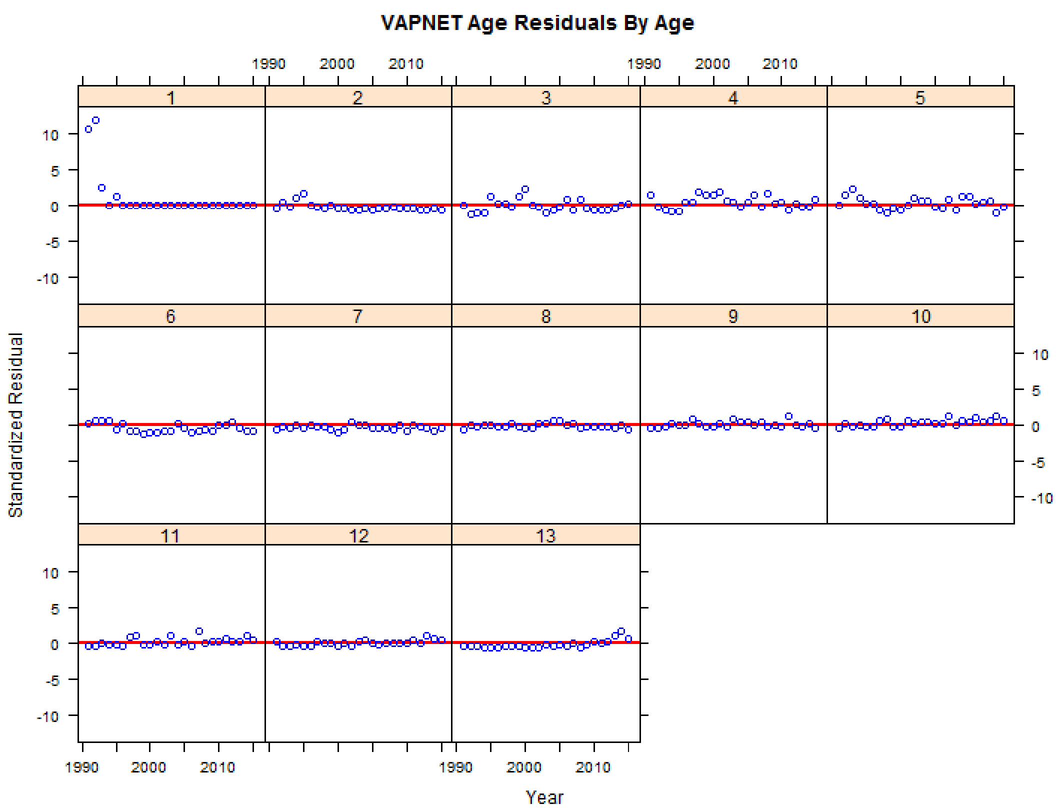


Figure 18. Observed and predicted proportions-at-age and standardized residuals for each year by age for the VAPNET survey.





Atlantic States Marine Fisheries Commission

Executive Committee

October 25, 2016
8:00 – 10:00 a.m.
Bar Harbor, Maine

Draft Agenda

1. Welcome/Call to Order, *D. Grout*

2. Committee Consent
   - Approval of Agenda
   - Approval of Meeting Summary from August 2016

3. Public Comment

4. Consider Approval of FY16 Audit *(L. Leach)* **Action**

5. Review Conservation Equivalency Guidance Document *(T. Kerns)* **Action**

6. Review ASMFC Standard Meeting Practices Document *(R. Beal)* **Action**

7. Awards Committee Report *(S. Woodward)*

8. Review Performance Appraisal/Merit Increase Protocol *(R. Beal)*

9. Review Resolution Regarding Revision of Retirement Plan *(L. Leach)* **Action**

10. Discuss Revision of Action Plan to Include ACCSP Goal *(R. Beal)*

11. Discuss Health Benefits for Retired ASMFC Employees *(R. Beal)*

12. Other Business/Adjourn

Please Note: Breakfast will be served at 7:45 a.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

Vision: Sustainably Managing Atlantic Coastal Fisheries

Atlantic States Marine Fisheries Commission

South Atlantic State/Federal Fisheries Management Board

October 25, 2016
10:15 a.m. – 12:15 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(J. Estes)*	10:15 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	10:15 a.m.
3.	Public Comment	10:20 a.m.
4.	Consider Draft Cobia FMP Public Information Document for Public Comment *(L. Daniel*) **Action**	10:30 a.m.
5.	Red Drum Working Group Report (*J. Kipp)* • Presentation of Follow Up Tasks to the Red Drum Assessment	11:10 a.m.
6.	Progress Report on the Spot and Atlantic Croaker Benchmark Stock Assessments (*J. Kipp*)	11:45 a.m.
7.	Consider 2016 Fishery Management Plan Reviews and State Compliance for Black Drum, Spanish Mackerel and Spotted Seatrout (*A. Hirrlinger*) **Action**	11:55 a.m.
8.	Review and Populate Advisory Panel Membership (*T. Berger*) **Action**	12:05 p.m.
9.	SEAMPAP Funding Update (S. Madsen)	12:10 p.m.
10.	Other Business/Adjourn	12:15 p.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

MEETING OVERVIEW

South Atlantic State/Federal Fisheries Management Board Meeting
Tuesday, October 25, 2016
10:15 a.m. – 12:15 p.m.
Alexandria, Virginia

Chair: Jim Estes (FL) Assumed Chairmanship: 02/16	Technical Committee Chair: Red Drum: Mike Murphy (FL) Atlantic Croaker: Chris McDonough (SC)	Law Enforcement Committee Representative: Capt. Bob Lynn (NC)
Vice Chair: Pat Geer	Advisory Panel Chair: Tom Powers (VA)	Previous Board Meeting: May 5, 2016
Voting Members: NJ, DE, MD, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS, SAFMC (12 votes)		

2. Board Consent
- Approval of Agenda
- Approval of Proceedings from August 2, 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Consider Draft Cobia FMP Public Information Document for Public Comment (10:30 - 11:10 a.m.) Action
Background • The South Atlantic Council Fishery Management Council (Council) requested the Commission consider joint or complementary management of cobia with the Council. • In 2105, 82% of the cobia harvest occurred in state waters. The ACL was exceeded by approximately 91,000 pounds. • The Council is looking for a more flexible management approach to allow for timely adjustments of measures but still provide equitable access across multiple jurisdictions while meeting conservation goals. • Staff to draft a white paper to outline how Cobia management would work under a joint, complementary, ASMFC only or Council only plan and the Board initiated a complementary FMP for Cobia. • The PDT drafted a PID based on Board direction.

Presentations

- L. Daniel will present the Draft Cobia FMP Public Information Document for Public Comment (**Meeting Materials**)

Board actions for consideration at this meeting

- Approve the Draft Cobia FMP Public Information Document for Public Comment

5. Red Drum Working Group Report (11:10 – 11:45 a.m.)

Background

- The 2016 update stock assessment and peer review was presented to the Board in May of 2016.
- The models, using Stock Synthesis framework, suggest overfishing is occurring in both the northern and southern regions. The northern model predicts low adult abundance (age 6+) since 1989. The southern model shows increasing F, resulting in low escapement of juveniles from the fishery.
- The Board had questions/concerns regarding the assessment inputs, reference points, and model types and tasked the TC/SAS to investigate several questions.
- The TC/SAS has completed the tasks.

Presentations

- J. Kipp will present a report on the TC/SAS tasks (**Meeting Materials)**

Board actions for consideration at this meeting

- None

6. Progress Update on Spot and Atlantic Croaker Stock Assessments (11:45 – 11:55 a.m.)

Background

- A data workshop for both species was held in September 2015.
- The first of two assessment workshops we held one in February and one in September 2016.
- It is expected that both assessments will be completed in early 2017

Presentations

- Stock assessment update by J. Kipp

7. 2016 Fishery Management Plan Reviews (11:55 -12:05 a.m.) Action

Background

- Spanish Mackerel State Compliance Reports are due on October 1. The Plan Review Team reviewed each state report and compiled the annual FMP Review.
- Black Drum State Compliance Reports are due on August 1 . The Plan Review Team reviewed each state report and compiled the annual FMP Review. Georgia, New Jersey and Delaware have applied for *de minimis.*
- Spotted Seatrout Reports are due on September 1 . The Plan Review Team reviewed each state report and compiled the annual FMP Review. New Jersey and Delaware have applied for *de minimis.*

Presentations

- Overview of the Spanish Mackerel, Spotted Seatrout and Black Drum FMP Review Reports by A. Hirrlinger. **(supplemental materials)**

Board actions for consideration at this meeting

- Accept 2016 FMP Reviews and State Compliance Reports
- Approve *de minimis* requests: NJ, DE, and GA for Spanish mackerel and NJ and DE for spotted seatrout.

8. Review and Populate Advisory Panel Membership (12:05 – 12:10 p.m.) Action

Background

- South Atlantic Board was asked to evaluate current membership and seek new members with experience in the cobia fishery.

Presentations

- T. Berger will present nominations to the South Atlantic Advisory Panel **(supplemental materials)**

Board actions for consideration at this meeting

- Approve Captain Bill Parker (SC), Glenn Ulirch (SC), Lee Southard (GA), Aaron Kelly (NC)

9. SEAMAP Funding Update (12:10 – 12:15 p.m.)

Background

- Taxes and assessments on the SEAMAP Congressional appropriation have decreased the overall funding available to surveys.
- This has resulted in decreased days at sea, number of stations sampled and therefore the amount of fishery independent data collected.

Presentations

- S. Madsen will present the funding implications on SEAMAP-SA surveys **(meeting materials)**

10. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

SOUTH ATLANTIC STATE/FEDERAL FISHERIES MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
August 2, 2016

TABLE OF CONTENTS

These minutes are draft and subject to approval by the South Atlantic State/Federal Fisheries Management Board. The Board will review the minutes during its next meeting.

INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).

2. **Approval of Proceedings of May 2016** by consent (Page 1).

3. **Move that the South Atlantic Board recommend to the Policy Board the development of a complementary Fishery Management Plan for Cobia; so this would be Option 1 under the plan structure listed** (Page 8). Motion by Michelle Duval; second by Robert Boyles. Motion carried (Page 13).

4. **Move to recommend to the ISFMP policy board that the South Atlantic Board is the appropriate venue to develop the FMP for Cobia** (Page 13). Motion by Robert Boyles; second by Spud Woodward. Motion carried (Page 13).

5. **Motion to adjourn** by Consent (Page 22).

ATTENDANCE

Board Members

Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
John Clark, DE, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Rachel Dean, MD (GA)
Lynn Fegley, MD, proxy for D. Blazer (AA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Joe Cimino, VA, proxy for J. Bull (AA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Doug Brady, NC (GA)
Jerry Schill, NC, proxy for Rep. Steinburg (LA)
Michelle Duval, NC, proxy for B. Davis (AA)
Robert Boyles, SC (AA)
Malcolm Rhodes, SC (GA)
Patrick Geer, GA, proxy for Rep. Nimmer (LA)
Spud Woodward, GA (AA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Wilson Laney, USFWS
John Carmichael, SAFMC

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Staff

Toni Kerns
Robert Beal

Guests

Roy Crabtree, NMFS
Dr. Louis Daniel, NC
Andrew Shiels. PA Fish & Boat Comm.

These minutes are draft and subject to approval by the South Atlantic State/Federal Fisheries Management Board. The Board will review the minutes during its next meeting.

The South Atlantic State/Federal Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2016, and was called to order at 10:04 o'clock a.m. by Chairman Jim Estes.

CALL TO ORDER

CHAIRMAN JIM ESTES: Good morning. I would like to convene the South Atlantic/Federal Fisheries Management Board this morning. My name is Jim Estes; I am the Administrative Proxy from Florida; welcome! I hope we can do some conservation this morning.

APPROVAL OF AGENDA

CHAIRMAN ESTES: We have an agenda. you all should have been given the agenda.

I would like to make an addition to the agenda. When we're discussing cobia management, we would also like to discuss any recommendations that we might have to the South Atlantic Fisheries Management Council on Framework 4. We'll do that during the discussion of cobia. Are there any other suggestions about changes to the agenda?

CHAIRMAN ESTES:Is there any objection to accepting the agenda as amended? Seeing none; the agenda is set.

APPROVAL OF PROCEEDINGS

CHAIRMAN ESTES: We also have the proceedings from our May meeting; and I'm sure that most of you can remember how much fun that was. Are there any suggestions to edit or change the proceedings of the May meeting? Seeing none; are there any objections to accepting those proceedings? Seeing none; the proceedings are accepted.

PUBLIC COMMENT

CHAIRMAN ESTES: Public comment, do we have any members from the public that wish to speak on items that are not on the agenda? Okay, seeing none; we'll go forward.

COMMISSION INVOLVEMENT IN COBIA MANAGEMENT

At our May meeting the Policy Board tasked the staff to create a white paper about cobia management, and I think that we'll have an explanation about that in a few minutes. We have an honorary member who agreed to help work on this issue. Dr. Louis bluegill Daniel is here with us to make a presentation about possible cobia management actions that we might take.

DR. LOUIS B. DANIEL, III: It is a delight to be back in Alexandria and be with you again. I am working for the Commission on a limited basis; putting together the cobia information for you. I'll go through a-- I tried to keep it short and sweet for you, to go through the issues as they pertain to cobia management.

Essentially, these fish range from Nova Scotia to Argentina, I think the Scotian fish were lost; but they are uncommon north of Maryland. We'll talk more about that here shortly. They are an extremely valuable fishery to the for-hire and recreational sector, and they serve primarily as a bycatch in the commercial fishery.

Briefly, the management history, cobia have been managed by the South Atlantic Fishery Management Council through the coastal migratory pelagics FMP since 1982, as a unit stock from the east coast of Florida to New York. Management has been precautionary throughout the time series, with a two-fish limit for commercial and recreational fishermen and a size limit of 33 inches fork-length. The thought was there to be, I think at the time, extremely precautionary on cobia. The primary fishery occurs when they're spawning; so let's be precautionary and preemptive on any potential problems and maintain this fishery as a small fishery.

Amendment 18 did establish allowable catch limits in 2012, and some recent genetics studies indicate two separate populations of cobia; the Gulf group, which is the east coast of Florida and around the Gulf of Mexico, and the Atlantic migratory group, which you'll see me denote here from here on as AMG cobia, which occur from the Georgia/Florida line north to New York and may occur north of there. We do have some landings records from north of New York.

Further with the management history, Amendment 20B revised catch limits based on the stock assessment. That stock assessment was the SEDAR; Southeast Data Assessment and Review 28, and modified the boundary between the Atlantic and Gulf based on the recent genetic studies. The current management strategy, which you'll go over I think after my presentation, coming out of the South Atlantic is Framework action Amendment 4.

That is currently being developed to address overages of the allowable catch limits by the recreational fisheries of the Atlantic migratory group. To briefly summarize current issues, and probably the primary reason we're here at this particular point. The National Marine Fisheries Service announced a closure to the AMG cobia effective June 20th, of 2016, for exceeding the allowable catch limit in 2015.

The allowable catch limit for our cobia in 2015 was 630,000 pounds. That is based on the stock assessment. Well, landings were 1.5 million pounds; so an extraordinary overage of the recreational ACL for 2015. The closure that was scheduled for June the 20th impacted the fishery throughout the range of the AMG cobia; but impacts were greatest for the outer banks of North Carolina and all the states from Virginia to the northern extent of the range.

Virginia and North Carolina reacted to the closures recently by implementing state-specific regulations to try and lessen the impact of the closures on their specific states. To kind of give you a sense of why this is so important, the recreational fishery occurs primarily from April to October in nearshore and offshore waters.

Based on the MRIP information, about 82 percent of the cobia harvest is reported from in-state waters. You can see from this graphic that the dominant landings occur during that May/June Wave 3, but there are substantial landings during the July/August Wave. The June 20 closure had a significant impact on the later fisheries that occur along the east coast of our jurisdiction.

Where the fish go from October to April is a good question, and one that I hope we will be able to delve into if we move forward and develop something further on this fishery. The fishery generally begins as fish move nearshore off of Georgia in early spring, and proceeds northwards. Just to give you an idea of where the landings come from, the majority of the recreational landings occurred in North Carolina and Virginia from May through July, during most years.

But you'll notice here that while for North Carolina and Virginia, many years would count for 80 to 90 percent of the total landings, there is variability in those trends on an annual basis. I think particularly to note are the landings from South Carolina, for example in 2007, the landings from Georgia particularly in 2008, and again from South Carolina in 2012. It is variable as the fishery moves south to north. But generally, North Carolina and Virginia take the lion's share of the cobia landings recreationally; at least they have from 2005 to 2015, important to note here that there are no MRIP landings reported north of Virginia.

Just to look at the general trend, recreational landings from 2005 to 2015, it is a pretty variable trend over the time series until this past year, when the recreational ACL was exceeded. You will note here that with a recreational ACL of 630,000 pounds, it would have been exceeded in seven of the last 11 years.

To look at the landings a little more completely, and not to forget our friends in Florida, this is all in your white paper that was distributed in your supplemental material. From 2005 to 2015, these are the landings from Virginia. I include the east coast of Florida to give you an idea of the magnitude of the landings in that recreational fishery.

The next iteration of this presentation I will have a comparison of the total landings from the AMG cobia and the east coast of Florida, because in putting this together, I noticed they are fairly diphasic in terms of they don't track one another. Some years the AMG cobia will have very high landings and the Florida landings down and vice versa. They don't track one another very well.

What you can see here from the east coast of Florida landings that they do have a significant landing of cobia off the east coast of Florida. Looking at the commercial fishery, again, those trends have shown an increase since 2011. The areas here are down below Georgia/South Carolina, very minor landings.

The Mid-Atlantic States, which is essentially Virginia, and then reported landings from the states of Maryland, New Jersey, New York and Rhode Island also, have reported landings during the time series; not every year north of Virginia do those states have landings, but episodically through that time series, they have reported landings, mostly in the 3 to 400 pound range.

Then for North Carolina you can see the general trend tracks the Mid-Atlantic since 2011, with pretty steadily increasing landings. There was a late season closure in 2014; as the result of going over the ACL for the commercial fishery. A pretty significant overage occurred in 2015; but that information came in so late that we weren't able to react to a closure in 2015. Just a reminder that these closures in the commercial fishery do raise some concerns for discards in a bycatch fishery.

Just briefly, and this is in the white paper, the fishery is primarily a bycatch in the trawl fisheries for king mackerel and other species; as well as a pretty substantive bycatch in the South Atlantic snapper grouper complex fishery, where, when they move offshore after the spawning season, they tend to aggregate around wrecks and reefs and live-bottom areas; where they are subject to bottom fish fishermen, snapper grouper fishermen.

The same general trend in Florida East Coast commercial landings, they are not included in the AMG cobia quotas and are managed through the Gulf Council portion of the plan. But you can see that general trend in their landings is likewise up over the last five years, well not the last five years. These are the latest, most recent data we had for the Florida landings. But they are seeing an increase in those landings, as well. Further examination into why those landings are increasing the way they are, is something that we would like to look at in the future. Just a basic summary of the stock status, and John Carmichael is here to my left with the South Atlantic.

Between the two of us, I think we can answer any of your questions on the stock status. The most recent assessment was the 2013 cobia benchmark assessment, with data through 2011. While the assessment indicates that the stock is not overfished, and overfishing is not occurring, the assessment does indicate an overall decline in stock biomass.

I pulled out this one figure that I think is pretty pertinent to this discussion, with the SSB over SSBmsy ratio, and you can see that from about 1995 to present, there has been a fairly steady decline to where we are approaching the one-to-one ratio of SSB over SSBmsy, and if we fall below that one, then we would be considered overfished. We're getting close in that particular graphic.

The assessment does indicate an overall decline in stock biomass. The 2015 recreational landings exceeded the overfishing limit as well as the ACL. The overfishing limit is set at 699,200 pounds. With the landings at about 1.5 million, we basically doubled the overfishing limit in 2015; resulting in at least the council's determination, overfishing for 2015 in the recreational fishery.

There is a new benchmark stock assessment scheduled for 2018 to further look at the trends, and particularly in this SSB graphic. Just a little more detail on the stock boundaries. The new cobia stock boundaries were established through South Atlantic Council Amendment 20B in 2014, and beginning March the 1st of 2015, the Atlantic migratory group cobia annual catch limits apply from Georgia through New York.

Cobia caught off the east coast of Florida are now counted against the Florida East Coast allocation of the Gulf of Mexico cobia annual catch limit. As was discussed, to continue to look at this stock ID question is that the commission was able to get cobia included in the stock ID workshop in 2017.

Hopefully, by the 2018 stock assessment, we'll have a good handle on the stock boundaries for the stock assessment. There is some chance, based on some of the discussions with the analysts, that there could be some drop down into the state of Florida; but right now the data being used for this is, I think, a study out of South Carolina, where they did have a lot of samples from what is considered the mixing zone, which is right around the Florida/Georgia border.

Based on these issues, concerns, problems, the commission received a letter from the South Atlantic Fishery Management Council requesting that the commission consider cobia management at some level. The ISFMP Board at your May meeting directed staff to develop a white paper to consider options for moving forward.

Based on those discussions and based on a review of the minutes of your board meeting, we put together two potential options for your consideration here today. I'll go through these, and then we can start back, Mr. Chairman, if that satisfies your plan. The first issue is the cobia management plan options to A, develop a management plan structure should the plan be a complementary plan between the Atlantic States and the South Atlantic; Option 1. Option 2 is a joint fishery management plan between the commission and the South Atlantic. Option 3 is an ASMFC exclusive management plan, which would not include the council. Option 4 is status quo, which means we would continue to just have the South Atlantic Council operate the way they have and simply abide by the closures, or come up with some independent state options to monitor those quotas.

If there are any other options that the board may have in mind that they would bring up during this discussion. Then the second issue that we felt we needed clarification on and direction is the board structure. We basically have three options. There could be others. Option 1 would be to have this board, the South Atlantic State/Federal Fisheries Management Board, handle the issues related to cobia; reaching out to states that have an interest in sitting at this board to discuss these issues, if so desired.

Option 2 would be a standalone Atlantic migratory group cobia board, and Option 3 is an option where we could possibly split out species that are currently within the South Atlantic Board and try to coordinate species that are more alike. One option would be to perhaps include the red drum, black drum and cobia as a single unit in the South Atlantic Board, and maybe have the smaller croaker, spot, speckled trout, Spanish mackerel in a separate group; but that is for the board to discuss.

The short term timeline, you've got a long term, very detailed timeline in the white paper that is in your supplemental materials, but just for the next meeting or two, if the board moves in direction or recommends to the ISFMP Policy Board to move forward with a cobia plan, we would begin developing the PID for your review and approval, hopefully, in November of 2016.

During the period between the annual meeting and the end of January, staff would conduct public meetings and accept public comment. Then at the 2017 board meeting, you would review public comments and direct FMP development. With that, a couple of nice cobias off of Wrightsville Beach, I would be happy to answer any questions you may have.

CHAIRMAN ESTES: Do we have questions, Malcolm?

DR. MALCOLM RHODES: Just one question. Since we've talked about or have been brought up with the east coast of Florida and the Gulf. How is the Gulf stock handled? Is it solely the council, is it commission? Do they have some complementary plan going; just to see how it is handled in our neighboring jurisdiction?

DR. DANIEL: Well, we've got Dr. Roy Crabtree and John Carmichael here, but there is a joint coastal migratory pelagics plan between the South Atlantic and the Gulf. This is consistent with the way that king mackerel are handled, where the king mackerel Gulf are handled in a separate but equal situation as the Atlantic king mackerel.

In the Gulf for Gulf cobia, they have their own special stock assessment and they have specific ACLs and overfishing limits, and they are handled as two separate stocks; two separate species. They are managed the same way as the council manages the Atlantic group cobia.

MR. JOHN CARMICHAEL: In the Gulf it is council. The states aren't involved at this time. I am not aware that they've talked to the Gulf's States Commission about getting involved, so it is strictly council management.

MR. ROBERT BOYLES: Dr. Daniel, thank you for an excellent presentation and excellent work. No surprise, I think that we have, from our perspective in South Carolina, a lot to gain from coordinated management; whatever that coordinated management looks like. I've sat here before at this table and pled my case for the Ben Franklin approach to fisheries management. "If we don't all hang together, we will all certainly hang separately."

With 82 percent of the catch occurring in state waters, I think this is a species that certainly lends itself to interjurisdictional fisheries. Dr. Daniel, thank you for your excellent presentation. A question perhaps for Roy, and this might be a nuanced question that maybe I should handle separately and offline.

In South Carolina, we manage cobia, again because it primarily has been managed under the Magnuson Act authorities. We adopted by reference the regulations as promulgated under the South Atlantic Council. My question may be for Roy is, can you school us or school me on the differences, the nuances between what we may call a complementary fishery management plan versus a joint fishery management plan.

I guess, let me state my interest at the outset. I certainly think that there are a lot of cross-shelf movements. I certainly think that there is a lot to be had for federal involvement in it, as well. I certainly think that the accountability measures and the ACLs as promulgated under Magnuson need to be part of cobia management.

DR. ROY CRABTREE: Well, I would defer a little bit to staff on some of that. Most of my experience has been with complementary plans, which we've done, and in that case I think the council can operate in their own meeting and go down their path, and then the Atlantic States does theirs.

But if we were to do a true joint plan, then we would need to have joint meetings and we would need to each pass the same motions and those kinds of things; similar to when we do a plan amendment of the coastal migratory pelagics plan and have to meet jointly with the Gulf Council. I think that is the main distinction. I would defer to Toni, if you've got anything to add to that.

MS. TONI KERNS: I think there are a couple of things with the complementary plans oftentimes, like, for example, Atlantic herring we would call that a complementary plan. The quotas are typically set by the council, and then the states then deal with those quotas that are set by the council and there is not a lot of input from the states on those quotas and the ACLs that are attached to those.

I think that there is some flexibility around the accountability measures in the sense of how the states decide to implement measures to meet those quotas within their groupings. With the joint plans Roy is correct, we have to make actions like motions, so then the states have input on those quotas. You are still bound by what the SSC sets for the ABC, but there is input from both groups on the overall quota, so how much you're going to take into account for uncertainty for scientific uncertainty or management uncertainty. With the complementary plans, if the states do decide to do something different than what the council has done, then you have chance that you are going to have different measures, and so then your state and federal permit holders would be fishing on different rules; which sometimes can be problematic, depending on what set of regulations are different.

For example, if you set a different quota, then the federal permit holder would be impacted, or the state permit holder would be impacted. I think those are some of the bigger ones. It does take a little bit longer for us to get through management documents when they are joint plans, because we do need to meet consistently with the other council. I think that is most of the large differences that are there. On Page 8 and 9 of the white paper it does spell out in bullet format what the differences are between the different plans. Hopefully, that is a little bit helpful as well.

CHAIRMAN ESTES: Are there other questions?

MR. JOHN CLARK: Thanks for the presentation, Dr. Daniel. Great to see you back here. I guess I had a question about the data. I mean the increase in the recreational landings between 2014 and 2015 is enormous. Does the MRIP show a corresponding increase in effort? At the same time I saw that the stock assessment actually shows the stock coming down, and yet these catches are just huge.

DR. DANIEL: Well, we certainly don't see anything in the 2015 landings data that would suggest that there is something wrong in the MRIP landings data stream. We don't think that there is a glitch there. Situations occurred that came together where there were a lot of fish available, and also the fish are trending larger in the fishery, quite a bit larger actually.

The actual numbers of fish probably aren't as reflective as they would be in previous years, when the fish were a little bit smaller. I believe, and this is speaking to some degree anecdotally, because I don't know that the data formally exists. But we are seeing an increase in the number of trips directed towards cobia in the recreational fishery.

But we've also seen sort of a shift in how the fishery operates, to where it has become far more, at least in the Mid-Atlantic region in our southern area region, more of a hunt and fish fishery, as opposed to a bottom fishery. We've seen quite an increase in the development of tackle and baits directed for large cobia.

That increase in interest and effort I think is reflective in some of these landings. But clearly, you can see in years previous it has vacillated around a pretty stable mean. What we'll see this year would only be speculation, but the concern is if we continue to exceed that 630,000 pound allowable catch limit, then we continue to run the risk of an overfished condition.

DR. MICHELLE DUVAL: I'll ask for your indulgence, since I'm wearing a couple of hats here today. I chair the South Atlantic Council, but I'm also here as North Carolina's administrative proxy. There have been a lot of questions from stakeholders with regard to the MRIP data, and we did have some conversation yesterday during the state director's meeting about MRIP estimates.

You know, there has been some concern and there were, with regard to black sea bass and blue fish, final estimates; and we did ask MRIP folks if they could go back and look at if the re-estimations that were used for those species had any impact on cobia. The answer was very little; I believe it was a drop in something like 28,000 pounds.

That said, I think one of the things that from a council perspective I am interested in exploring are some of the alternative techniques for estimation of harvest that the MRIP staff have been gracious enough to present to the South Atlantic Council's SSC, using things like an annual estimate of catch multiplied by estimates of effort; so that you might be not necessarily getting wave-based estimates, but you might be getting annual estimates that would allow for a smoothing out some of these spikier approaches.

There were multiple approaches that MRIP staff had put forward last fall to our SSC. These were for different species that tend to be rarely intercepted, but I think for a pulse fishery like cobia, some of those might be applicable. We have encouraged NOAA Fisheries MRIP staff to consider development of additional business rules for when those types of techniques might be applied during the MRIP review that has gone on.

I also wanted to follow up on Mr. Boyle's comments with regard to commission involvement in the management of cobia. I think one of the things that has certainly become clearer, if we didn't already know it, is the differences in this fishery up and down the coast. You know Georgia's fishery is different than South Carolina's fishery, is different than North Carolina's fishery, is different than Virginia's fishery.

You know we've just seen in the past few weeks a little girl from Maryland who caught a fish that was half as big again as she was. I think it certainly lends support and rationale for the commission becoming involved in cobia management. I think, and Pat can correct me if I'm wrong, but Georgia's fishery is pretty much a federal waters fishery.

South Carolina has seen a lot of changes in their inshore versus offshore fisheries over the last seven or eight years. You know in North Carolina itself, we sort of straddle between what Virginia's fishery characteristics are versus what the characteristics are south of us. You know, north of Ocracoke Inlet it is a different fishery, versus south of Ocracoke Inlet.

Then Virginia, of course, has a longer season with a peak that is offset by another wave. I think with the things that we have heard from stakeholders, with regard to having an equal voice or an equal seat at the table, the commission process offers that with every state having an equal vote and an equal voice.

Then one of the other major issues that we've heard has been the ability to react to changing conditions within the fishery, and the commission process allows for a more nimble and flexible response. Certainly, even though the council as you'll hear about, is undertaking a framework amendment, and most folks here are familiar with a framework amendment; its process.

It is a shorter process, but it still requires going through federal rule making; whereas the commission process allows for more rapid changes in regulations. I think for all of those reasons I would certainly advocate for the commission becoming involved in this. Whenever you're ready, Mr. Chairman, I am prepared to make a motion with regard to that.

CHAIRMAN ESTES: Thank you. Let's see if we can exhaust the questions.

MR. JOE CIMINO: I just wanted to make a comment and follow up with what Michelle has just said. I think the South Atlantic Council's framework has exhausted all of their possible management options. I think they've done a great job with what they are putting forward with options for the framework. I'm not sure that that is enough for this fishery, since it is so different state-to-state.

I really think we need to have some decisions made here, especially for the conservation equivalency that could put the states in a bind with the current framework. I would feel remiss if I didn't thank the council for all they've done so far. This has been a tough year for a lot of us, and I also want to thank Dr. Crabtree's staff. They've been extremely helpful through all of this, and just really open to working with us; but I do believe it belongs here.

DR. CRABTREE: I just wanted to follow up on some of the comments. I think the Fishery Service thinks it is important that the commission take on more of a role in management of this fishery, and I think there is a need for the commission to develop a fishery management plan. I don't think any of us want to complicate this any more than we need to; to achieve our objectives and have a successful fishery.

But I think we do need to insure that the states that have important fisheries for cobia all do have a voice in how the fishery is managed. I think flexibility here is certainly desirable. I think more state involvement here. This is, I think, Louis, 80, 85 percent of the fishery is occurring in state waters; and so this is predominantly a state water fishery.

I think it is appropriate that the states take on a greater role in the management of the fishery. Exactly how we get there, the complementary plan sounds like maybe the most straightforward way to get to what we need to do, but I'm open to other options, as well. But I do think we support the development of a commission plan of some sort; and I think that is necessary to properly manage the fishery.

CHAIRMAN ESTES: If there are no other questions, maybe if we could go backwards about three or four slides here to look at the management options; and then when we get that up there Michelle, if you have a motion, I would appreciate that. Go ahead, Michelle.

DR. DUVAL: I move that the South Atlantic Board recommend to the Policy Board development of a complementary fishery management plan for cobia; so this would be Option 1 under the plan structure listed.

CHAIRMAN ESTES: Do we have a second? Robert Boyles. Michelle, would you like to expand on that?

DR. DUVAL: I put forward the option for complementary management at this time, because as you've heard here, I think there is a strong rationale for the commission to become involved in this; based on some of the stakeholder concerns with regard to adequate representation, being able to be responsive to each state's management needs. But I think what we've also heard is that stakeholders believe that the actions that have occurred as a result of the federal process have led to the situation that we are in today, and so they want to see the council fix that situation as much as possible. I think maintaining federal involvement at this time is certainly appropriate.

PUBLIC COMMENT

CHAIRMAN ESTES: Before we have any further discussion, we have a member of the public that I think would like to make a comment. Sir, if you come to the microphone and state your name and any affiliation you might have.

MR. JONATHAN FRENCH: Thank you, my name is Jonathan French. I represent a loose collaboration of charterboat captains; tackle shops and just regular recreational anglers from

Virginia and North Carolina. I'm probably the stakeholder that Dr. Duval has mentioned expressed most of those concerns.

I am here to ask for this commission to be very patient and not make a recommendation at this time. I think Dr. Daniel; his presentation shows the reason why. I don't know if it is appropriate to ask for the slides to go backwards, but one of the slides mentioned that there is a genetic dividing line at the Florida/Georgia general area.

I believe the exact line claimed is slightly south of the Florida/Georgia state line. We have two genetic studies, one of which is from South Carolina Department of Natural Resources that say that that is hogwash. It is an example of throughout this process, information has been presented to the public that at best is best and inconsistent, and at worse seems to be downright dishonest; and those issues need to be fixed before additional regulatory bodies come into place.

The first of those studies comes from Texas A & M University. It is peer reviewed and it's published in the North American Journal of Aquaculture that says the cobia sampled from the coastal waters of Virginia, Mississippi and Louisiana were genetically homogeneous; based on essays of microsatellite genotypes and mtDNA haplotypes.

The second study, again, I reference from South Carolina, says that offshore migratory fish are genetically identical throughout Gulf and Atlantic waters. There is no dividing line. However, that study does acknowledge the existence of an anomaly genetically in South Carolina that is a byproduct of a failed stocking effort and aquaculture projects started in 2004 by the state.

I would like to reference specifically from that study; "No fish collected outside of South Carolina were identified as South Carolina stocked fish. Therefore evaluation of hatchery contribution represents the contribution to South Carolina's cobia populations." What that means is that the fish that are the genetic anomaly that were used for the justification for the zone split in Amendment 20B, in the fisheries management plan, those fish don't move.

South Carolina's actions in order to reduce pressure on that localized fishery, I would deem them to be appropriate, but should not be impactful outside of that area. Those were the reasons used to justify the zone split; and the end result was 880,000 pounds of quota that were carved out of the Atlantic management zone and given to East Florida, which is now part of the Gulf management zone.

Those 880,000 pounds was given, even though the average catch in the East Florida for the years 2013 through 2015, was only 427,000 pounds. Essentially, East Florida got double what they normally catch; at least in that three-year period. During the same time period, North Carolina and Virginia by themselves caught 550,000 pounds; yet only 630,000 pounds was carved out of the entire area from the Georgia state line up to New York. That is not fair; that is not equitable, that is a violation at the absolute root; not best science available, not fair and equitable impact, not a fair and equitable impact of the resource.

The result is, even if you accept the MRIP data as accurate, which most of the folks that I try to represent say is absolute malarkey. But even if you accept it as being accurate, you look at the standard deviation of the catch averages for the last ten years, and 2015 is the only year that goes above the standard deviation.

It is one of only three years that go above the appropriate ACL, which is the ACL that includes East Florida; because as I pointed out earlier the genetic rationale for the zone split is not grounded in science. With that being the case, we wouldn't have a crisis. This is a manufactured crisis that, frankly, to use a term that "us dumb folks" are familiar with, because of the recent election cycle, this has been gerrymandered.

I would recommend that this commission wait until South Atlantic conduct a new stock assessment to reconsider some of this other scientific information, and determine whether or not there needs to be any additional management. One other point that was kind of brushed over in Dr. Daniel's presentation is what North Carolina and Virginia have done. That catch average occurred when North Carolina allowed a two-fish per person limit, with fish at 33 inches a piece in 2015.

North Carolina initially dropped to a one-fish limit for this year, and that was only deemed to be worth a couple of additional days of the season, so now North Carolina has gone to a four-fish boat limit for charter boat anglers, a two-fish boat limit for recreational boat anglers who can only possess a fish on Monday, Wednesday and Saturday; which I regard as a horrible violation of equal protection, and peer anglers can keep one fish per day, all at 37 inches fork-length rather than 33.

There is going to be a significant drop in the catch from those steps. Virginia has had a one-fish per person limit for an extended period of time. That is one of the reasons we regard the population as thriving in the Chesapeake Bay. Virginia has managed carefully and ended up getting punished for it.

Virginia, in response to all this, did not comply with federal law either; however, the commission in Virginia made the decision to drop to a two-fish boat limit, only one fish over 51 inches could be kept, and Virginia anglers are only allowed to use nets. If you factor in those changes, or even if you adopted a one-fish per person limit across the states in the management area, look at the trended data out over ten years.

There is no reason to reasonably assume that if the ACL were set at the 2014 level, where it belongs, with East Florida/Key West as the appropriate dividing line; which is appropriately based on the genetic science available and the tagging data available, that a one-fish per person limit would not produce numbers well beneath the ACL.

We have argued this until we're blue in the face. We have been told by we're wrong, and yet the information presented is at best confusing and misleading; and at worse it feels like we're being lied to. Fisheries management will not work if the public feels like they can't trust the folks around this table and the folks around those councils and commissions as honest dealers. The folks I represent are furious. They're independent, they are not well organized, but they are mad as all get out.

What they observe on a daily basis does not align with the information you have been presented. I regard the presentation that Dr. Daniel just gave to you as dishonest. I hope you all read it closely. I would beg and plead that another hearing is held so we have an opportunity to present this other publically available, peer reviewed, published genetic information; and then you make up your own minds. But don't feed this bull you've been handed. Thank you.

CHAIRMAN ESTES: Thank you for your comments. Do we have any further discussion of the motion on the board?

MR. THOMAS P. FOTE: I really didn't want to comment on this, since New Jersey is a very small player. We have some recreational incidental catches and some commercial catches. But I really am not happy with complementary plans, the same way I'm not happy with joint plans. I mean, the only complementary plan that I've been involved with is winter flounder; and that really works horribly.

As we can put in the commission, we put in a one fish bag limit and a 50 pound trip limit, and GARFO for some unknown reason allows 5,000 pound trip limits on our boats, commercial that fish in federal waters; which meant that in four or five trips they would catch more fish than our commercial fishermen in state waters would catch in 30 years, and the same thing with the recreational.

They didn't ask for our guidance in things like that. I'm also concerned -- I didn't see the PEs on the recreational data. I was wondering, because I'm not that familiar with the fishery. When the red snapper fishery was constrained, did that basically put a lot more effort on the cobia fishery? That is the question that hasn't been answered; because I can see that happen.

When we started losing summer flounder and regulations went where they had to do 20 to 1 to catch and release. Then it put more pressure on, and more people became striped bass fishermen. That's my other concern here. I'm just trying to look at the data that I'm not that familiar with. My concern is I have a problem with a complementary plan.

MR. BOYLES: I support the motion, obviously having seconded it. I remind the board that in South Carolina, our state waters and what is now known as the Southern Cobia Management Zone closed May the 1st, to protect what we believe to be is a spawning aggregation. Because we adopt federal regulations by reference, South Carolina anglers have not had access to the cobia fishery since June the 20th of this year.

Eighty percent of the catch caught in state waters, I think this is a species that screams for interjurisdictional management. With respect to our fishermen and our anglers to points north, their commissions, which we respect, those anglers in Virginia and North Carolina have access to the cobia fishery. My anglers in South Carolina are asking me why that is. I support the motion and think it is something that we should move forward to the Policy Board.

MR. ADAM NOWALSKY: Can we get any comment here today about the question of the DNA demarcation line? We heard that the gentlemen and those groups involved have gotten a response as to why they're wrong. Can we hear that on the record here today?

CHAIRMAN ESTES: Dr. Carmichael.

MR. CARMICHAEL: The genetics information that was available at the time the assessment was done was studied in quite a bit of detail; and then the samples by South Carolina were during the assessment process where there was some additional sampling done for them as well. Now the study that Mr. French sited by Dr. Gold that was done had a relatively small sample size. They looked at the Virginia offshore, they looked at Mississippi, Louisiana and Taiwan versus the Darden study.

The South Carolina study looked at inshore/offshore of Virginia, North Carolina and South Carolina, all of them inshore/offshore. There were kind of two different purposes of the studies. The South Carolina and Darden study was to try and define the stock boundaries as they were; and really started out in the case of South Carolina to try and understand the inshore components, you know, like the Port Royal population, whether that was its own separate population.

What was happening to the stocked fish? Then as the result of those efforts began to realize that there were multiple stock units along the coast that had various degrees of mixing and interactions, and then looked closer at what the relationship was to the Florida stock and the Gulf stock, and maybe where those lines were.

The Gold Study that was sited came along later and was really geared toward aquaculture and trying to understand relationships between different stocks. That is why it included Taiwan. One of the things that I found interesting about that is that the Gold Study that was sited used Virginia offshore. They had 35 fish, and they had some difficulties in telling whether or not those were truly different; distinct from say the fish in the Gulf of Mexico where they studied.

One of the problems that certainly that raises is that the Darden Study that was done in '08 and '09, and then added more stocks in 2012; really made an effort to collect the fish when the Virginia inshore fish were inshore. Because what they realized is sometimes those inshore stocks were mixing with this offshore component; particularly off of North Carolina and Virginia.

The Darden Studies for example, couldn't establish the North Carolina fish as being distinct from either the fish in the Virginia inshore or the fish that were farther south in the South Atlantic. There is a mixing that goes on, and you guys work with striped bass and other stuff; you all are well aware of all that kind of stuff that was going on sort of off of the mouth of the Chesapeake Bay and stuff.

Of course, genetics being such as they are that is not always the be all and end all, and there are sample size issues and trying to truly understand what a distinct, functioning, productive population unit is. When these stock boundaries were drawn for the assessment, they took all that into account. They realized that it was difficult to draw a line on the southern boundary; which is the case with many of our stocks, and they recommended a pragmatic choice of drawing a line at the Georgia/Florida boundary. I think we know in terms of dealing with datasets and things of that nature in regulations, it is often if you can go to a boundary that exists and you don't have clear distinction as to whether it should maybe be 150 miles north or south of that. It is going to be much more efficient to use that existing boundary. Now, of course, that has raised a lot of questions as we've looked into that and as Louis mentioned, we're going to have a stock ID workshop coming up in late 2017. Cobia is at the top of that list and will absolutely be considered in preparation for the next assessment.

Florida FWC is looking into this now. They're doing some tagging and they're trying to look at movements and other things; to really get better resolution of that Florida component, to try to decide where should the line be? Is it possible that the South Atlantic stock that we call the Atlantic stock should go down to maybe Daytona Beach, as opposed to being at the line?

The reality was there weren't a lot of studies of fish in that area. There weren't a lot of samples of fish in that area when this was done for the last assessment with the data through 2012. There is a lot going on now, and I would say this will definitely be looked at in the next assessment. There may be more genetic studies perhaps, or more samples that come to light when we get around to the next assessment; and that will all be looked at.

Our thought is to look at this population and try to decide, what are the functioning population units? Is there a Chesapeake Bay stock that should be considered similar to the Port Royal stock? Perhaps, and if that is the case, then I would think the commission involvement in the management would certainly become an even stronger position.

DR. DUVAL: Since I made the motion I am obviously in support of it. I did just want to follow up on John's response to Adam's question. I don't believe the Gold Paper was available at the time that the data workshop for this species occurred, so there has got to be a deadline for information to be considered in a data workshop for a species to be assessed.

That information came to light afterward. It certainly has played into the council's request that cobia be at the top of the list for this stock ID workshop that is occurring. I think, if it were up to the council, we would keep all stock boundaries at the nice, neat jurisdictional boundaries that we have between the South Atlantic and the Mid-Atlantic and between the Gulf and the South Atlantic.

Unfortunately it doesn't always work that way. The council has had to respond on many occasions to these designations of biological stock boundaries. We have one, an action that is going through right now for king mackerel where the mixing zone was thought to be pretty much most of the east coast of the Florida Peninsula and part of the way around the west coast of the Florida Peninsula.

The most recent stock assessment for king mackerel has determined that the mixing zone between the Gulf and Atlantic stocks is actually now centered around the Florida Keys. We are at the whim of the science to some extent, but we are trying to be as responsive as possible to the very valid concerns that stakeholders have brought forth on this.

CHAIRMAN ESTES: Unless I see further interest in discussion, I will read the motion. Move the South Atlantic Board recommend to the Policy Board for the development of a complementary fishery management plan for cobia. Motion by Dr. Duval and seconded by Mr. Boyles, I'll give you just a moment to talk to each other, and then we will ask for a vote. Okay, all of those in favor of the motion as read; please raise your right hand. All those opposed, like sign, abstentions, null votes; motion passes. Okay, the next agenda item is; excuse me, where did Dr. Daniel go?

DR. DANIEL: I'm right here.

CHAIRMAN ESTES: I'm sorry; we have another part to this.

BOARD STRUCTURE OPTIONS

DR. DANIEL: Yes, if you go back to the presentation and we can get there. The next slide talks about the board structure options, Mr. Chairman.

MR. BOYLES: I would make a motion that we recommend to the ISFMP Policy Board that the South Atlantic State/Federal Fisheries Management Board be the appropriate venue for development of a cobia interstate fishery management plan.

CHAIRMAN ESTES: Is there a second? Spud.

DR. DUVAL: I'm supportive of this motion. I struggled with, what is the best approach here? I think that if current situations are any indicator, it is highly likely that harvest of cobia north of Virginia is probably going to increase down the road. I think it is appropriate that the other states that are currently on the board have the opportunity to participate in the development of a fishery management plan.

CHAIRMAN ESTES: Any further discussion of this issue? As soon as it is on the board we'll see what we're doing. Move to recommend to the policy board that the South Atlantic Board is the appropriate venue to develop the FMP for cobia. Motion by Mr. Boyles and seconded by Mr. Woodward. **Is there any objection to this motion? Seeing none; it passes unanimously.**

FRAMEWORK 4 FOR COBIA

Now, Toni wants to talk a little bit about Framework 4 for cobia.

MS. KERNS: We had a request from the South Atlantic Council to give some recommendations or comments on their Framework 4; as Michelle said that they are undergoing management action that looks at cobia. Framework 4 is just addressing the Atlantic migratory group for cobia within the document.

The document is considering changes to insure longer future seasons and allow fair access to cobia for fishermen in all states. The public comment will go through September, which is when their council meeting is, to address this issue. If we have written comments that get in by August 19, they will be a part of the meeting materials; but they will accept comments after that timeframe.

The actions that are in the document include recreational harvest limits, the bag and vessel limits modifying the recreational minimum size, modifying the accountability measures for the recreational fishery, and then establishing a commercial trip limit for Atlantic cobia. There is also action within this document to look at the recreational fishing year.

The council was given guidance after the document was put out that they have to do an amendment in order to do this, but they are still seeking comment on the fishing year; just in case they decide to change the actual season through management action. Again, like I said, it is just looking at the Atlantic migratory group, so this is the management from Georgia northward. The current limits for federal waters are 33 inches and two fish per person per day. All of the management scenarios and the impacts of those scenarios are based off of these coastwide measures; not based on the state specific measures that have been put in place recently by some of the states.

Skip through some of these slides just in the interest of time. First is looking at modifying the recreational management measures for cobia. There are a couple of things that we are looking at here. First is looking at the possession limit. There are alternatives to not modify or to have a one fish per person per day, and that is the preferred alternative.

There is also looking at a vessel limit. That vessel limit has options ranging from one to six fish per vessel per day. The preferred alternative is three fish per vessel per day. In addition, they are looking at modifying the size limit for recreational harvest. The current is 33 inches. The document looks at modifying anywhere from 33 to 50 inches. The preferred alternative is 36 inches within the document.

This figure here shows what the preferred alternatives would get you, in terms of how much season you would have; and remember that this is a coastwide measure comparison, and it assumes the fishing date start would be January 1. Those two preferred alternatives would pull the season through almost the end of July. It is predicted that it would go through July 20th.

Next is looking at modifying the recreational fishing year for Atlantic cobia. Again, this action would actually have to be done through an amendment. But 1 is to not modify. The preferred alternative is to have the fishing year be from May 1st through April 30th. Alternative 3 would be a June 1st through May 31st season, and the last alternative is an April 1st through March 31st season.

This figure here shows the recreational landings by month, and where you see the spikes in the landings occurring is mostly March through September/October, for the waves in MRIP. I am going to skip through these tables, Max and we're going straight to the accountability measures. Then looking at how the council is adjusting, modifying their accountability measures.

The current accountability measure for cobia has the recreational ACL reduced by the total overage in the next year. That's based on the most recent three years of data, so you do some averaging out to determine how much of the overage has to be taken out of the ACL in the following year. In the commercial fishery the council closes harvest when the quota has been met, and if any overages occur, those quotas come out of the next year's quota. Michelle is correcting me, and I asked her to do this.

DR. DUVAL: Just a quick correction on the recreational side of things. The current accountability measure requires a shortened season the following year if the recreational annual catch limits and the total annual catch limit; so recreational and commercial combined, is exceeded. The length of the season will be reduced the following fishing year. If the stock is overfished, which cobia is not, then you would also have a reduction in the annual catch limit. Right now, we're just under a situation of having had a reduced season.

MS. KERNS: The preferred alternative for making changes to the accountability measure is that if the recreational landings exceed the recreational ACL, landings would be monitored for a persistent in the increase in landings. There would be a reduction in the length of the season to insure that the recreational landings met the ACT; but are not exceeding the ACL in the next year.

This would be based on one year of data, not using the averaging that is in the current accountability measure. The next option is to look at reducing the recreational ACL in the following year, similar to what is in the current measures but it would be based on the one year of data, not the three year.

Lastly, is looking at having in-season closures. It gives the ability to close the recreational sector for the remainder of the fishing year if the ACL has been met or is projected to have been met. Then lastly is to modify the recreational vessel limit for the following fishing year, to insure that the recreational landings meet the ACT but don't exceed the ACL. It is based on the one year, as well.

For all of these recreational accountability measures, you can see that some of the big change would be instead of using the three-year average, you would use the one year. Just note that the council could use more than one of these accountability measures at a time, in order to ensure that there wouldn't be an overage in the following year.

Then lastly is to look at potentially establishing a commercial trip limit for cobia. The current trip limit is two fish per person per day. There is an alternative to establish a commercial trip limit of two person per day, and the trip would decrease to one fish when 75 percent of the commercial ACL had been met.

Then another is to establish a six fish per person vessel per day, and the trip limit would decrease to three fish per vessel per day when 75 percent of the ACL had been met. Lastly is to look at two fish per person per day with no more than six fish per vessel per day; and the trip limit would decrease to one fish per person per day, with no more than three per vessel per day when 75 percent of the ACL has been met.

This is a summary of the estimated month when the actual Atlantic cobia commercial landings reach 75 percent of the commercial ACL, and the current commercial ACL of 50,000 pounds. You can see that in the most recent year, that would have been in July, when 75 percent was met and then when it actually hit the ACL was August. That is all.

I think that we can either do one of two things here, Mr. Chairman, is that we can either get just a general consensus that the board wants to comment; and then those comments can come back to me and then we can draft a letter and send it back to the board for their review, or we can give the comments here today and then send the letter back to the board.

CHAIRMAN ESTES: First of all, so what is the will of the group? Do we want to make comments on this?

MR. NOWALSKY: I won't be cobia specific, but I will draw on the lessons learned with recreational management in conjunction with the Mid-Atlantic with summer flounder, black sea bass and scup. Having gone through that at the council level, one of the early iterations of accountability measures included in-season closure authority, and that has since been taken out and deemed just wasn't practicable. I would recommend that same course of action for recreational fisheries; including cobia, unless somebody can make some very clear case why the recreational cobia fishery is that much different than other recreational fisheries.

I would also draw on our experience in the variability inter-annually of the MRIP data and the danger of responding to a single year's worth of data, and some type of multiyear. Currently, we're using a three-year-rolling average at the council level. I would encourage the board to interact with the council, and recommend a similar course of action to reduce that inter-annual variability

DR. DUVAL: Thank you, Adam, very much. I appreciate those comments. I think the in-season closure option is in there because it is sort of consistent with what we have for some of the accountability measures for some of our other species; but we actually don't have in-season closures for recreational cobia right now, specifically for the very reasons that you've sited.

It is in there as a reasonable alternative for public comment. I think, with regard to the three-year-moving average that is what we have currently, and that three-year-moving average resets in the year that a new ACL is rendered from a stock assessment. That is the situation that we had in 2015. We got a new annual catch limit, so the three-year-moving average started again with 2015.

You were only comparing 2015 landings with the 2015 ACL. If we maintain that three-year-moving average, anglers are going to continue to be penalized for the next two years by having to include that 1.5 million pound spike in the following two years. I just wanted to provide some rationale for why the council was looking at moving to a one-year comparison, so that if for 2016 harvest has been constrained to the limit. You would only be comparing 2016 landings to a 2016 ACL.

You would not be penalizing anglers by inclusion of that 2015 spike in the three-year-moving average. I think the other thing with the accountability measures was the council was looking at trying to not have some type of season closure by inclusion of the option that allows for a reduction in the vessel limit as a potential option; to be used possibly in combination with a shortened season, but to try to offset any shortened season that might need to occur. I just wanted to provide some context for some of those options in there.

CHAIRMAN ESTES: Obviously, each state can provide comments to the council as they see fit. I think the question before us is do we want, as the commission, do we want to provide comments on this Framework 4?

MR. BOYLES: I'm not sure we could get consensus on what to say, and so my sense is let's just look at this, at commenting individually. Again, I think that is one of the challenges we have; in terms of moving the interstate management. We don't have that yet. I wouldn't expect my views on cobia or South Carolina's views on cobia would be congruent with those of Virginia necessarily, and so I think that would be a futile exercise. I'd recommend we just move on.

MR. CIMINO: I agree with that. I just want to reiterate that I'm glad to see all the work that the council put into this, and in bringing so many options forward; although I think it would be very difficult for us to have consensus on all of them right now. There was an obvious realization by everyone that there needed to be more options within the accountability measures, and I think this is a big step forward for that.

DR. DUVAL: Just one final thought. I agree with Robert, but if there are folks, like Adam offered some very constructive comments. I think if there are folks sitting around the table who do have specific thoughts that they may want to provide to Toni, and Toni could certainly just compile. I mean, recognizing that this isn't consensus, but certainly any constructive criticism of what's in the document would be appreciated by any individuals around the table who chose to do so.

CHAIRMAN ESTES: Is everybody all right with that approach, send comments to Toni that she can compile? Okay, it looks like that is what we're going to do. It is now lunchtime. We obviously can't get done in the next five minutes. Let's break until about 12:30? It's 12:20.

MS. KERNS: We may have Jeff start giving his presentation on sort of what the red drum working group is doing while you guys are eating, and then by the time you're done eating, you can start asking him questions.

(Whereupon a recess was taken.)

RED DRUM WORKING GROUP REPORT

MR. JEFF J. KIPP: I'll be giving an update on the red drum tasks that this board tasked the Red Drum Technical Committee and Stock Assessment Subcommittee with at the May meeting. Just to refresh your memory, the tasks were to look at the appropriateness of the current biological reference points for red drum; which are spawning potential ratios.

Similar to that, 0 look at F-based reference points and the appropriateness of those for just a juvenile-based-F reference point. Evaluate the validity of age-based models for red drum, given data limitations and the life history of this species. Conduct continuity runs of the statistical catch-at-age model that was developed for SEDAR 18, the previous benchmark assessment, and to evaluate the tag return rates and the tag recapture data as it is used in the stock synthesis models.

Just a summary of the meetings that we've had since the May meeting, we did have a conference call with the commissioners to clarify some of the questions we had on the tasks; and sort of what the goals of the tasks were. We've had a series of conference calls and webinars with the Technical Committee and Stock Assessment Subcommittee to go over these tasks.

We do have a webinar planned for the week of August 15th. Also, where we'll get most of our in-person work and discussions done is at an in-person meeting at the Fall TC week, which is September 12th through the 16th, and we don't have that to be determined, the exact date and time for that meeting.

I'll spare the full language here, just in the matter of time, but the first was biological reference points and evaluating the appropriateness of spawning potential ratios for red drum, and whether or not the 30 percent threshold and 40 percent target are suitable goals for red drum. The progress to date for this task -- we started out and felt that it would be useful to go summarize the theory and use of spawning potential ratios as reference points; and how that relates to red drum and their life history. That was provided in the summary in meeting materials. We also did discuss that an overfished reference point is still contingent on spawning stock biomass estimates out of the models; whether that be the stock-synthesis models in the current assessment or, as I'll get to, the catch-at-age model that was used in SEDAR 18.

It was noted that there is the need for some additional information in addition to these F-based reference points, especially if we are lacking an SSB overfished reference point. The group kind of centered around the need for a recruitment reference point likely derived from an index-based survey under a stoplight framework or a traffic light framework as you may recognize, to supplement the F-based reference points; whether those be the spawning potential ratios, or we are tasked also at looking at just juvenile-F reference points.

Moving forward, we are currently working also on some simulations of looking at the red drum stock, fished to an equilibrium state under different spawning potential ratios, and how that will impact recruitment in the long term to help inform the group's final decision on the SPR reference points for red drum.

The ultimate goal of that will be the final recommendation on SPR reference points and the appropriate threshold and targets for both stocks. Also, to supplement that, as I mentioned, we will provide a recommendation for an index-based-recruitment reference point. For the F-based reference point this was to look at an F-based reference point strictly for the juvenile harvest. We later did confirm on our call with some of the commissioners that that harvest is also to include the assumed B2 mortality of the fish that are discarded in the recreational fishery.

What the group has done here, they've evaluated the relationship between the current overfishing reference point SPR, and juvenile fishing mortality estimates, and also developed a list of pros and cons or advantages and disadvantages of using a juvenile F-based reference point for management of the red drum stocks.

These two figures here just show that evaluation of the relationship between the juvenile fishing mortality estimates and SPR. On the left figure for the southern stock and the right figure for the northern stock, the SPR estimates out of the stock synthesis model are on the Y axis and on the X axis are the fishing mortality estimates for age 0-5 fish.

You can see that there is a tight relationship between those two measures of fishing mortality, but one of the issues that we are currently debating for this is similar to the issues for spawning potential ratios and escapement that have been discussed in the past; and that is what is the appropriate level or reference point of fishing mortality for this type of metric to manage the stock on.

Moving forward with that in mind, again, we will be having discussions at our in-person meeting, but the final product for this task is a final recommendation on the appropriateness of a juvenile F-based reference point; and if it is deemed appropriate to provide a recommendation for what that reference point is.

As I mentioned before, the group does feel that there needs to be this supplemental index-based recruitment type reference point to supplement any type of fishing mortality reference point. The third task was to evaluate the validity of age-based models for red drum, given some of the data limitations for the species, and also the life history of that species. What the group has done here is we've summarized the potential concerns about data limitations for age-structured models for red drum. We did discuss some other types of models; most notably a biomass dynamics model or surplus-production-type model, and the TC and SAS do recommend against any type of this as inappropriate for red drum.

Moving forward, the product right now is we have coming for this task is a description of the potential implications that the data limitations that are currently in place for red drum could have on age-structured model estimates. I will note that the TC and SAS on our calls have struggled the most with this task and what the goal of this task is.

If what I've presented here is kind of what we see as the final product coming forward for this task is agreeable amongst the board, then we'll keep moving forward on that. But if there is feedback on kind of additional information or thoughts on what the board would like to see to address this task, we are kind of seeking that today.

The fourth task here is updated continuity runs of the catch-at-age model that was used in SEDAR 18. If you recall the presentation of the assessment at the May meeting, there are some pretty major differences between the estimates out of SEDAR 18 and the new stock synthesis models that were put forth in the most recent assessment.

What we spent most of our time working on for this task is just updating the model inputs to align them as closely as possible to the inputs going into the stock-synthesis-3 models, for the sake of comparing those results more closely and from the updated continuity models through 2013.

I just made a note here that the tag recapture components will be unchanged from SEDAR 18. The group views this as a major task that would not be able to be accomplished before the annual meeting when the board would like to review the work on all these tasks. Moving forward, once those models are run, we will put together a comparison of the catch-at-age model estimates and the stock-synthesis model estimates, and we'll provide a description of those discrepancies and the likely reasons for those discrepancies.

The Stock Assessment Subcommittee will provide a final recommendation on the utility of that catch-at-age model that was used in SEDAR 18 for management advice and the caveats that go with that recommendation. But I do want to note here that the group sees the primary goal of this task in comparing what the implications are from switching from the old catch-at model to the stock-synthesis model.

If the board would like to consider the catch-at-age model as a model for management advice, there would likely need to be additional work to be done following the annual meeting. The group believes that that would need a peer review of that model; because there would be some additional data streams going into the model and likely some modifications to the model, relative to how it was configured for SEDAR 18.

The last task was to evaluate the tag return rates that are used in the stock synthesis model, and the tag recapture data and make a recommendation if any changes should be made, on how that is incorporated in the stock synthesis models. For the southern stock synthesis model, there were two sensitivity runs done, one with a lower reporting rate and one with a higher reporting rate; 60 percent reporting rate was the higher value, and an 18 percent for a lower value. For the northern model there was a likelihood profile conducted over several fixed values for the recreational harvest fleet reporting rate.

These are just some figures to show the preliminary results of those analyses. In the upper left hand corner is for the southern model, and on the Y axis is the static SPR estimates out of the stock-synthesis model over the time series. The red line is the sensitivity run with the southern model with the reporting rate fixed at 60 percent.

When that is allowed to be estimated within the model, it is estimated at about 30 percent, so it is about doubling the reporting rate as it is estimated in that model. You can see that those estimates fall very similar to the SEDAR 18 SPR estimates, which are the green-dashed line. The black line is the base-southern-stock-synthesis model, and the SPR estimates out of that model, the black-dash line is the stock synthesis model without the tag recapture data included; and you can see it has a little effect on the overall SPR estimates.

The blue line is the sensitivity run with the reporting rate fixed at 18 percent. You can see that the SPR does decrease when fixing that value at a lower rate than what it's estimated in the base model. In the lower right hand corner is the likelihood profile done for the northern model, with the change in the likelihood on the Y axis and the recreational harvest reporting rate on the X axis.

This was profiled over fixed values from 10 percent all the way up to 95 percent. If you recall, that model was estimating a reporting rate around 10 percent. What we're looking for here in this figure is just a smooth convex shape that comes to a minimum point at the best estimate out of the model.

As you can see here, that is not what we're seeing. This model, when the reporting rate is fixed, estimates a similar solution up to about a reporting rate of 50 percent, and at that point the model finds a very different solution and jumps to that solution instead of a smooth kind of transition to that as you increase the reporting rate. This is indicative of some stability issues within the model when that tag recapture data is included and the reporting rate is fixed.

Moving forward, another idea and thought that the group had and is looking into currently is evaluating the tag recapture data that was used in the stock synthesis model; but in standalone software, most notably the MARK program which is used to look at tag recapture data to get a feel for what that model would estimate from the tag recapture data.

Given a similar reporting rate that is being estimated in the stock synthesis model, that will help us inform how that stock synthesis model is estimating those tag recapture parameters.

Then from that work we'll come up with a final recommendation on how to treat the tag recapture data in the stock synthesis models, and if there are any changes that need to be made relative to how they are presented in the assessment at the May meeting. That is just a quick summary on the work we've been doing for these tasks, and if there are any questions, I can take those now.

CHAIRMAN ESTES: Questions? Spud.

MR. A. G. "SPUD" WOODWARD: Thank you, Jeff, and I certainly want to extend my appreciation to the hard work that you and everybody else has been doing on our behalf. This one is a challenge, and I know everybody is busy. We certainly appreciate the attention to detail. A question that I have been asked is whether there would be any value to doing an SS3 run with the data from the previous statistical catch-at-age model.

Would that be informative in any manner, because I think one of the things we're struggling with is; is what we're seeing as a model output a function of the inputs or is it the methodology? That's a question I've been asked is whether there would be some value to doing that.

MR. KIPP: We did try and address that as closely as we could with some sensitivity runs. In the assessment there was what we kind of called our catch-at-age alternative model runs. Those were where we did go back and we used the input data as closely as we could from SEDAR 18, within stock synthesis; and looked at the model results from that model relative to the base models.

The model results were very similar. That was a sensitivity that we did look at, but it didn't have a major impact on the model; even though we were looking at an age structure of 0-6 plus, which was comparable to what was looked at in SEDAR 18. What our take home from that was that was not a major implication in how we are making the transition from the SEDAR 18 catch-at-age model to the stock-synthesis model.

MR. WOODWARD: Also, on the task related to the validity of age-based models, I think at least personally what I'm looking for there is that we know we have data source limitations that are unavoidable and very difficult to mitigate, because of management measures and ontogenetic shifts and habitat preferences of the fish, out migration into the ocean; a variety of things that we've been plagued with since we've been trying to do quantitative assessments of this species.

What I was looking for was just a very pragmatic assessment. Given all those limitations and the uncertainties that come along with trying to fill the empty spaces, is an age-based model the only choice we have? I see that there has been some analysis of alternatives that were rejected. But I think the thing that is troubling us is that we continue to struggle to fill in the empty boxes.

When you've got cohort recruits to the fishery, you basically get to quantify its abundance effectively for a couple three years, and then it's gone where you can't really get to it. Even with our best efforts to assess the adult stock, we still end up with fragmented data. Is there something else, or is this what we're stuck with?

MR. KIPP: I think we are on the same page as far as what we're providing and putting forth to address this task, which is a more detailed description of what those data limitations are, and how those could potentially affect model estimates from a model structure that we used in stock synthesis. But we will also include our thoughts and recommendations on other model types; in addition to the age-based models that are currently used.

CHAIRMAN ESTES: Any other questions? Hearing none; I guess there is more to come. We'll have more of this information when we meet up north in the end of October. If you are ready, Jeff, we can talk about the progress on the spot and croaker – oh, nope.

MS. KERNS: I just wanted to reiterate what Jeff had talked about in terms of moving forward with the different model types, and that if we get to at the annual meeting the point where the board wants to utilize information; that some of these models may require peer review for us to use it for management. I just want to make sure that that would mean that we couldn't move forward until after we had that peer review. I just want to make sure that everybody is clear on that.

CHAIRMAN ESTES: Any questions or issues with that?

MS. LYNN FEGLEY: Thank you, Toni. That was on my mind. It sounds like if, in October, the board decides to move forward with outputs from the statistical catch-at-age that it may need a peer review. I just wonder, for clarification, would that assessment then take the place -- What are we dealing with at that point? Are we dealing with two peer-reviewed assessments that we're considering in tandem, or are we considering the one with more recent science than the other?

MS. KERNS: I'm going to toss that question to my good friend, Pat Campfield, to answer.

MR. PATRICK A. CAMPFIELD: Thanks very much. My suggestion would be that you put together the whole package for peer review. Given the evolution of the red drum stock assessment models that we've gone through from SEDAR 18 to present, and possibly an additional type of model, you would want to put forward the whole package.

MR. BOYLES: Not a question, just a comment. Our trammel net surveys are suggesting a real issue. We are not getting year ones showing up in out years. We have strong interest in South Carolina to make some management adjustments. I find myself in this rather precarious position of wanting to be informed by the stock assessment.

I appreciate what Toni offered in terms of, if we have other questions this might just push this further and further out. I will just put a marker from our perspective. We have reason to be concerned in South Carolina with what we're seeing in our trammel net survey. We have some constituents who are very concerned about it.

I'm flummoxed in terms of a potential management response when our release rate is reported at somewhere north of 80 percent. It's got me in a little quandary, so I would just urge us to get it right to the degree we can. I'll echo Spud's comments. Jeff, to you and to all the members of the Technical Committee and the Stock Assessment Subcommittee, I appreciate your effort to this. But we want to get it right, but just know for the board that we've got some strong interest from South Carolina to make some management changes.

CHAIRMAN ESTES: I would also like to point out that although we want to get it right, the more that we task this group with doing things, there is an issue of funding and an issue of time. Therefore, the more things that we drag this out, the longer it is, there are going to be fewer things that we can do for the other species. I think we need to be mindful of that, also. Are there any other questions before we go on to the next agenda item? Seeing none; Jeff it is still your show, I guess.

PROGRESS REPORT ON THE SPOT AND ATLANTIC CROAKER STOCK ASSESSMENTS

MR. KIPP: Yes, I just have a quick update for the board on the progress of the spot and Atlantic croaker stock assessments that are currently underway. We do have our second stock assessment workshop scheduled for next week; it is Tuesday through Thursday at the commission's offices in Arlington. The bulk of that meeting will be to review our base models for both species and wrap up the assessment work at that meeting; and the plan is to then finalize the reports following that meeting and go to peer review, likely sometime in November.

For the Atlantic croaker assessment, the primary model right now is a stock-synthesis model, and for spot, we're looking at two modeling approaches, a surplus-production model and a two-staged-catch-survey analysis. Those will be the models that we're reviewing next week and moving forward with. If there are any questions on those assessments, I can take those now, as well.

CONSIDER 2015 FISHERY MANAGEMENT PLAN REVIEW AND STATE COMPLIANCE FOR RED DRUM AND ATLANTIC CROAKER

CHAIRMAN ESTES: Any questions? **Our next agenda was approval of fishery management plan reviews. Toni suggested, and I think it's a good idea, that we do this via e-mail; just because of the time that it is taking. Are there any objections to approval of the Atlantic croaker and red drum plan reviews via e-mail? Seeing none; is there any other business that we have before the board?** We've been here all morning, it seems like.

ADJOURNMENT

Seeing none; is there any objection to adjourning or do I have a motion to adjourn?

MR. BOYLES: So moved, Mr. Chairman.

CHAIRMAN ESTES: Malcolm seconded, we're adjourned.

(Whereupon the meeting adjourned at 12:40 o'clock p.m. on August 2, 2015.)

Atlantic States Marine Fisheries Commission

PUBLIC INFORMATION DOCUMENT

For the Interstate Fishery Management Plan For Cobia

October 2016

Vision: Sustainably Managing Atlantic Coastal Fisheries

This draft document was developed for Management Board review and discussion. This document is not intended to solicit public comment as part of the Commission/State formal public input process. Comments on this draft document may be given at the appropriate time on the agenda during the scheduled meeting. If approved, a public comment period will be established to solicit input on the issues contained in this document.

The Atlantic States Marine Fisheries Commission seeks your input on the initiation of an Interstate Cobia Fishery Management Plan

The public is encouraged to submit comments regarding this document during the public comment period. Comments must be received by **5:00 PM (EST) on Month Day, 201X.** Regardless of when they were sent, comments received after that time will not be included in the official record. The South Atlantic State/Federal Fishery Management Board will consider public comment on this document when developing the first draft of the Fishery Management Plan.

You may submit public comment in one or more of the following ways:

1. Attend public hearings held in your state or jurisdiction, if applicable.
2. Refer comments to your state's members on the South Atlantic State/Federal Fishery Management Board or South Atlantic Advisory Panel, if applicable.
3. Mail, fax, or email written comments to the following address:

Louis Daniel
Fishery Management Plan Coordinator
Atlantic States Marine Fisheries Commission
1050 North Highland Street, Suite 200A-N
Arlington, Virginia 22201
Fax: (703) 842-0741
ldaniel@asmfc.org (subject line: Cobia PID)

If you have any questions please call Louis Daniel at (252) 342-1478.

YOUR COMMENTS ARE INVITED

The Atlantic States Marine Fisheries Commission (Commission) is developing an Interstate Fishery Management Plan (FMP) for Cobia. The Commission, under the Atlantic Coastal Fisheries Cooperative Management Act, is charged with developing FMPs which are based on the best available science and promote the conservation of the stock throughout its range.

This is the public's first opportunity to inform the Commission about changes observed in the fishery, management measures the public feels should not be included in the FMP, regulation, enforcement, research, development, enhancement and any other concerns the public has about the resource or the fishery. In addition, this is the public's chance to present possible reasons for the changes and concerns for the fishery.

WHY IS THE ASMFC PROPOSING THIS ACTION?

At its August 2016 meeting, the Commission's South Atlantic State/Federal Management Board initiated the development of the first interstate Cobia FMP.

Currently, the South Atlantic Fishery Management Council (SAFMC) and NOAA Fisheries manage cobia under the Coastal Migratory Pelagic (CMP) FMP through an allowable catch limit (ACL), combined with possession and minimum size limits. An overage of the recreational ACL occurred in 2015 and resulted in a shortened recreational season in 2016, consistent with the accountability measures (AMs) implemented by the SAFMC. The closure had measureable impacts to member states when their recreational fisheries were shut down at the peak of their season (Outer Banks of North Carolina and all of Virginia). The closures occurred at the peak of the Outer Banks fishery and the Virginia recreational fishery causing an economic loss. Concerned by these impacts and recognizing that a significant but variable proportion of reported recreational landings are harvested in state waters, the SAFMC requested the Commission consider complementary or joint management of the cobia resource.

The Commission's Interstate Fisheries Management Program Policy Board reviewed a white paper at its August 2016 Meeting and agreed Commission management of cobia was prudent. The Commission tasked the development of an FMP to the South Atlantic State/Federal Fisheries Management Board, complementary with the SAFMC plan for cobia (*Rachycentron canadum*).

SAFMC management, based on current genetic information, addresses the management of Atlantic Migratory Group (AMG) of cobia that occur from Georgia through New York (Figure 1). Cobia that occur off the east coast of Florida are part of the Gulf stock, but the SAFMC manages the portion of that stock on the Florida east coast that occurs within its jurisdiction (Florida/Georgia (FL/GA) border to the Monroe County line). Tag recapture data suggested two main stocks overlap at Brevard County Florida and corroborated the genetic findings. The genetic findings also determined there were two distinct population segments (DPS) in Port Royal Sound, South Carolina and Chesapeake Bay, Virginia. The main South Atlantic and Gulf stocks were separated for management purposes at the FL/GA border because genetic data suggested the split is north of the Brevard/Indian River County line and there was no tagging data to dispute this split. The FL/GA border was selected as the stock boundary based on recommendations from the commercial and recreational work groups of the Southeast Data Assessment and Review (SEDAR) 28 stock assessment (2013) as well as enforcement and administrative concerns.

Cobia occurring off the east coast of Florida are part of the Gulf Migratory Group (GMG) of cobia, but the Gulf of Mexico Fishery Management Council (GMFMC) allocated a portion of the GMG cobia ACL for the SAFMC to manage. SAFMC sets measures for the Florida east coast to achieve the sub-ACL set by the GMFMC. The Florida east coast boundary and the revised ACLs based on the stock boundary changes were implemented through Amendment 20B to the CMP FMP (GMFMC/SAFMC014). Collection of genetic samples from northern Florida (east coast) and Georgia continues and analysis will be used in a stock identification workshop planned for 2017 that will review the stock boundary between the south Atlantic and Gulf stocks.

Recreational cobia landings in 2015 were 1,565,186 pounds (SEFSC), well above the 2015 ACL of 630,000 pounds. This overage resulted in a June 20, 2016 closure of the fishery by NOAA Fisheries. Concern was expressed by individual states whose recreational seasons were reduced by the 2016 closure. North Carolina and Virginia developed alternate management strategies for harvest in state waters to avoid the June 20, 2016 closure enacted by NOAA Fisheries. South Carolina recently implemented more restrictive measures to protect an inshore spawning population in southern South Carolina that was independent of the actions taken by NOAA fisheries.

Commercial cobia landings in 2015 were 71,790 pounds (landed weight) that exceeded the commercial ACL of 60,000 pounds (landed weight). Unusual fall landings occurred in 2015 that prevented a timely closure. Landings can be reported as both gutted or whole weight. Management uses “landed” weight to determine if the ACL has been met. Since landed weight includes both gutted and whole fish total weight harvested is likely underestimated.

STATEMENT OF THE PROBLEM

Historically, cobia has been managed through the federal Gulf of Mexico and Atlantic CMP FMP; the plan’s measures had been considered precautionary due to the low bag limits. Both sectors of the fishery have been managed with a two fish possession limit and 33” fork length (FL) minimum size since formal management began in 1990 (under Amendment 6). The ACLs and AMs were established through Amendment 18 and then updated in Amendment 20B

(GMFMC/SAFMC 2012 and 2014). The 2013 stock assessment conducted through the SEDAR process indicated overfishing was not occurring and the stock was not overfished. However, biomass/abundance had been as trending steadily downward over the previous two decades. Additionally, the stock assessment used a different stock boundary than that in the FMP. The current ACL is a conservative approach to prevent the stock from reaching an overfished status. The recent overage in 2015 exceeded the SAFMC's defined overfishing limit, meaning the stock is undergoing overfishing. Further, quota overages would continue to contribute to overfishing and could lead to the stock becoming overfished.

Efforts to more closely monitor state-specific harvest to ensure that quotas are not exceeded and that overfishing is averted is the Commission's primary focus. Further, by developing a Commission plan, the impacts of a single, federal closure may be mitigated through state-specific measures designed to maintain traditional seasons at reduced harvest rates. The proposed interstate FMP considers potential management approaches to maintain a healthy resource while minimizing the socioeconomic impacts of seasonal closures.

DESCRIPTION OF CURRENT MANAGEMENT

SAFMC management of cobia is consistent for the AMG in federal waters with a two fish possession limit and 33" FL minimum size limit for commercial and recreational harvest. To reduce recreational harvest and attempt to extend seasons, some states have recently modified their state water measures (Table 1). Commercial management remains at two fish and 33" FL. Because cobia found in Florida waters are not a part of the AMG, they have a different set of management measures designed to achieve the sub-ACL.

Table 1. Recreational measures in 2016 for Cobia in Virginia, North Carolina, South Carolina, Georgia, and Florida.

State	Bag limit (Fish per person/ day)	Vessel limit (Fish per vessel per day)	Size Limit (inches)	Legal Gear
Virginia	1 *	2	40" TL, only 1 > 50" TL	No gaffing permitted
North Carolina	1 **	For-hire: 4/vessel or 1 person when less than 4 people on board Private: 2 fish on vessels with more than 1 person on board	37" FL	
South Carolina – north of Jeremy Inlet, Edisto Island	2	None	33" FL	
South Carolina-south of Jeremy Inlet, Edisto Island	1 (June 1-Apr 30) Catch and release only May 1-May 31	3, or 1 per person, whichever is lower	33" FL	
Georgia	2	None	33" FL	
Florida	1	1 per person or 6 per vessel, whichever is less	33" FL	spears, gigs, hook and line, seine, cast net

*VA State waters close 8/30/16.
**NC State waters close 9/30/16; private recreational can only retain cobia on Mondays, Wednesdays, and Saturdays. Shore based anglers may retain 1 fish per day, 7 days per week.

In September 2016, the SAFMC recommended NOAA Fisheries approve the following measures contained in Framework 4: recreational harvest limits of one fish per person per day or six per vessel per day, and a minimum size limit of 36” fork length (FL) for recreational harvest; a commercial harvest limit of two fish per person per day or six per vessel, whichever is more restrictive, but no change to the commercial minimum size limit of 33” FL.

The SAFMC is also proposing modifications to the recreational AMs for AMG cobia. These changes are expected to be implemented in spring 2017. In December 2016, the Council will review and recommend to NOAA Fisheries approval of an amendment to change the recreational fishing year for AMG cobia, the current fishing year is January 1 – December 31. The amendment’s preferred alternative would change the fishing year to May 1 – April 30.

The allocation of the SAFMC’s ACL between commercial and recreational sectors is based on historical landings (50% is based on the average 2000-2008 landings and 50% is based on the average 2006-2008 landings). Beginning in 2016, the ACL is split 92% recreational and 8% commercial. The 2016 ACL for cobia is 670,000 pounds, with 620,000 comprising the recreational ACL and 50,000 comprising the commercial ACL. The ACL for 2015 was slightly higher at 690,000 pounds.

LIFE HISTORY AND STATUS OF THE STOCK

Cobia is a fast growing, moderately lived (14 years old) species, with most fish maturing by age two. Females grow faster and attain larger sizes than males, but become sexually mature later. Cobia migrate south to north as well as east to west. Spawning occurs when water temperatures reach 20-21° C from April through September with spawning occurring earlier in Florida and later in Virginia. Cobia form aggregations and spawn multiple batches of eggs throughout a relatively short season. Year class strength can be highly variable but trends in the data show a very strong year class occurs once in a decade. Both tag recapture and genetic data show cobia exhibit natal homing and are often recaptured on the same structure or in locations where they were caught years before. This natal homing and spawning aggregation behavior make them very predictable and easily located by fishermen.

The results of the SEDAR 28 stock assessment determined the FL/GA border as the demarcation between the Atlantic and Gulf of Mexico stocks. As previously mentioned, a workshop in early 2017 will evaluate all the current cobia genetic information. While cobia do frequent areas north of Virginia, the harvest is uncommon and sporadic. Landings have been episodically reported from Maryland, New York, New Jersey and Rhode Island and make up from 3-15% of the total Mid-Atlantic landings.

The SEDAR 28 stock assessment indicated overfishing was not occurring and the stock is not overfished. The current ACL is a precautionary approach to prevent the stock reaching an overfished status. The recent overage in 2015, exceeded the Council defined overfishing limit, meaning overfishing is occurring. The stock assessment does indicate concerns. While the terminal year of the assessment was 2011, spawning stock biomass (SSB) experienced a general decline from 2002 forward (Figure 2). Further, recreational landings have increased over the latter portion of the time series that may increase potential overfishing issues in the next assessment. The Council proposed cobia be included in the 2019 SEDAR schedule for a research track assessment which will give guidance on the appropriate data and models to be used in the 2020 stock assessment.

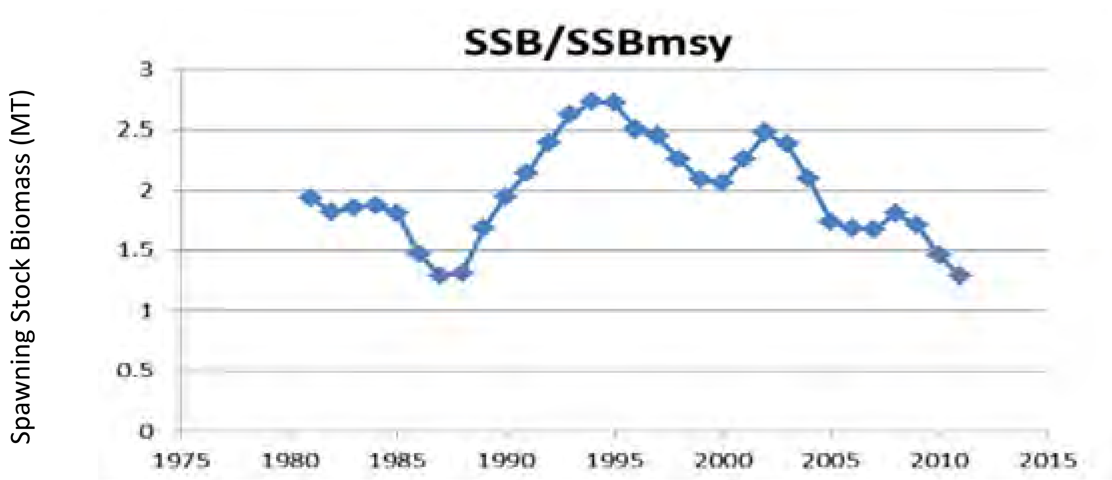


Figure 2. Cobia spawning stock biomass relative to the MSY biomass reference for 1981-2011.

Data collection programs vary by state and will be further described in the upcoming draft FMP. However, research efforts at the state level are confounded by the observation that cobia only occur in specific state jurisdictions in aggregations for a brief period each year and often in locations conflicting with the peak of recreational fishing. Directed sampling efforts are difficult outside of the primary recreational season that extends from April through August, because fish are migrating from spawning locations and not found in large concentrations.

DESCRIPITON OF THE FISHERY

Recreational Fishery

Cobia supports a valuable recreational fishery throughout the South Atlantic and into the Mid-Atlantic region. Known for their readiness to take a bait, tough fighting abilities and excellent table fare, the fishery is popular in the recreational sector. Recreational landings data are generated through the Marine Recreational Information Program (MRIP) for state and federal waters. Current information indicates a variable proportion of landings come from state waters and can range from 0 to 100% (Table 2). The 10 year average, annual percentage of cobia taken in state waters with and without east coast Florida included are 66% and 51% respectively (Tables 3 and 4).

Recreational fisheries are prosecuted similarly along the coast. The directed cobia fishery is prosecuted in two distinct ways. Bottom fishing with live or dead baits, often while chumming, in estuarine waters or around inlets or offshore around structure, buoys, markers, natural and artificial reefs. More recently, an active method of searching for fish traveling alone or in small groups on the surface or associated with schools of Atlantic menhaden or other bait fishes has grown in popularity. This newer method has resulted in the further development of the for-hire sector for cobia, as well as the development of specific artificial baits and boat modifications (e.g., towers) to facilitate spotting and catching the fish. A third method primarily prosecuted in offshore waters is to target large rays, large sharks, sea turtles or floating debris around which cobia congregate. This more active method likely confounds reported landings being in state or nearshore federal waters as vessels tend to move in and out of state and federal waters following the bait or the fish. Additionally, the Atlantic coast of Florida is starting to see more directed spearfishing pressure on cobia. Specifically, spearfishers are chumming for bull shark and then diving/free-diving to spear cobia that associate with them. Spearfishing also occurs off North Carolina, along with a popular pier fishery.

The recreational fishery also takes cobia as bycatch in offshore bottom fisheries such as snapper/grouper, nearshore trolling for king mackerel, bluefish, and dolphin and any other fishery that employs live or dead bait fished on or near the bottom. While the directed fishery appears to focus more on the spring-summer spawning migration, bycatch, especially offshore, can yield cobia virtually year-round.

Recreational landings for cobia have varied with little trend since 2005; landings did hit a time series high in 2015 resulting in a significant overage of the federal ACL (Figure 3). Since 2005, the highest landings have occurred in the east coast of Florida, North Carolina and Virginia. The three year average landings (2103-2015) in the east coast of Florida, North Carolina and Virginia were approximately 446,218, 466,944 and 429,179 pounds, respectively. In 2015, the three states with the highest recreational landings were Virginia (718,647 pounds), North Carolina (630,373 pounds) and Florida (east coast) (481,956 pounds) (Table 4).

Table 2. Percentage of cobia in the recreational fishery harvested in state waters (zero implies all were harvested from federal waters). All data are final MRIP estimates, which may differ from SEFSC estimates.

	Florida	Georgia	South Carolina	North Carolina	Virginia
2006	22	0	98	30	100
2007	9	0	0	47	100
2008	14	0	0	50	100
2009	53	0	0	58	100
2010	59	39	41	75	94
2011	33	0	0	90	50
2012	21	80	0	49	42
2013	9	0	61	79	83
2014	17	0	52	82	100
2015	13	0	6	92	97

Table 3. 10-year average percentage of cobia harvested in state waters with and without east coast Florida. All data are final MRIP estimates, which may differ from SEFSC estimates.

	Percent of Cobia Harvested in State Waters GA-NY	Percent of Cobia Harvested in State Waters FL-NY
2006	87	68
2007	52	34
2008	29	22
2009	80	71
2010	75	68
2011	56	40
2012	34	28
2013	77	59
2014	83	47
2015	85	71

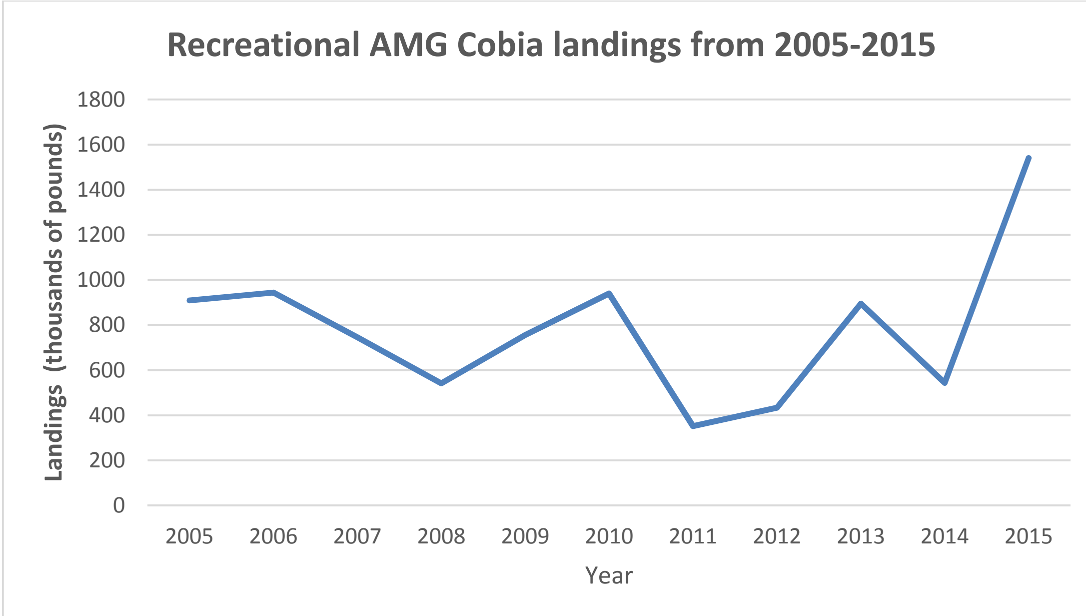


Figure 3. Recreational landings of AMG cobia (2005-2015)

Commercial Fishery

The commercial fishery has traditionally been a bycatch in other directed fisheries such as the snapper/grouper hook and line fishery and troll fisheries for various species (e.g., king mackerel, dolphin, wahoo, amberjack). Directed fisheries are generally precluded as a result of the low possession limits, but do occur, specifically Virginia's commercial hook and line fishery. Cobia from for-hire trips may also be sold commercially, depending on the state's permit requirements for selling fish.

Commercial harvest has been increasing in North Carolina since 2011 and in the Mid-Atlantic since 2012 (Figure 4). Commercial harvest has remained stable in Georgia and South Carolina since 2010. Commercial cobia landings on the east coast of Florida ranged from 57,003 to 156,069 pounds (avg. = 88,278 pounds) during the 2007-2011 time series. Commercial landings in Georgia and South Carolina were low and values for the two states were combined from 2010-2015 to avoid confidentiality issues and averaged 3,867 pounds per year(Table 5).

The commercial cobia fishery closed December 11, 2014. The 2015 overages would have been deducted if the stock were overfished; however, given they are not overfished, the commercial quota for 2016 remains 50,000 pounds (Figure 4). In 2015, North Carolina landings (52,684 pounds) accounted for nearly the entire commercial quota and would have exceeded the 2016 quota (Table 5). Commercial landings for the Mid-Atlantic region (Virginia, Maryland, New Jersey, New York,) and Rhode Island are combined in Table 6 to avoid confidentiality issues in several Mid-Atlantic states. The majority of the Mid-Atlantic landings come for Virginia. The average landings from 2010-2015 were 14,732 pounds per year.

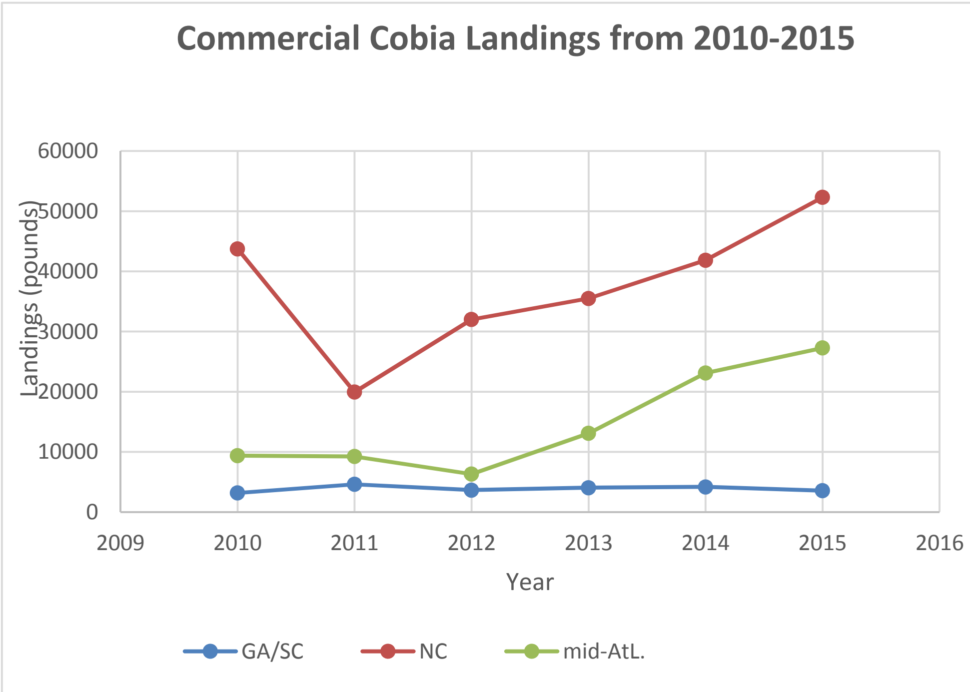


Figure 4. Commercial landings of cobia (2010-2015)

Table 4. Recreational landings of AMG cobia from 2005-2015 in pounds. Data sources: SEFSC

Year	Virginia	North Carolina	South Carolina	Georgia	Total AMG (VA-GA)	East Coast of Florida
2005	577,284	322,272	5,793	3,358	908,707	287,267
2006	733,740	104,259	101,018	4,824	943,841	493,334
2007	322,887	90,197	268,677	64,708	746,469	580,632
2008	167,949	66,258	50,108	257,690	542,006	438,621
2009	552,995	123,061	76,229	3,997	756,282	361,120
2010	232,987	561,486	65,688	79,855	940,015	745,228
2011	136,85u9	121,689	3,565	90,375	352,488	761,440
2012	36,409	68,657	224,365	105,193	434,623	370,373
2013	354,463	492,969	19,130	29,224	895,786	274,276
2014	214,427	277,489	31,927	20,642	544,485	582,423
2015	718,647	630,373	123,952	67,804	1,565,186	481,956

* There are no MRIP-estimated recreational landings of AMG cobia in states north of Virginia.

Table 5. Commercial cobia landings (pounds) and revenues (2014 dollars) by state/area, 2010-2015.

Year	GA/SC	NC	Mid-Atlantic*	Total
		Commercial Landing in Pounds		
2010	3,174	43,737	9,364	56,275
2011	4,610	19,950	9,233	33,793
2012	3,642	32,008	6,309	41,959
2013	4,041	35,496	13,095	52,632
2014	4,180	41,848	23,111	69,139
2015	3,555	52,315	27,277	71,790
Average	3,867	37,559	14,732	56,158
		Dockside Revenues (2014 dollars)		
2010	$11,377	$70,377	$19,976	$101,730
2011	$19,666	$37,893	$21,666	$79,224
2012	$15,554	$66,887	$14,597	$97,038
2013	$15,639	$79,397	$35,792	$130,828
2014	$13,320	$95,462	$67,972	$176,754
2015	$11,151	$147,160	$75,360	$233,672
Average	$14,451	$82,863	$39,227	$136,541

Georgia and South Carolina landings are combined to avoid confidentiality issues.
Source: SEFSC Commercial ACL Dataset (December 2015) for 2010-2014 data; D. Gloeckner (pers. comm., 2016) for 2015 data.
*Mid-Atlantic States include Virginia, Maryland, New York, New Jersey.

WHAT IS THE PROCESS FOR DEVELOPING A FMP?

The publication of this document and announcement of the Commission's intent to develop a Cobia FMP is the formal, first step of the FMP development process. Following the initial phase of information gathering and public comment, the Commission will evaluate potential management alternatives and the impacts of those alternatives. The Commission will then develop a draft FMP, incorporating the identified management alternatives, for public review. Following the review and public comment, the Commission will specify the management measures to be included in the FMP, as well as a timeline for implementation.

The timeline for completion of the FMP is as follows:

	Oct 2016	Nov 2016 – Jan 2017	Feb 2017	Mar – May 2017	May 2017	May – Aug 2017	Aug 2017
Approval of Draft PID by Board ***Current Step***	**X**						
Public review and comment on PID		**X**					
Board review of public comment; Board direction on what to include in the Draft FMP			**X**				
Preparation of the Draft FMP				**X**			
Review and approval of Draft FMP by Board for public comment					**X**		
Public review and comment on Draft FMP						**X**	
Board review of public comment on Draft FMP							**X**
Review and approval of the final FMP by the Board, Policy Board and Commission							**X**

WHAT IS THE PURPOSE OF THIS DOCUMENT?

The purpose of this document is to inform the public of the Commission's intent to gather information concerning the cobia fisheries, develop management measures to assist the SAFMC in maintaining harvest levels within the prescribed ACL, and provide management flexibility to the states to minimize the impact of potential closures. The PID provides an opportunity for the public to identify and/or comment on issues and alternatives relative to the management of cobia. Input received at the start of the FMP development process can have a major influence on the final outcome of the FMP. This document is intended to draw out observations and suggestions from fishermen, the public, and other interested parties, as well as any supporting documentation and additional data sources.

To facilitate public input, this document provides an overview of issues identified for consideration in the FMP, as well as background information on the cobia stock, fisheries and management. The underlying question for public comment is: **"How would you like the cobia fishery and population to look in the future?"**

The Commission is looking for both general comments on cobia management in state waters and any comments specific to the issues listed in this document.

WHAT ISSUES WILL BE ADDRESSED?

The primary issues considered in the PID are:

- Complementary Management with the SAFMC
- Management Objectives
- Coastwide, Regional or State-by-State Approach to Management
- Commercial and Recreational Management Tools

ISSUE 1: COMPLEMENTARY MANAGEMENT WITH THE COUNICL

Background: The SAFMC manages cobia through the CMP FMP with consistent bag, trip and size limits in federal waters. A recent ACL has been employed to protect the resource and minimize the possibility of cobia being subjected to overfishing or becoming overfished. Complementary management of cobia is intended to increase flexibility and management reaction time, while providing states the ability to more actively and adequately manage the fishery in their respective states. It is anticipated Commission would adopt the ACLs and biological reference points established by the benchmark cobia stock assessment developed by the SAFMC.

States have historically mirrored the SAFMC's size and bag limit regulations in state waters. The recreational closure in 2015 resulted in Virginia and North Carolina modifying their regulations in order to reduce the impacts of the June 20, 2016 federal closure. South Carolina has developed various, additional regulations based on area-specific genetic work and concern over the condition of a DPS that occurs in its southern waters.

Management Questions:

- Should the Commission develop a complementary Cobia FMP to the SAFMC's CMP FMP?
- What federal management measures should be required in the Commission plan?
- What states should be included in the management unit?
- Given the upcoming genetic workshop in 2017, should the FMP provide the flexibility to make changes to management and stock units to reflect changes in the science?

ISSUE 2: MANAGEMENT OBJECTIVES AND GOALS

- **Background:** The first step in proactive fisheries management is to decide what is meant by optimizing the benefits for a fishery. Goals and objectives can be divided into four subsets: biological, ecological, economic, and social, where social includes political and cultural goals. The biological and ecological goals can be thought of as constraints in achieving desired economic and social benefits. Examples of goals under each of these categories include:

- Maintain the target species at or above the levels necessary to ensure their continued productivity (biological);
- Minimize the impacts of fishing on the physical environment and on non-target (bycatch), associated and dependent species (ecological);
- Maximize the net incomes of the participating fishers (economic); and
- Maximize employment opportunities for those dependent on the fishery for their livelihoods (social).

Identifying such goals is important in clarifying how the fish resources are to be used. Without such goals, there is no guidance on how the fishery should operate, which results in a high probability of ad hoc decisions and poor use of the resources (resulting in lost benefits), and increases the probability of conflicts among user groups.

The Commission could consider the following management objectives for the Cobia FMP and is soliciting other ideas or options that could be raised.

A. Provide a management plan that achieves the long-term sustainability of the resource and strives, to the extent practicable, to implement and maintain consistent coastwide measures, while allowing the states the flexibility to implement alternative strategies to accomplish the objectives of the FMP
B. Provide for sustainable recreational and commercial fisheries.
C. Maximize cost effectiveness of current information gathering and prioritize state obligations in order to minimize costs of monitoring and management.
D. Adopt a long-term management regime which minimizes or eliminates the need to make annual changes or modifications to management measures.

Management Questions
What should be the objectives in managing the cobia fisheries through the Commission?

ISSUE 3: COASTWIDE, REGIONAL OR STATE-BY-STATE MANAGEMENT

Background: States currently manage their cobia fisheries independently. The Commission is considering coordinating the management of cobia in order to avoid states being disadvantaged based on where they occur along the migratory route, while maintaining harvest at the SAFMC's ACL level.

States have been disadvantaged by geography in the past when they occur on the northern or southern end of a migratory range, often resulting in early closures or no fishery at all. While consistent, coastwide measures may be desirable, they may result in disproportionate impacts to certain states.

More flexibility to individual states may be available through state-by-state allocations of the cobia ACLs. Allocations can allow limits and seasons to be imposed that maximize the individual state fishery needs, and reduce the impact of other state overages.

Management Questions:

- Are consistent, state-specific management measures, coordinated by the Commission, needed for cobia?
- Are there regional differences in the fishery and/or resource that need to be considered when implementing management measures?
- Should the FMP require a coastwide closure if the SAFMC ACL is met?
- Should the FMP require a coastwide measures (e.g., size and bag limit)?
- Should the FMP require regional measures?
- Should the FMP develop a suite of options for the allocation of state-specific quotas, and allow states to adopt unique size, bag, and season measures?

ISSUE 4: COMMERCIAL AND RECRATIONAL MANAGEMENT TOOLS

Background: The Commission could consider different management approaches for the commercial and recreational cobia fishery. Currently, the commercial fishery is managed consistently throughout state and federal jurisdictions, while recreational management measures vary (Table 1).

Potential management tools include: minimum size restrictions, maximum size restrictions, bag/trip/boat limits, seasons or gear restrictions.

Management Options:

- What are the appropriate commercial and recreational measures for cobia?
- Should the FMP consider gear restrictions, e.g. circle hooks for all live and dead bait fisheries for cobia or prohibition on gaffing cobia?
- Are there other management options that should be considered (e.g., slot limits, spawning season closures, etc.)?
- Should the FMP consider some level of *de Minimis* or threshold landings where cobia harvest is minimal or episodic?

ISSUE 5: OTHER ISSUES

The public is asked to comment on any other issues for consideration in the development of the Commission’s Draft Fishery Management Plan for Cobia.

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: **South Atlantic Management Board**

FROM: **Red Drum Technical Committee and Stock Assessment Subcommittee**

DATE: **10/11/2016**

SUBJECT: **TC/SAS Response to Board Tasks for Benchmark Assessment of Red Drum**

This document contains responses of the Red Drum Technical Committee (TC) and Stock Assessment Subcommittee (SAS) to tasks given them by the South Atlantic Management Board (Board) after the 2016 Red Drum Benchmark Stock Assessment was presented to the Board. A summary of the TC/SAS's conclusions and recommendations regarding these tasks is shown below, followed by four reports providing detailed responses to each of the tasks given by the Board.

Summary of Conclusions

After reviewing all the work done for each of the tasks assigned by the Board, the TC and SAS discussed recommendations moving forward. The TC and SAS recommend against using a juvenile fishing mortality reference point for management. This type of reference point ignores fishing mortality on mature fish which has increased over time as catch and release has become more prevalent, leading to potential adverse effects on the productivity of the stocks. There is also no guidance or support for an appropriate overfished reference point to ensure sustainability. The TC and SAS conclude spawning potential ratios, including the current target (30%) and threshold (40%), are appropriate metrics for red drum management. These management goals are supported by literature reviewed by the TC and SAS, particularly in the absence of better information on the stock-recruit relationship.

The TC and SAS agree age-structured modeling approaches are appropriate and preferred, given red drum life history and the available data. However, there are data gaps that limit the complexity of these modeling approaches. The TC and SAS agree the estimates from the statistical catch-at-age (SCAA) models are more realistic than the estimates from the Stock Synthesis 3 (SS3) models. Given both approaches passed peer review, but the SCAA models provide estimates that better match expert opinion, the TC and SAS recommend using the spawning potential ratio (SPR) estimates from the SCAA models for management. The SS3 framework still provides potential for improvements over the SCAA in future assessments, if certain data gaps are addressed, therefore the TC and SAS recommend to continue working on the SS3 model in the future. Addressing these data gaps may allow for the inclusion of the tag-recapture data, but the TC and SAS recommend these data not be included in the SS3 model for the northern stock until some observed data conflicts are addressed. The biomass estimates from the SCAA models are not reliable and should not be used to determine overfished status. The TC and SAS recommend in the absence of reliable biomass estimates and overfished status, a reference point for relative recruitment should complement SPR estimates. SPR is a per-recruit measure that does not account for changes in absolute abundance. Therefore, a stock being fished above the target SPR could still experience declining abundance and biomass if recruitment declines. The TC and SAS are developing a recruitment stop light indicator to address the limitation of solely using a SPR reference point to manage red drum.

Biological Reference Points

Board Task: Investigate whether the current biological reference point for overfishing (SPR40% target, SPR30% threshold) is appropriate given the species' long life history. This task is two-fold in that the Board is interested in whether spawning potential ratio is an appropriate metric and whether the 30% threshold and 40% target are suitable goals. The Board also requests the development for an overfished reference point recommendation.

The South Atlantic Board requested information regarding spawning potential ratio (SPR), specifically its basis for usage in stock assessment, whether it is appropriate as a overfishing reference point for red drum, and if the current target and threshold are appropriate. The usage of SPR spread from New England fisheries in the early 1990s and, as a result, much of the early work regarding "spawner productivity" was based on groundfish life history strategies and other northwest Atlantic fisheries (Clark, 1991; Clark, 1993). The stock assessment subcommittee (SAS) believes SPR is the most appropriate type of reference point to use for overfishing for red drum. Calculation of SPR does not require constant recruitment, and it tracks 1-to-1 with fishing mortality. Also, unlike fishing-mortality-based reference points such as $F_{0.1}$ and F_{MAX}, it does not become a "moving target" when there are changes in size structure due to changes in fishing regulations. Because red drum has undergone considerable regulation changes in the past, calculation of $F_{0.1}$ or F_{MAX} would be complicated.

Early simulations conducted in the 1990s suggested that fishing at a level that produced SPR levels between 35-45% provides a high percentage of maximum sustainable yield, especially if there is uncertainty in the stock-recruitment relationship (Clark, 1993). Later work in the early 2000s suggested this SPR would need to be higher for less resilient and/or data-poor stocks but could be lower for resilient and/or data-rich stocks (Clark, 2002). Because red drum has an uncertain stock-recruitment relationship but is considered resilient because of its large number of spawning age classes, the SAS recommends staying with the current 40% SPR target and 30% SPR threshold.

The SAS recommends against the development and usage of an overfished reference point for red drum at this time. Overfished reference points often take the form of a spawning stock biomass estimate and the difficulties of reliably estimating spawning stock biomass in SEDAR 18 have persisted in this assessment, as well. This might suggest a data deficiency in the adult stage of red drum. Currently, the longline surveys in South Carolina, Georgia, and North Carolina are the main indices used to inform adult abundance and age structure in the southern and northern regions. The North Carolina longline survey is relatively new (2007), so it is possible that the issue will be mitigated in the northern region as the time series grows in length. A common solution for setting the overfished target and threshold would be to set them at the biomasses that correspond to the SPR target and threshold. However, the validity of these values as reference points depends on having a well-defined stock-recruitment relationship (Goodyear, 1993); otherwise, SPR is not inherently tied to stock biomass. There is likely not a well-defined stock-recruitment relationship for red drum, especially in the northern region where recruitment may be heavily influenced by environmental factors rather than spawning stock biomass.

The SAS is currently designing a juvenile/recruitment-based traffic light analysis to be employed for red drum. It will include juvenile abundance indices as well as age-1 and age-2 surveys from Florida, Georgia, and South Carolina to assess the southern region and North Carolina to assess the northern region. While it is not ready to be implemented alongside the proposed stock assessment, one of the goals is for it to be used in conjunction with assessment results. For this assessment, SPR is the only reference point being proposed, but SPR is not a true indicator of population size, so this analysis could at least provide much-needed information on the productivity of the stocks. The other goal would be to use this traffic light approach in between assessment years—similar to the exercise used for Atlantic croaker—which could inform the Board whether an assessment of red drum can be put on hold or if there is an urgent need to update it. Because of its longer life span relative to croaker, the SAS has considered a requirement based on four years of traffic light indicators. This may help avoid premature action as a few bad years of recruitment do not appear to impact the stock considerably.

See Appendix I for a list of papers and summaries which provide more detailed information on reference points and analysis techniques.

References

Clark, W. G. 1991. Groundfish exploitation rates based on life history parameters. Canadian Journal of Fisheries and Aquatic Sciences 48: 734-750.

Clark, W. G. 1993. The effect of recruitment variability on the choice of a target level of spawning biomass per recruit. Management of Exploited Fish, Alaska Sea Grant: 233-246.

Clark, W. G. 2002. $F_{35\%}$ revisited ten years later. North American Journal of Fisheries Management 22: 251-257.

Goodyear, C. P. 1993. Spawning stock biomass per recruit in fisheries management: foundation and current use. P. 67-81. In SJ Smith, JJ Hunt, and D Rivard [ed.] Risk evaluation and biological reference points for fisheries management. Canadian Special Publications of Fisheries and Aquatic Sciences 120.

Appendix I

Summaries of relevant literature on SPR and other biological reference points.

Bacheler, N. M., L. M. Paramore, J. A. Buckel, and F. S. Scharf. 2008. Recruitment of juvenile red drum in North Carolina: Spatiotemporal patterns of year-class strength and validation of a seine survey. North American Journal of Fisheries Management 28: 1086-1098.

- North Carolina's juvenile abundance index (JAI) seine survey estimated dome-shaped age-0 CPUE at its 21 sites over the course of each sampling period (September-November). This suggests the survey was capturing peak abundance levels.
- Temperature and salinity only explained 8.1% of the variation in abundance in a GAM framework (spawning stock biomass, predation might be other factors).

- The loss rates of age-0 red drum (from peak time to emigration in November) were not density-dependent, as late-November CPUE did not reach an asymptote at higher peak CPUE values. Also, the loss rates were not correlated with age-0 CPUE.
- Commercial catch of age-2 red drum two years later were correlated with the age-0 abundance index. When the outlier of 1996 was removed from JAI numbers (hurricane), recreational catch of age-2 was also correlated with the age-0 abundance index. *Could these JAI values serve as a proxy for age-2 abundance (and later) and vice versa?* "Thus, the JAI survey appears to provide a robust index of age-0 abundance and should be useful as a valid tuning index for red drum stock assessments in North Carolina." *Could it be used to tune Virginia as well?* "…red drum CPUE was correlated at a large, intrastate scale of tens to hundreds of kilometers but not at a much larger spatial scale."

Clark, W. G. 1991. Groundfish exploitation rates based on life history parameters. Canadian Journal of Fisheries and Aquatic Sciences 48: 734-750.

- Fixed exploitation rates (unless biomass gets below a threshold) can maintain SSB, except it is hard to decide on rates or biomass threshold without knowing the stock-recruit relationship. It is also not equipped to deal with stocks that are "subject to large natural variations in equilibrium abundance." The author uses examples of Alaskan groundfish stocks seeing 5- to 10-fold changes in abundance in 20 years. *Does red drum experience this, or just wild fluctuations in recruitment? Probably not with its many spawning age classes.*
- "It is clear that even if unfished spawning biomass were known only very roughly, say with a precision of the half-to-double variety, one could still be reasonably sure of getting something close to MSY simply by holding the spawning biomass in vicinity of 35-40% of the estimated unfished level." This strategy also requires a consistent equilibrium abundance. *Only problem with this is that for red drum we aren't estimating biomass, SPR is based on F. (From Genine Lipkey's notes) Could we get anything "accurate" enough?*
- The "maximin yield," defined as the maximum of the minimum yields at each level of spawning biomass per recruit (or at each rate of fishing mortality), is close to $F_{0.1}$ for typical marine demersal fisheries—which is also close to M. Depending on which particular stock-recruit relationship a fishery is dictated by, any one of the rates chosen (F_{mmy}, $F_{0.1}$, F_M) would give 75-90% of MSY or more. The danger is that this F_{mmy} is very sensitive to M, so if the estimate of M is off, so too will F_{mmy} be. It is also not robust to uncertainty in the stock-recruitment relationship. Still, it may be safer than a biomass-based approach when there is high variability in equilibrium abundance.
- When recruitment is delayed (i.e., mature more before fishing mortality), F_{mmy} can be much higher than both $F_{0.1}$ and F_M. The opposite is true when maturity is delayed (i.e., recruit to fishery before spawning). *If anything, red drum may recruit slightly before becoming fully mature (recruit at ~age 2, not quite 100% are mature at age 2).*

Clark, W. G. 1993. The effect of recruitment variability on the choice of a target level of spawning biomass per recruit. Management of Exploited Fish, Alaska Sea Grant: 233-246.

- Goal was to see if ideal spawning biomass per recruit was different from $F_{35\%}$ if random recruitment variability was included, and what level would result in stable year-to-year yield and minimal instances of low biomass.
- Recruitment can range from totally independent year-to-year to serially correlated (run of good years followed by run of bad years). With purely random variation, the deterministic F_{MSY} can be fully achieved, and a large percentage of MSY can be taken without putting spawning biomass per recruit below 35% of the unfished value (deterministic optimum 36%, stochastic 38%, achieves 75% of MSY). With serially correlated variation, the best is 90% of deterministic F_{MSY} achieved; optimal level of spawning biomass per recruit is about 42%, with that F getting only 60% of deterministic MSY.
- Yield is also highly variable with random recruitment variation, and very highly variable with serially correlated variation.
- The number of times spawning biomass falls below 20% unfished levels is greatest with serial correlation (most spawner-recruit curves and any F between $F_{35\%}$ and $F_{45\%}$. If variation is uncorrelated, $F_{40\%}$ prevents this except for one of the SR curves considered. This happens for about half the curves at F35%, which shows that small discrepancies can lead to large management implications depending on how these discrepancies fall in relation to reference points.
- Keeping the spawning biomass per recruit between 35% and 45% is a safe bet, especially if the SRR is largely unknown.

Clark, W. G. 2002. $F_{35\%}$ revisited ten years later. North American Journal of Fisheries Management 22: 251-257.

- D is the density-dependent multiple by which spawner productivity at low stock sizes exceeds that at the unfished level; a measure of resilience. If this is less than 8, then F_{MSY} will generally be less than $F_{40\%}$, and the $F_{40\%}$ rule of thumb could deplete the stock. If not enough SR data are available to determine D, you could choose a range and set target SPR/Fs accordingly.
- If unsure of the stock's resilience (i.e., could be very low), even fishing at $F_{40\%}$ could lead to trouble; $F_{70\%}$ is safer, even though it gets only a fraction (about half) of MSY. Pacific Ocean perch is the example for this study.
    - Biomass-based strategies, however, are robust to different levels of resilience, with B/B_0 = 0.4 being safe across the board.
    - At lower levels of D, $F_{40\%}$ could lead to B/B_0 = 0.20-0.30. $B_{40\%}$ (B at $F_{40\%}$) is always less than B/B_0=0.4, but $B_{50\%}$ or $B_{60\%}$ gets above B/B_0=0.4.
    - *Why isn't there agreement between F and B/B_0 in terms of Yield/MSY?*

Gabriel, W. L., P. M. Mace. 1999. A review of biological reference points in the context of the precautionary approach. Proceedings, 5th NMFS NSAW. NOAA Technical Memom. NMFS-F/SPO-40.

- Proxies can be used in situations where they are easier to calculate, require fewer data, or are more robust than traditional reference points.

- Some proxies for B_{MSY} are equilibrium biomass corresponding to F reference points (e.g., $F_{30\%}$, F_{MAX}, $F_{0.1}$), some percentage of unfished biomass (e.g., 30% for data-rich or resilient stocks, 60% for data-poor or sensitive stocks), and mean recruitment multiplied by SPR(F_{MSY}) or 30-60% $SPR_{F=0}$.

- If F_{MSY} cannot be reliably estimated, authors suggest a proxy of $_{F30\%SPR}$-$F_{40\%SPR}$. $F_{0.1}$ might be preferable after that, more so than M, F_{MAX}, or F_{MED}. Biomass according to these proxies are suggested (in that same order).

Gibson, AJF, RA Myers. 2004. Estimating reference fishing mortality rates from noisy spawner-recruit data. Canadian Journal of Fisheries and Aquatic Sciences 61: 1771-1783.

- Researchers estimate MLE of F_{msy} using a production model made up of a BH stock-recruit curve, an SPR model, and a YPR model; does not provide clear parameter combinations in the stock-recruit curve
- SPR model gives "the rate at which recruits produce spawners as a function of fishing mortality."
- Can also estimate reference F values with the mode of the marginal PDF for alpha (F_{marg}, alpha = slope at origin of SR curve) and the F that maximizes the expectation of the catch ($F_{maxE[Y]}$).
- $F_{maxE[Y]}$ can be estimated without stock-recruit data, if you assume all values for SR parameters within some range are equally probable (estimates will be sensitive to assumed range).
- Monte Carlo simulation (assuming constant R_0): The MLE of F_{msy} is the least biased estimator, but most variable in its estimation. At higher levels of alpha and sigma, $F_{maxE[Y]}$ was least variable. $F_{maxE[Y]}$ and F_{marg} did not highly overexploit populations in the simulation, but MLE of F_{msy} did 25% of the time (extinction 13.4%). $F_{maxE[Y]}$ gave the highest yields on average (especially in cases of high recruitment variability), with F_{marg} maintaining the highest spawner biomass. *Would the $F_{maxE[Y]}$ method provide utility for F reference point for red drum?*
- By taking random effects distributions and transforming them (see paper p. 1779), one can get priors with information about distribution of SR parameters "at the species level obtained by analyzing data from other alewife populations." *Perhaps we could use prior information from the GoM (or the other region on Atlantic coast) to adjust $F_{maxE[Y]}$.*
- Researchers suggest maximizing expected yield while including information from other populations. However, if the data used have a small spawner biomass range, the $F_{maxE[Y]}$ method could overestimate compared to the true F_{msy}; this is why it's important to compare to parameters from similar populations, if possible. Also, this method is most appropriate for a fishery focused on fish that are fully grown prior to recruitment. *Can we say this for red drum? Probably not. More importantly, the difference between alewife and red drum is one only lives to five or so and one lives to fifty. Alewife are at risk for extinction because two bad years of recruitment could eliminate the spawning stock, which is not the case for red drum.*

Goodyear, C. P. 1993. Spawning stock biomass per recruit in fisheries management: Foundation and current use. P. 67-81. In SJ Smith, JJ Hunt, and D Rivard [ed.] Risk evaluation and biological reference points for fisheries management. Canadian Special Publications of Fisheries and Aquatic Sciences 120.

- SPR is not directly tied to population size, it depends on the density-dependent effect of the population growth (slope of the stock-recruit curve near the origin). So, you need a well-defined stock-recruit relationship to derive SSB from SPR.
- There are three common ways to set the critical minimum for SPR (i.e., threshold): noting the point at which compensation required “jumps” (often 20-30%); comparing to stocks that have declined at certain SPRs (if cases exist for related species); setting the value based on stock-recruitment relationships in the literature.
- SPR has advantages and disadvantages relative to other biological reference points:
    - Values like $F_{0.1}$ and F_{MAX} are based on the distribution of F among the age classes of a population, so these values are “moving targets” if the size structure is fished down, or if regulations change. Nor does $F_{0.1}$ consider the spawning stock size directly. It can also change if selectivity changes (especially if age distribution of harvest is affected).
    - Managing for a spawning stock biomass that maximizes average recruitment is preferred over SPR, but data needs are often too high.
    - SPR behaves similarly to fixed harvest and fixed escapement strategies, except that it is defined more in terms of conservation (instead of F or its associated yield). This benefit is most pronounced when there are competing sectors in the fishery, because each can be given an allowable reduction in SPR. However, this is not really the case for red drum.
- The commonly employed 20-30% range of SPR comes from experience in the NW Atlantic fisheries.

Halliday, R. G., L. P. Fanning, and R. K. Mohn. 2001. Use of the traffic light method in fishery management planning. Research Document, Marine Fish Division, Science Branch, Scotia-Fundy Region, Department of Fisheries and Oceans: 41 pp.

- If using the precautionary approach, the yellow/red boundary should be the limit reference point, while the green/yellow boundary should be a buffer between good conditions (green) and those that are close to unacceptable conditions (yellow).
    - The green/yellow boundary should not be set at some “target” (see p. 11).
- Setting the green/yellow boundary at the mean of a data series and the yellow/red at 60% of the mean is appropriate when the series is long enough to illustrate long-term behavior (*i.e.*, includes highs and lows).
    - In this case, the boundaries can be set at the 33^{rd} and 66^{th} percentiles, as the mean and 60% settings are a statistical rule that assume the data span the full range of the attribute.

Mace, P. M. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. Canadian Journal of Fisheries and Aquatic Sciences 51: 110-122.

- Reference points devised in deterministic conditions can be adapted for stochastic systems by employing control laws that act based on the frequency at which a threshold is breached.
- *Tau* is a measure of compensation at low stock sizes (e.g., 0.05 implies twenty times higher survival than at virgin stock size). For Beverton-Holt, *tau* strongly impacts the SRR, being almost linear at high values (low compensation) but having flat recruitment down until about 20% B_0 at lower values. In other words, as *tau* increases, F_{MSY} and F_{tau} (F with equilibrium biomass being zero) decrease (but increase with M and K).
  - $F_{0.1}$, F_{MAX}, $F_{20\%}$, and $F_{35\%}$ are not influenced by tau, but increase with M and K.
- B_{MSY} never fell below 20% B_0 (but got close for M = K = 0.2 and *tau* = 0.05).
- For Ricker configurations, F reference points behaved similarly, except for F_{MSY}, which was higher than in the Beverton-Holt runs (e.g., at most, twice as high at *tau* = 0.05).
- B_{MSY}/B_0 was less sensitive to tau than with B-H, but all other ratios were more sensitive.
- Setting biomass at a fixed value of B_0 can be dangerous as the fixed Fs become less sustainable as age of recruitment is reduced or compensation decreases.
  - Setting the biomass reference point at a fixed percentage of R_{MAX} or at 100**tau** (tau as a percentage) can incorporate the degree of compensation, with the latter working best if you don't know the SRR. These would work as control laws, too.
  - Unfortunately, tau is difficult to estimate without good contrast in stock size data. Using the survival ratio of R/S may not be reliable as a proxy.
  - Most of the time, *tau* appears to fall somewhere between 0.05 and 0.35, and 0.20 is probably appropriate for stocks of average or above-average resilience. If this is true, $F_{35\%}$ exceeds F_{MSY}, so $F_{40\%}$ is more appropriate (which Clark (1993) found, except based on recruitment variability). Then, F will stay away from F_{tau} (extinction) unless *tau* > 0.40.

Report from Gulf of Mexico SPR Management Strategy Committee (1996). Rationale for choosing SPR for Gulf of Mexico fisheries.

- Static SPR—amount of spawning with constant F (selectivity and reference F) over a lifespan relative to spawning without fishing
  - Does not require constant recruitment, but does require constant growth rates and mortality and maturity schedules. Assumes stable age structure
  - Maps 1:1 with F, which is why it's used to measure overfishing
- Transitional SPR—spawning per recruit in year t relative to spawning per recruit in year t if there had been no fishing on the cohorts in year *t*
  - Conceptually, like static SPR, except with a running average of fishing mortalities; because of this inclusion of past damage, inherently lends itself to being used as a recovery target
  - Used to measure whether a stock is overfishED, which is the distortion of age structure from fishing; however, does not measure depletion, which is low biomass that could result from fishing or natural causes
  - Transitional SPR cannot be expected to correlate with biomass, just age structure

  - Requires you to have at least as many years of recruitment data as age classes for the fish; also expanding age classes past maximum age
  - Sensitive to changes in exploitation patterns (*e.g.*, gear, regulations); not as sensitive to uncertainty in M

Williams, E. H., and K. W. Shertzer. 2003. Implications of life-history invariants for biological reference points used in fishery management. Canadian Journal of Fisheries and Aquatic Sciences 60: 710-720.

- The use of life-history invariants (relationships between K, M, and a_{mat}) allows biological reference points (M-based, B-based, and SPR in this study) to be viewed as a function of the growth coefficient K and steepness.
- With knife-edge selectivity and maturity, the BRP is independent of K (only depends on steepness).
  - In general, all three BRPs depend on steepness, regardless of selectivity/maturity.
- Ratio of age at 50%-selectivity to age at 50% maturity: matters in M-based BRP, does not with B- or SPR-based BRPs.
- For Beverton-Holt scenarios, B-based and SPR BRPs have a strong relationship with each other (but neither with M-based BRP). This becomes a little less so with a Ricker curve and M/K ratio other than 1.65 (*which definitely exist*). SPR BRP is the most robust to deviations in M/K for both stock-recruit curves. The BRPs diverge from each other at higher steepness values, for both stock-recruit curves.
- The M-based BRP (e.g., F_{MAX} and $F_{0.1}$) should be used with caution, because they assume the stock-recruitment relationship is well-defined and the life history and steepness parameters are well estimated. Also, they ignore effects on SSB.
- Because the SPR BRP is almost independent of life history parameters, it is one of the best to use when life history data are limited. Steepness becomes paramount!

Use of a Sub-Adult F-based Reference Point for Red Drum Management

Board Task: Given concerns regarding the appropriateness of the current reference point and the lack of data on adult red drum, the Board would like to see an investigation of the feasibility of an F-based reference point that looks strictly at the harvest of juvenile red drum[1]. The Board looks for guidance on whether this type of reference point would provide an appropriate level of information for management.

Summary

The committee considered various advantages and disadvantages of using an F-based reference point that looks strictly at the harvest of juvenile (sub-adult) red drum.

Advantages include: (i) the existence of a close relationship between sub-adult mortality and spawning potential ratio (i.e. the current reference point), (ii) a sub-adult reference point will likely be estimated more precisely than SPR because it focuses on the most data-rich component of the stock, and (iii) sub-adult fishing mortality can be estimated, and thereby cross-validated, using a variety of methods.

There are, however, some serious disadvantages to focusing on just sub-adult fishing mortality. Disadvantages include: (i) no effective method of deriving a suitable reference point due to the lack of information about stock-recruitment relationships (this issue has been addressed previously with Gulf of Mexico red drum), (ii) stock depletion can occur under a scenario of increasing adult mortality, and (iii) stock depletion can occur under a scenario of declining recruitment and/or recruitment stochasticity.

The committee concluded that a reference point based solely on sub-adult fishing mortality could lead to stock depletion under realistic population scenarios, since declines in recruitment or spawning stock would not trigger management action. **Therefore, the committee <u>does not recommend</u> the use of a reference point based <u>strictly</u> on the harvest of sub-adult red drum**.

Issues considered by the committee

Potential advantages of using sub-adult fishing mortality as a reference point

i) <u>Close relationship between sub-adult F and SPR</u>: Since the majority of fishing mortality occurs on sub-adult red drum, there is a tight link between sub-adult fishing mortality and spawning potential ratio (SPR). This close relationship is evident from the results produced by the Stock Synthesis 3 (SS3) base runs, which show log-linear relationships between SPR and sub-adult red drum mortality ($\sum_{age\ 0}^{age\ 5} F_{age}$)[2] with $R^2 \approx 0.99$ (**Fig. 1**, top two panels).

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[1] In a conference call on 6/13/2016, Robert Boyles confirmed that the Board's interpretation of 'harvest' *does* include B2 (discard) mortality.

[2] In this document, we use Stock Synthesis 3 ageing notation. (i.e. Fish turn age 0 on their first Jan 1st of life at a biological age of ~4 months; they turn age 1 on their second Jan 1st of life at a biological age of ~16 months, etc.)

ii) Sub-adults are a data-rich component of the stock: An advantage of focusing on just the sub-adults is that they comprise the most data-rich part of the population. This should allow reference parameters to be determined with greater precision, and to be compared against the reference point with greater certainly, than when tracking reference parameters that incorporate data-poor components of the population (e.g. the adults).

iii) Availability of methods for cross-validation: Focusing on sub-adult mortality may allow reference points to be estimated (and cross-validated) by a variety of methods. For example, in addition to estimates produced by stock assessment models, sub-adult mortality may be estimated from fishery-independent survey data, or from stand-alone tag return models. The latter two methods may enable reference points to be tracked more frequently (e.g. annually) than stock assessment updates (~5 years). (Note, however, that state-run fishery-independent surveys and tagging programs operate over relatively small spatial scales when compared against the scale of the entire stock).

Potential disadvantages of using sub-adult fishing mortality as a reference point

i) Difficulties in deriving a suitable reference point: It is unclear how to derive a suitable sub-adult fishing mortality reference point. This issue was addressed previously with Gulf of Mexico red drum when the Florida Division of Fisheries Management was requested to examine relationships between spawning stock, recruitment, and escapement (i.e. sub-adult fishing mortality). They concluded that it is difficult to derive a suitable reference point due to poor information about stock-recruitment relationships (Murphy, pers. comm., 2016). The lack of good stock-recruitment information results in a variety of equally feasible scenarios that produce very different sustainable escapement rates (see **Fig. 2**).

ii) Ignoring fishing mortality on spawning adults: Although most of the red drum fishery targets the sub-adults, post-release (B2) mortality of discarded fish outside the harvestable size limits may also have an important effect on the sustainability of the stock. Discards are a significant source of red drum fishing mortality, but allocating discard mortality across red drum sizes is notoriously difficult because there are no surveys designed to collect B2 size information. Notwithstanding these difficulties, results from the SEDAR 44 base runs suggest that adult fishing mortality has been increasing in the southern stock (**Fig. 3**). This agrees with anecdotal evidence of a growing catch-and-release fishery for adult red drum in some areas. Changes in adult mortality patterns have an obvious and direct effect on spawning capability. Therefore, using just sub-adult F as a management reference point results in a risk of stock depletion under a scenario of increasing adult mortality.
It is also worth noting that, although the board highlighted the lack of information about adult red drum, there has been considerable progress in gathering information on adults since the previous stock assessment (SEDAR 18, 2009).

Longline surveys in both the northern and southern regions have greatly increased our knowledge of adult size composition, age composition, and catch per unit effort. The influence of the adult longline data will likely increase in future stock assessments as their temporal coverage increases. Therefore, there will be increasing benefits of using reference points that take the stock as a whole into consideration (including the spawning stock), rather than just the sub-adults.

iii) Reference point is independent of recruitment: Another potential risk of relying on just sub-adult F as a reference point is that, in order for the stock to be sustainable, an assumption is made that recruitment does not decline over time. If recruitment were to decline, spawning stock biomass could decline to unsustainable levels, even if sub-adult fishing mortality was maintained below a previously sustainable reference point. Stochastic variation in recruitment may have additional influences on the choice of a sub-adult F reference point (Holden & Conrad, 2015).

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Fig. 1 Relationships between static spawning potential ratio (SPR) and fishing mortality. (Data from Stock Synthesis 3 base runs for the southern (left) and northern (right) Atlantic red drum stock assessments). Top row: sub-adult fishing mortality (sum of ages 0-5); middle row: age 1 fishing mortality; bottom row: adult fishing mortality (sum of ages 6-40). Fitted lines are back-transformed linear regressions of Ln(SPR) vs F (solid lines: intercept fixed at SPR = 100%; dash-lines: intercept fitted).

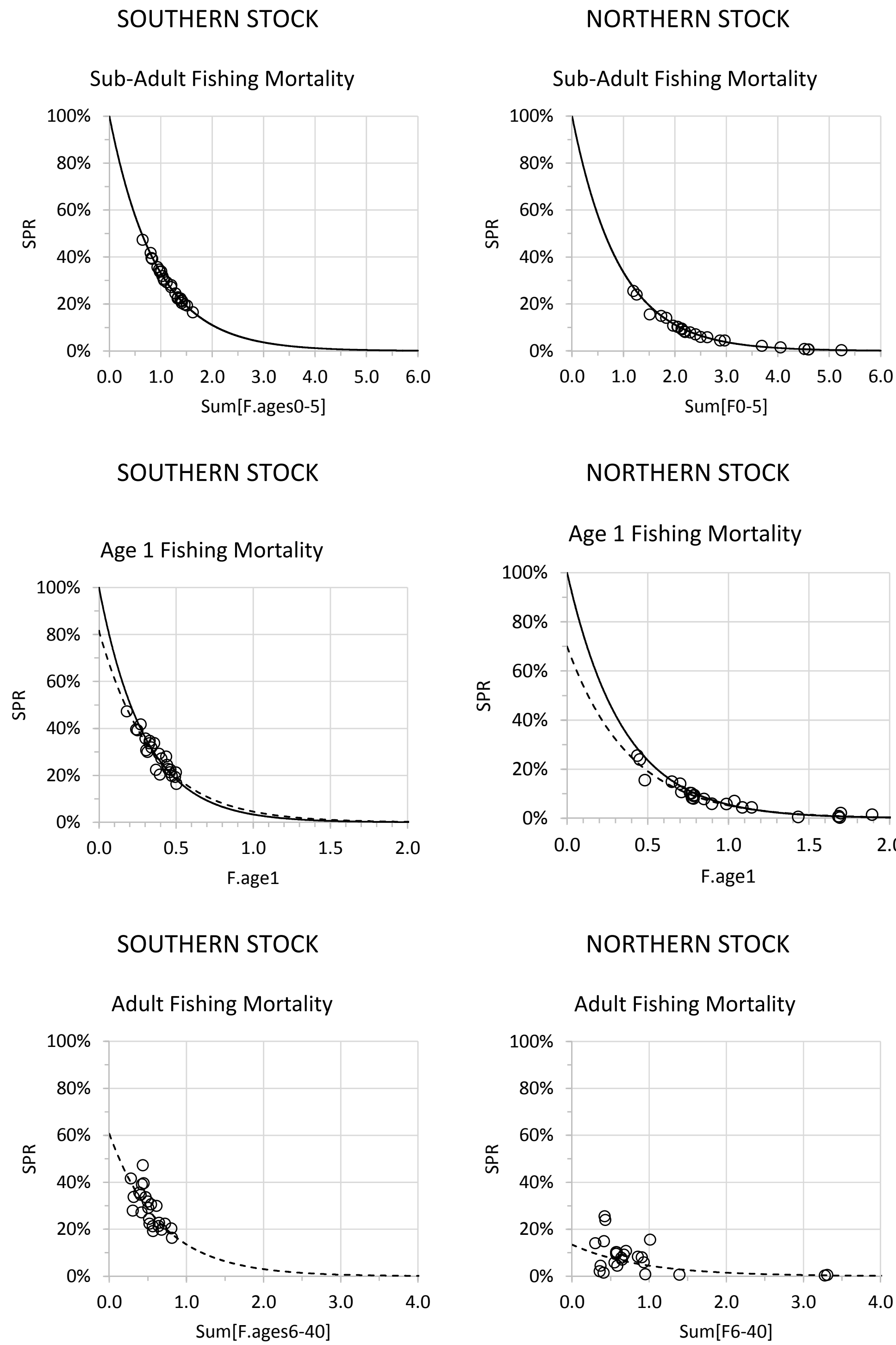


Fig. 2 Two plausible spawner-recruit relationships (pink lines fitted to blue diamonds) for Gulf of Mexico red drum that result in different sustainable levels of sub-adult escapement. Radiating dash lines show expected levels of recruitment (intersects with the pink spawner-recruit relationship) associated with sub-adult escapement rates (percentages). (Plots from Murphy, pers. comm., 2016).

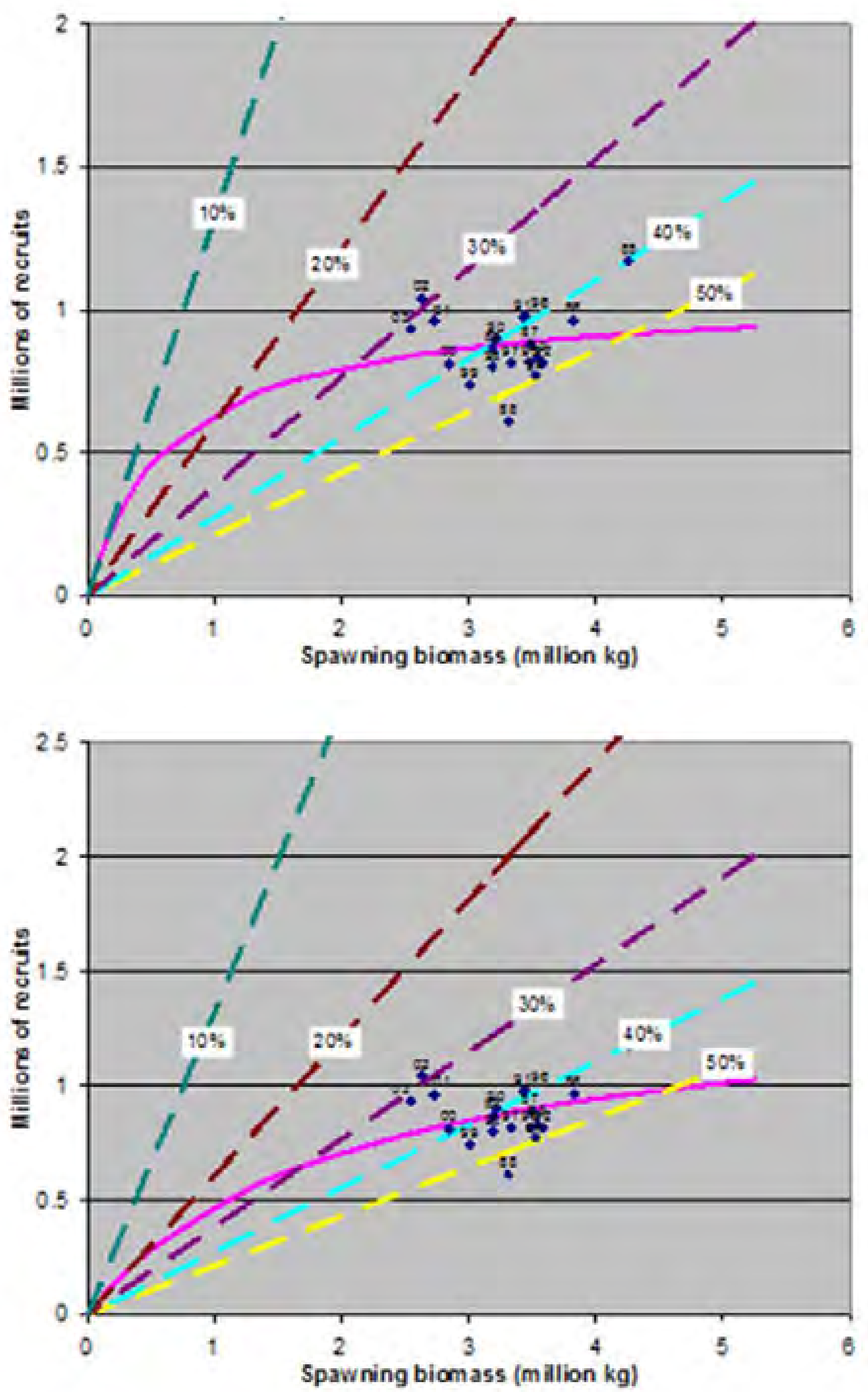
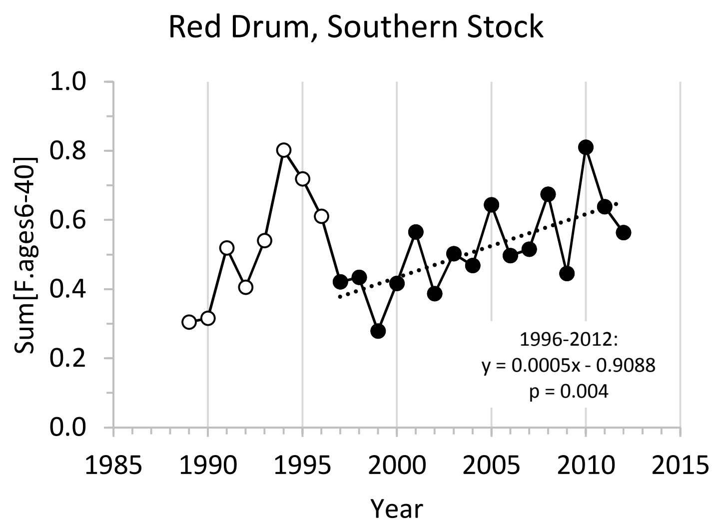
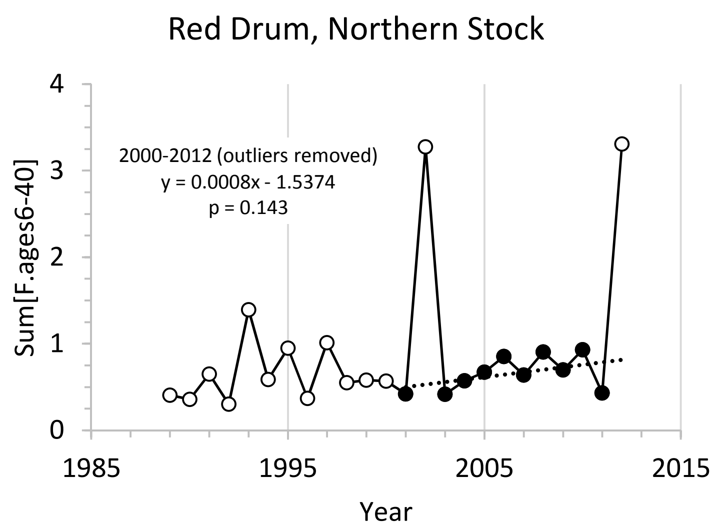


Fig. 3 Temporal changes in adult red drum (ages 6-40) fishing mortality, based on outputs from SEDAR 44 Stock Synthesis 3 base runs. Regression lines are fitted to just the filled circle data points.





Validity of Age-Based Models

Board Task: The Board is concerned that the lack of information on adult red drum, especially in the northern stock, may impact the ability of the stock synthesis models to accurately measure stock abundance. As a result, the Board asks for an evaluation of how red drum life history and current regulations (namely the moratorium on fishing in federal waters) may limit the validity of an age-based model such as SS3.

Working Group Progress

Age-based models provide a framework capable of providing managers with estimates of fishing mortality that can be separated into year and age effects as well as providing information on the abundance and age structure of a population, given all necessary inputs are available.

The prior stock assessment, SEDAR 18, incorporated a statistical catch-at-age model (SCAA; SEDAR 18, 2009). The model used standard inputs such as fishery catches, abundance indices and age compositions but also, for the northern region, incorporated externally derived F-at-age estimates reported from a tag recapture model (Bacheler et al. 2008). The model configuration also included a very large proportion of the population in a plus group (ages-7+). This plus group was necessitated by the sparseness of information on adult fish from either dependent or independent sources and a scarcity of aging data at older ages. This dearth of information on the adult stock led to model results that were considered uninformative regarding biomass reference points. Determinations on the overfishing status, however, were considered useful through the use of static SPR, given that the majority of catch and indices were indicative of sub-adult ages (1-3).

For the northern stock, estimated parameters in the model were heavily influenced by the inclusion of the tagging data. This dependence on the tagging data was a concern, particularly with how the model was configured (i.e. tagging estimates used were derived external to the model). A high priority research need in the review recommended that the tagging data should be integrated within the SCAA model to ensure that assumptions used when analyzing the tagging data would be fully incorporated into the estimates of the SCAA. The southern stock, which lacked F-at-age estimates from tagging data, had much higher uncertainty in the SPR estimates.

The move from the SCAA model to the SS3 framework was in response to recommendations from SEDAR 18 and the ongoing need to provide managers with reliable estimates of spawning stock biomass. SS3 provides an integrated modeling approach that addresses many of the concerns made during SEDAR 18. For example, SS3 allows for integration and analysis of tagging data internal to the model. The framework also allows for the direct fitting of index, length, and age composition data. The integrated design requires less processing and/or assumptions about data external to the model and takes into account the uncertainty in the various data inputs. While this integrated approach is advantageous, data gaps, particularly for adult red drum, still exist adding to qualitative uncertainty with any estimated adult biomass.

Lack of information on adult red drum

As noted above, the lack of information on adult red drum has precluded prior assessments from providing reliable estimates of spawning stock biomass. More recent efforts through the red drum longline surveys in Georgia, South Carolina, and North Carolina provide fishery independent indices of abundance and age-structure information that is incorporated into the SS3 framework. While informative, it should be noted that relative to the life-span of red drum (40+ years), these indices offer a short time series for evaluation (2007 for Georgia and North Carolina; 1994 for South Carolina).

Some noted sources of data gaps and assumptions impacting estimates for adult red drum include:

1. Adult Harvest and Regulations
    - Estimated harvest of adult fish from MRIP is very low, even in the early part of the time series when known fisheries existed and harvest was legal.
    - Regulations implemented by the states between 1998 and 2002 prohibited harvest on adults (no harvest over 27 inches from states NJ south) further limiting information on this portion of the stock.
    - Regulations taken to reduce or prevent adult harvest had no detectable impact on length compositions of recreational harvest. As a result, the data available from landings estimates suggests no significant adult harvest fishery existed.
    - In contrast, tag data suggests a large proportion of tagged adult red drum recaptures were harvested for the period when harvest was legal.
    - An accurate accounting of adult harvest has been a longstanding data concern. Adult red drum catches have traditionally been noted as poorly represented in the catch. In part, low catches could be due to a large portion of the adult fishery occurring at night while recreational sampling was exclusively in daytime hours. Extending MRIP sampling to include night time intercepts has been a long-standing research recommendation of the TC (note: night sampling is in place under MRIP where it is "needed" as described by NOAA but this did not start until 2016).
    - Lack of adult harvest data in the past leads to a potential lack of contrast in length composition data over time despite regulatory changes to the contrary. There is no apparent shift in length composition despite a ban on the harvest of adult fish. It is likely harvest on adult fish may be underestimated in the early part of time series as a result.
    - Lack of adult harvest data also leads to an inability to measure any potential benefit from past regulatory action.

2. Life History and Management Strategy
    - Relative to the long-lived age of red drum (40-60 years), the data used for the model (catch and indices) results in a short time series (1989), limiting any potential historical contrast over time as exploitation has changed.
    - There is only a short time series for the adult indices (longline) relative to the life-history of red drum.

- Ontogenetic shifts in life history likely reduce availability of red drum to the fishery with increasing age. Immature fish are described as ubiquitous with shorelines and shallow habitat in estuaries. These changes in availability occur with the onset of maturity (age 3+) and subsequent movement out of estuaries (presumably to areas of reduced vulnerability; i.e. offshore).
- No fishery dependent or independent surveys fully select for fish over a wide range of sizes, particularly as fish transition from sub-adults to adults. Most surveys collect data on sub-adults or juveniles, while the adult indices from the longline surveys are likely not fully selected until around age 5 or higher.
- As a result, there can be difficulty in estimating selectivity given the decreased availability due to both the life history changes and the slot limit. Model results will be sensitive to any assumptions about the descending limb of a dome shaped selectivity curve.
- Review of the SS3 model noted an impact on the model's ability to estimate equilibrium catch and initial F in the start year of the model. This concern arises from the short time series and potential lack of contrast in data.

3. Size Distribution of Recreational Releases
    - Length information on releases is largely unknown and must be assumed from other sources.
    - The proportion of releases to harvest has increased over time, increasing any potential bias. Removals from release mortality exceeds harvest mortality in some years.
    - Decreased bag limits, increasing catch and release practices in the fishery, and possible increased effort in the fishery have all led to an increasing trend in the number of fish released alive.
    - The size distribution for all releases (sub-adult and adult) is implied from tagging data. To the extent that these tagged fish do not represent the size of fish in the population at-large, the resulting assumed length frequency will be biased. Potential exists in the north that there is a bias towards larger fish due to volunteers in the red drum tagging program being instructed not to tag red drum under 27 inches.
    - The lack of harvest data on adult fish in the early part of the time series coupled with the increasing trends and assumed length composition of the recreational releases could result in a positive bias of adult removals in the more recent time period and an underestimate of removals in the earlier time period.

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SS3 Tag-Recapture

Board Task: During the red drum benchmark assessment, the SS3 model for the northern stock was found to be sensitive to the reporting rate of recaptured tags. When freely estimated, the reporting rates were estimated at values much lower than estimates from previous analyses of red drum tag-recapture data (Table 1). When the reporting rate of tagged red drum harvested by recreational anglers is fixed to the value estimated by Bacheler et al. (2009) (0.49), the estimates fluctuate significantly. Due to this sensitivity, the *South Atlantic State/Federal Fisheries Management Board* tasked the Red Drum Technical Committee and Stock Assessment Subcommittee to further evaluate the tag-recapture component of the SS3 framework and to provide a recommendation on how to proceed with the SS3 models. Several analyses discussed below were completed to inform the recommendation on how to treat the tag-recapture data in the SS3 models. An additional analysis was attempted with the SS3 model for the northern stock by using lengths of tagged fish that were recaptured and released alive by recreational anglers from the Virginia Game Fish Tagging Program in place of the length data from the NC DMF Tagging Program to characterize the size composition of fish released by recreational anglers and assumed to die post-release and part of the size composition of the recreational CPUE. This model run did not converge.

Analysis: Sensitivity runs with the SS3 model for the southern stock.

The final base run of the SS3 model for the southern stock estimated the reporting rate for the South Carolina harvest fleet of about 32%. This is within the range of reporting rates determined for inshore fisheries tagging programs in South Carolina in the past (21%, Jenkins et al., 2000; 57-63%, Denson et al., 2002), similar to rates reported by black drum and red drum anglers from Texas (28%, Matlock, 1981) but lower than reporting rates for a highly prized common snook fishery in Florida (60-70%, Taylor et al., 2006).

The exclusion of tag-recapture data from the southern base model had little impact on the estimates of spawning potential ratio (Fig. 1). This apparently indicates that the analysis of data for age/length composition, catch, indices of abundance, etc., gave similar estimates of fishing mortality as those derived when the tag/recapture data were included.

When the reporting rates were fixed at different (and less likely) values in the southern base model, higher reporting rates of 60% gave SPRs similar to that estimated for SEDAR 18 and lower reporting rates of 18% gave SPRs that, on average, were about 30% lower than the base model levels (Fig. 1).

Due to the similarities of the reporting rate estimate from the SS3 model for the southern stock and the literature estimates and the negligible effect of excluding the tag-recapture data, the following analyses focused on the discrepancies in reporting rate estimates from the SS3 model for the northern stock.

Analysis: Likelihood profile on the reporting rate of tagged red drum harvested by recreational anglers.

Methods

The model was run with the reporting rate parameter fixed at values ranging from 10-95% at increments of 5%. Additionally, a run with the reporting rate fixed at 18% was included in the profile. This value was an alternative estimate from the literature (Bacheler et al., 2008) and a specific run recommended by the peer reviewers and subsequently requested by the Board.

A likelihood profile was originally done by fixing the reporting rate of all harvest fleets to the same value since the values in the literature for NC DMF tags are not fleet, or even, sector-specific (Bacheler et al., 2008; Bacheler et al., 2009). However, fixing the reporting rate of just one fleet allows the model flexibility to estimate inter-fleet variability in these parameters. There was inter-sector variability estimated by Bacheler et al. (2009) between commercial and recreational fisheries. Therefore, fixing the reporting rate of just the recreational harvest fleet was determined to be the best approach.

Objective

Determine how model fits to observed data change over the values of reporting rate. The likelihood profile shows how model fits to data components, individually and aggregated, change over the values of the reporting rate parameter. As fits deteriorate, the negative log likelihood increases. As fits improve, the negative log likelihood decreases. The lowest negative log likelihood indicates the most likely parameter value, given the input data.

Results and Discussion

The total negative log likelihood increases as the reporting rate is increased up to 45%, declines at a value of 50%, and becomes stable at values $\geq$ 55% (Fig. 2). The profile indicates the most likely value for the reporting rate, given the input data, is the model estimated value of 9%. However, there is some conflict among the likelihoods of the individual data components. This becomes more apparent when the change in negative log likelihoods across runs is scaled to a maximum of 1 (Fig. 3). Negative log likelihoods of the length composition, tag-recapture compositions across fleets, and tag-recapture time series generally increase as reporting rate is increased. Negative log likelihoods of the catch, indices of abundance, and conditional ages-at-length generally decrease as reporting rate is increased.

Fits to individual tag groups were investigated to provide further insight on why the negative log likelihoods of tag-recapture data are increasing as reporting rate is increased. Likelihoods of the individual tag groups also tend to conflict between tag groups of young fish (< age 3) and older fish ($\geq$ age 3). As the reporting rate is increased, fits to the older tag groups, which are generally poorer than young tag groups in the model with the reporting rate estimated, generally deteriorate while fits to the young tag groups remain relatively stable (Tables 2 and 3). This indicates that observed recaptures of older fish are higher than the model expects, given the low fishing mortality on these older fish as informed by the other data sources. This poor fit becomes poorer as the reporting rate is increased (i.e., abundance increases and F decreases). Removing the older tag groups results in negligible changes to model results, as negative log likelihoods of the other data components are collectively minimized at high values of fishing mortality (i.e., low values of reporting rate).

The reporting rates of the commercial fleets increase in runs with the recreational reporting rate fixed from 10-45%, though at relatively slow rates (Table 4). This is consistent with lower reporting rates estimated for commercial fisheries by Bacheler et al. (2009). The reporting rates of the commercial fleets then increase to values greater than the recreational fleet when this parameter is fixed at values ≥ 50%.

As reporting rate is increased, the fishing mortality decreases. This results in an increasing stock abundance. Because spawning potential ratio (SPR) is an inverse function of the fishing mortality, the SPR estimates increase as reporting rate is fixed at increasing values. Instead of the expected smooth gradient in population estimates as reporting rate is increased, the model jumps between two very different solutions. For reporting rate values from the model estimate (9%) to 45%, the model estimates similar SPRs that are below the 40% target throughout the time series (Fig. 4). For reporting rate values ≥ 50%, the model estimates SPRs that are all above the 40% target throughout the time series. Recruitment estimates also fall into two similar solutions between runs in the range of 9-45% and runs ≥ 50% (Fig. 5).

The coarse and drastic change in model solution as well as the conflict in data sources indicate abnormal model behavior and instability when the tag data are included and the reporting rate is fixed at different values (Cass-Calay et al., 2014). At the SEDAR 44 Review Workshop, the Review Panel originally suggested investigating the reporting rate parameters, as these parameters should be correlated with another scaling parameter, the unfished recruitment in log space (Ln(R0)). A likelihood profile of unfished recruitment over the range of recreational harvest reporting rate values shows a similar pattern in likelihoods and coarse change in model solution (Fig. 6). A profile of the unfished recruitment parameter from the base model (without the tag-recapture data) over a range of values for the unfished recruitment parameter, shows a much more defined estimate, though some data conflicts remain (Fig. 7).

When the reporting rate is fixed at values ≥ 50%, the population estimates are very inconsistent with prior estimates (SEDAR 18, 2009). The recreational harvest reporting rate, when estimated or fixed ≥ 50%, also results in patterns inconsistent with the expectation of this parameter (i.e., less than commercial reporting rates).

Analysis: Data weighting sensitivity runs.

Methods

Data weights, either through changes to the model lambdas or input error values, were changed and the model was rerun. Parameter estimates were checked against bounds and a subset of model estimates were compared.

Alternatives considered were (1) decreasing the lambdas (downweighting) of the recreational length composition data, (2) decreasing the lambdas of all length composition data, (3) increasing the lambdas (upweighting) of the conditional age-at-length data, (4) decreasing the overdispersion parameter for all tag groups to 1.5, (5) increasing the overdispersion parameter for all tag groups to 5, (6) decreasing the overdispersion parameter for all tag groups to 1.5 and increasing the lambdas for all tag-recapture time series to 2, (7) increasing the lambdas of all fishery-independent indices to 10, and (8) the SS3 suggested adjustments to input error for composition and index data. All alternatives were compared to the base SS3 model with tag-recapture data and the reporting rates estimated.

The SS3 weighting adjustments are an approach to objectively weight all data components so that the model puts equal emphasis on fitting each data input. Changing the lambdas is a subjective weighting approach that is usually based on expert judgment and some fitting criteria to put more emphasis on a particular data component (e.g., increase the lambda of fishery-independent indices under the belief that they are more reliable than fishery-dependent indices).

Objective

Determine how model results are impacted across alternative data weighting scenarios. Due to the observed data conflicts in the likelihood profiling, the weighting of data components will potentially impact model results (Francis, 2011). Data weighting was not reported during the assessment, outside of the standard weighting adjustment procedure within SS3.

Results and Discussion

Generally, the estimates are insensitive to the different weighting alternatives considered (table 6). Some parameters do change across the alternatives, but population estimates are relatively unaffected by the weighting changes.

One consistency throughout the alternatives is the tendency to estimate a more depleted stock as the weighting of the length composition data is decreased and/or the weighting of the conditional age-at-length data is increased.

Analysis: Comparison of external tag-recovery model estimates to SS3 estimates.

Methods

Brownie et al. (1995) tag-recovery models implemented in the program MARK were fit to tag-recapture data used in SS3 and tag-recapture data used in Bacheler et al. (2008). Because of the many differences in the SS3 tag-recapture model, Brownie model, and the Bacheler et al. (2008) model, only a small subset of data were compatible with all three approaches for a snapshot comparison. Two tag groups modelled in SS3 (TG 19 and TG 23) and an additional tag group of age-2 fish that did not meet the original threshold of tagged fish (300) were used in the analysis based on a visual evaluation of the SS3 model fit to these tag groups. The additional age-2 tag group was included to estimate age-1 survival for comparison. All fish were tagged with cinch or internal anchor type tags. Recaptures were aggregated across all harvest fleets, unlike in SS3 where fleet-specific recaptures are modelled. The corresponding tag-recapture data from Bacheler et al. (2008) were also modelled.

Objective

(1) Determine if estimates in SS3 informed by tag-recapture data (i.e., recovery rate, survival) are consistent with estimates using other tag-recovery models. (2) Determine if the data used

in SS3 can explain the differences between reporting rate estimates within the SS3 model and those from the literature.

Results and Discussion

The Brownie model estimates lower survival than the SS3 model (table 7). The lowest survival is estimated with the Brownie model using the Bacheler et al. (2008) data. Recovery rate estimates were higher from the Brownie model, with the highest from the model with the Bacheler et al. (2008) data. Because survival is estimated lower in the Brownie models, a higher proportion of available tags are being recovered, resulting in higher recovery rates. Given the Brownie survival estimates and using external natural mortality and chronic tag loss estimates, the combination of fishing mortality and reporting rate can be solved. The Brownie model suggests higher fishing mortality and higher reporting rate than estimated in SS3 (tables 8 and 9). There are other data sources informing the survival estimates in SS3 and the higher survival estimated in the SS3 model results in more tags alive at the beginning of each year with the same number of observed recaptures, resulting in lower proportions of recoveries (recovery rates that are too low given the other data sources) that can be offset by lower reporting rates. Other potential explanations for the differences in survival are that the Brownie model is expecting higher chronic tag loss and/or natural mortality. Bacheler et al. (2008) used higher natural mortality estimates for their analysis.

Comparison of the two data sources showed consistently lower recapture rates in the SS3 data, explaining the higher survival and lower recovery rates estimated in the Brownie model with these data. Looking at all data included in the SS3 model, this pattern appeared in the age-0 and age-1 tagged fish and the opposite pattern generally occurred for the older tag groups (tables 10-12). The latter may be due to assigning an age based on the median length of tagged fish, with slower growing fish that are more likely to remain inshore being tagged.

Analysis: SS3 model runs with simulated recapture data.

Methods

Observed recaptures in the SS3 data were adjusted based on the ratio of the recapture rates in the SS3 data and Bacheler et al. (2008) data (tables 10-12) and the SS3 model was fit to the adjusted recapture data. The Bacheler et al. (2008) recaptures are not fleet specific, so the fleet-specific recapture data in SS3 were adjusted by the ratio of recapture rates aggregated across harvest fleets. Subsequently, observed recaptures were multiplied by a constant (3) and the model was refit to the tag-recapture data.

Objective

(1) Determine if the differences in recapture rates between the data developed for the SS3 model and the Bacheler et al. (2008) data explain the differences in reporting rate estimates.
(2) Determine how many recaptures would be expected by the SS3 model to agree with the mortality estimates informed by the other data sources under a reporting rate close to the estimate from the southern model (≈30%). This reporting rate estimate is roughly in the middle of the range of estimates from the literature for NC DMF tags.

Results and Discussion

Adjusting the recapture rates of the SS3 data to match the recapture rates in the Bacheler et al. (2008) data resulted in only slight changes to the recapture rates (table 13) and SPR estimates (table 14). This indicates that the differences in recapture rates between the data sets do not explain the differences in reporting rate estimates between models. Multiplying the adjusted recaptures by 3 (200% increase) resulted in reporting rate estimates near the estimate from the southern model and SPR estimates similar to the estimates from the northern model with the original tag-recapture data and the reporting rates estimated. This further indicates that the current data inputs and SS3 model configuration for the northern stock do not support reporting rates in the range of the literature estimates in table 1.

Final Recommendation

Given the insensitivity of the model to changes in the input tag-recapture data (including data weighting) when reporting rate is estimated and the unstable behavior when fixing reporting rate, the SAS and TC recommend not including tag-recapture data with fixed reporting rates in the current SS3 base models. Data inputs and weighting, including tag-recapture data, need to be reevaluated before including the tag-recapture data in the model with fixed reporting rates. These types of changes would require peer review.

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Tables

Table 1. Reporting rate estimates from the base SS3 model and other analyses of red drum tagged in North Carolina.

Reporting Rate	Estimate	Ages	Fishery	Time Period of Fish	Treatment of Released Tags	Tags
Base SS3 Tag Model	0.09-0.12	0-16	Fleet-Specific	1989-2004	Not Included	NC DMF
Bacheler et al. 2008	0.18	0-3+	All Fleets Combined	1983-2006	Included	NC DMF
Bacheler et al. 2009	0.49	1	All Fleets Combined	2005-2007	Included	NC DMF
Bacheler et al. 2009	0.77	1	Recreational Fleets Combined	2005-2007	Included	NCSU
Bacheler et al. 2009	0.44	1	Commercial Fleets Combined	2005-2007	NA	NCSU

Table 2. Change in fits to tag groups when the reporting rate of the recreational harvest fleet is fixed at 50%.

	Tag Recapture Compostions			**Tag Recapture Time Series**		
	Total	Young	Old	Total	Young	Old
Fit improved	10	8	2	11	8	3
Fit deteriorated	17	8	9	19	8	11
No Change	3	0	3	0	0	0

Table 3. Change in negative log likelihood when the reporting rate of the recreational harvest fleet is fixed at 50%.

	All	Young	Old
Tag Recapture Compostions	1%	0%	7%
Tag Recapture Time Series	21%	-1%	54%

Table 4. Reporting rate values across runs in the likelihood profile.

Fleet	**Reporting Rate of Tagged Red Drum**						
Commercial GNBS (estimated)	10%	11%	12%	12%	13%	13%	13%
Commercial Other (estimated)	12%	14%	14%	15%	15%	16%	16%
Recreational Harvest (fixed)	10%	15%	18%	20%	25%	30%	35%
Commercial GNBS (estimated)	14%	14%	50%	56%	61%	67%	72%
Commercial Other (estimated)	17%	17%	60%	67%	74%	80%	87%
Recreational Harvest (fixed)	40%	45%	50%	55%	60%	65%	70%
Commercial GNBS (estimated)	77%	83%	88%	93%	97%		
Commercial Other (estimated)	93%	100%	100%	100%	100%		
Recreational Harvest (fixed)	75%	80%	85%	90%	95%		

Table 5. Negative log likelihoods of the data weighting alternatives.

Likelihood Component	Base with tag data and reporting rates estimated	All recreational length compositon lambdas = 0.1	All length composition lambdas = 0.1	All conditional age-at-length lambdas = 2	Tag recapture overdispersion = 1.5
TOTAL	11,412	7,263	5,588	15,441	11,423
Catch	0.000158	0.000899	0.000073	0.000161	0.000160
Equilibrium catch	0.0096	0.0861	0.0479	0.0125	0.0101
Indices of abundance	360	320	284	362	360
Length composition	6,209	2,287	725	6,371	6,210
Conditional age-at-length	4,098	3,926	3,854	7,958	4,098
Tag recapture composition	492	493	492	493	493
Tag recapture time series	220	208	205	220	231
Recruitment	32	29	29	38	32
Parameter softbounds	0.007	0.017	0.016	0.007	0.007

Likelihood Component	Tag recapture overdispersion = 5	Tag recapture overdisperion = 1.5 & tag recapture time series lambdas = 2	FI index lambdas = 10	SS3 Variance Adjustments
TOTAL	11,410	11,651	12,649	4,229
Catch	0.000150	0.000150	0.000081	0.000374
Equilibrium catch	0.0090	0.0131	0.0018	0.1611
Indices of abundance	360	362	1,312	-9
Length composition	6,209	6,217	6,431	1,420
Conditional age-at-length	4,098	4,099	4,153	2,107
Tag recapture composition	492	492	492	491
Tag recapture time series	218	449	229	202
Recruitment	32	32	32	19
Parameter softbounds	0.007	0.007	0.007	0.006

Table 6. Select model estimates from the data weighting alternatives.

Parameter	Base with tag data and reporting rates estimated	All recreational length compositon lambdas = 0.1	All length composition lambdas = 0.1	All conditional age-at-length lambdas = 2	Tag recapture overdispersion = 1.5
VonBert_K_Fem_GP_1	0.28	0.27	0.29	0.28	0.28
Age_K_Fem_GP_1_a_4	0.62	0.58	0.36	0.49	0.62
SR_LN(R0)	5.56	5.57	5.51	5.55	5.56
Early_InitAge_41	0.0082	0.1721	0.0412	0.0778	0.0116
Early_InitAge_40	0.0021	0.0175	0.0436	0.0235	0.0023
Early_InitAge_27	0.0331	-0.0187	-0.0744	0.0706	0.0336
Main_RecrDev_1992	-0.010	0.106	0.156	0.015	-0.009
Main_RecrDev_2001	0.210	0.377	0.456	0.252	0.214
Main_RecrDev_2013	-0.020	0.201	-0.405	-0.097	-0.020
InitF_1Comm_GNBS	0.40	0.43	0.45	0.44	0.40
InitF_2Comm_OTHER	0.15	0.14	0.14	0.16	0.15
InitF_3Rec_Harv	1.33	1.64	1.57	1.48	1.33
InitF_4Rec_Discard	0.004	0.005	0.005	0.004	0.004
LnQ_base_5_NC_JAI	-5.49	-5.46	-5.45	-5.48	-5.49
LnQ_base_6_NC_IGNS_0	-5.38	-5.30	-5.27	-5.35	-5.38
LnQ_base_7_NC_IGNS_1	-5.10	-4.94	-5.02	-5.05	-5.10
LnQ_base_8_NC_LL	-4.87	-4.00	-4.00	-4.68	-4.86
LnQ_base_9_Rec_CPUE	-5.23	-5.17	-5.34	-5.17	-5.22
SizeSel_4P_2_Rec_Discard	-0.77	-0.57	-0.50	-0.75	-0.77
SizeSel_9P_6_Rec_CPUE	-1.97	-0.59	-0.81	-1.86	-1.97
SPB_Virgin	32,933	31,599	29,646	31,891	32,908
SPB_Initial	3,202	1,047	1,201	2,502	3,181
SPB_1989	5,039	1,553	1,712	4,022	5,002
SPB_2013	2,135	774	1,186	1,845	2,115
Recr_Virgin	260	262	248	256	259
Recr_Initial	260	262	248	256	259
Recr_1989	100	90	72	88	99
Recr_2013	206	244	131	188	206
SPRratio_1989	0.99	0.99	0.98	0.98	0.99
SPRratio_2013	0.97	0.99	0.97	0.97	0.97
F_1989	1.22	1.24	1.06	1.16	1.22
F_2013	0.81	0.82	0.82	0.84	0.81

Table 6. Continued.

Parameter	Tag recapture overdispersion = 5	Tag recapture overdisperion = 1.5 & tag recapture time series lambdas = 2	FI index lambdas = 10	SS3 Variance Adjustments
VonBert_K_Fem_GP_1	0.28	0.28	0.27	0.28
Age_K_Fem_GP_1_a_4	0.63	0.62	0.63	0.48
SR_LN(R0)	5.56	5.55	5.57	5.56
Early_InitAge_41	0.0058	0.0489	0.0049	0.1108
Early_InitAge_40	0.0019	0.0048	0.0019	0.0210
Early_InitAge_27	0.0328	0.0386	0.0478	-0.0124
Main_RecrDev_1992	-0.011	-0.003	0.245	0.015
Main_RecrDev_2001	0.201	0.236	0.010	0.244
Main_RecrDev_2013	-0.022	-0.020	-0.160	0.114
InitF_1Comm_GNBS	0.40	0.40	0.37	0.45
InitF_2Comm_OTHER	0.15	0.14	0.14	0.14
InitF_3Rec_Harv	1.33	1.31	1.22	1.58
InitF_4Rec_Discard	0.004	0.004	0.003	0.004
LnQ_base_5_NC_JAI	-5.49	-5.49	-5.56	-5.54
LnQ_base_6_NC_IGNS_0	-5.38	-5.37	-5.37	-5.36
LnQ_base_7_NC_IGNS_1	-5.10	-5.08	-5.10	-4.99
LnQ_base_8_NC_LL	-4.88	-4.73	-5.24	-3.73
LnQ_base_9_Rec_CPUE	-5.23	-5.19	-5.39	-5.08
SizeSel_4P_2_Rec_Discard	-0.77	-0.76	-0.78	-0.38
SizeSel_9P_6_Rec_CPUE	-1.97	-1.88	-2.08	-1.17
SPB_Virgin	32,958	32,691	33,315	31,650
SPB_Initial	3,218	2,965	3,881	1,494
SPB_1989	5,068	4,623	6,148	2,001
SPB_2013	2,151	1,886	2,913	811
Recr_Virgin	260	258	263	261
Recr_Initial	260	258	263	261
Recr_1989	100	98	99	102
Recr_2013	206	204	183	224
SPRratio_1989	0.99	0.99	0.98	0.99
SPRratio_2013	0.97	0.98	0.96	0.99
F_1989	1.22	1.23	0.75	0.98
F_2013	0.80	0.82	0.69	0.96

Table 7. Estimates of survival and tag-recovery rates from the SS3 model and Brownie et el. 1985 model using SS3 tag-recapture data and Bacheler et al. 2008 tag-recapture data.

Model	SS3	Brownie et al. 1985	Brownie et al. 1985
Data	SS3	SS3	Bacheler et al. 2008
1998 age 0 survival of tags	0.65	0.58	0.50
1998 age 0 recovery rate	0.008	0.012	0.013
1999 age 1 survival of tags	0.36	0.17	0.13
1999 age 1 recovery rate	0.040	0.046	0.055
2000 age 2 survival of tags	0.42	N/A	N/A
2000 age 2 recovery rate	0.035	0.077	0.106

Table 8. Combinations of 1998 age-0 survival, fishing mortality, and reporting rate estimates using external natural mortality (0.195) and chronic tag loss (0.09) estimates. Values in yellow show the survival or adjacent survival estimates form the Brownie model using the two data sets. The base SS3 model with tagging data estimates age-0 fishing mortality at 0.14 and the average reporting rate across fleets at 0.10.

Reporting Rate	F (SS3 Data)	Survival (SS3 Data)	F (Bacheler Data)	Survival (Bacheler Data)
0.050	2.75	0.05	2.89	0.04
0.100	1.38	0.19	1.44	0.18
0.150	0.92	0.30	0.96	0.29
0.200	0.69	0.38	0.72	0.37
0.250	0.55	0.43	0.58	0.42
0.300	0.46	0.48	0.48	0.46
0.350	0.39	0.51	0.41	0.50
0.400	0.34	0.53	0.36	0.52
0.450	0.31	0.55	0.32	0.55
0.500	0.28	0.57	0.29	0.56
0.550	0.25	0.59	0.26	0.58
0.600	0.23	0.60	0.24	0.59
0.650	0.21	0.61	0.22	0.60
0.700	0.20	0.62	0.21	0.61
0.750	0.18	0.63	0.19	0.62
0.800	0.17	0.63	0.18	0.63
0.850	0.16	0.64	0.17	0.63
0.900	0.15	0.65	0.16	0.64
0.950	0.14	0.65	0.15	0.65

Table 9. Combinations of 1999 age-1 survival, fishing mortality, and reporting rate estimates using external natural mortality (0.129) and chronic tag loss (0.09) estimates. Values in yellow show the adjacent survival estimates form the Brownie model using the two data sets. The base SS3 model with tagging data estimates age-1 fishing mortality at 0.79 and the average reporting rate across fleets at 0.10.

Reporting Rate	F (SS3 Data)	Survival (SS3 Data)	F (Bacheler Data)	Survival (Bacheler Data)
0.050	10.22	0.00	12.24	0.00
0.100	5.11	0.00	6.12	0.00
0.150	3.41	0.03	4.08	0.01
0.200	2.56	0.06	3.06	0.04
0.250	2.04	0.10	2.45	0.07
0.300	1.70	0.15	2.04	0.10
0.350	1.46	0.19	1.75	0.14
0.400	1.28	0.22	1.53	0.17
0.450	1.14	0.26	1.36	0.21
0.500	1.02	0.29	1.22	0.24
0.550	0.93	0.32	1.11	0.26
0.600	0.85	0.34	1.02	0.29
0.650	0.79	0.37	0.94	0.31
0.700	0.73	0.39	0.87	0.34
0.750	0.68	0.41	0.82	0.36
0.800	0.64	0.42	0.76	0.37
0.850	0.60	0.44	0.72	0.39
0.900	0.57	0.46	0.68	0.41
0.950	0.54	0.47	0.64	0.42

Table 10. Ratios of recapture rate in the Bacheler et al. 2008 tag-recapture data to recapture rate in the SS3 tag-recapture data for age-0 fish tagged with anchor tags. Ratios bolded in red indicate higher recaptures rates in the Bacheler et al. 2008 data.

Year Tagged	Year Recaptured: 1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1991	**1.20**	0.95	**1.07**	**1.16**	**1.16**							
1992		**1.50**	**1.06**	0.97	0.97	0.97						
1993			**1.51**	**1.22**		**2.32**						
1994				**1.17**	0.90	0.72	0.00					
1995					**1.19**	0.95	0.95					
1996												
1997							**1.10**	**1.23**	**1.20**	1.00		
1998								**1.05**	**1.01**	0.99		0.99
1999									**1.55**	**1.19**	**1.11**	**1.11**
2000										**1.25**	**1.10**	**1.07**

Table 11. Ratios of recapture rate in the Bacheler et al. 2008 tag-recapture data to recapture rate in the SS3 tag-recapture data for age-1 fish tagged with anchor tags. Ratios bolded in red indicate higher recaptures rates in the Bacheler et al. 2008 data.

		Year Recaptured				
		1998	1999	2000	2001	2002
Year Tagged	1998	**1.06**	**1.41**	0.99		
	1999		**1.22**	**1.00**		**1.00**
	2000			**1.72**	**1.55**	**1.62**
	2001				**1.15**	0.90

Table 12. Ratios of recapture rate in the Bacheler et al. 2008 tag-recapture data to recapture rate in the SS3 tag-recapture data for age-3+ fish tagged with dart tags. Ratios bolded in red indicate higher recaptures rates in the Bacheler et al. 2008 data.

		Year Recaptured												
		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Year Tagged	1989	**1.01**	**1.01**	**1.01**		**1.01**								
	1990		**1.96**	0.98	0.98	0.98				0.98				
	1991			0.93	0.93	0.93		0.93						
	1992				0.87			0.87						
	1993						0.89	0.89		0.89				
	1994						0.90	0.90		0.90	0.90			
	1995							**1.35**	0.90	0.90				
	1996									0.91		0.91		
	1997										0.87			
	1998										**1.83**		0.92	0.92
	1999													0.98

Table 13. Recapture rate estimates from SS3 model runs with the input SS3 recapture data, the SS3 recapture data adjusted by the recapture rate ratios in tables 10-12, and the adjusted SS3 recapture data multiplied by 3.

Fleet	SS3 Recapture Data	SS3 Recapture Data Adjusted by Recapture Rate Ratio	Adjusted SS3 Recapture Data Mutiplied by 3
Commercial GNBS	9%	10%	28%
Commercial Other	12%	10%	29%
Recreational Harvest	9%	9%	26%

Table 14. Spawning potential ratio estimates from SS3 model runs with the input SS3 recapture data, the SS3 recapture data adjusted by the recapture rate ratios in tables 10-12, and the adjusted SS3 recapture data multiplied by 3.

Year	SS3 Recapture Data	SS3 Recapture Data Adjusted by Recapture Rate Ratio	Adjusted SS3 Recapture Data Mutiplied by 3
1989	0.014	0.014	0.014
1990	0.019	0.021	0.020
1991	0.063	0.068	0.063
1992	0.128	0.140	0.137
1993	0.006	0.007	0.006
1994	0.038	0.043	0.038
1995	0.007	0.008	0.008
1996	0.038	0.044	0.045
1997	0.143	0.153	0.147
1998	0.050	0.057	0.056
1999	0.092	0.101	0.099
2000	0.092	0.102	0.099
2001	0.240	0.251	0.241
2002	0.003	0.003	0.003
2003	0.137	0.148	0.147
2004	0.085	0.093	0.089
2005	0.082	0.091	0.090
2006	0.074	0.082	0.081
2007	0.069	0.078	0.078
2008	0.072	0.080	0.078
2009	0.097	0.108	0.107
2010	0.052	0.058	0.057
2011	0.225	0.239	0.238
2012	0.005	0.005	0.005
2013	0.027	0.032	0.032

Figures

Fig. 1. Static spawning potential ratios for southern stock red drum under different configurations for the inclusion of tag-recapture data into the analysis.

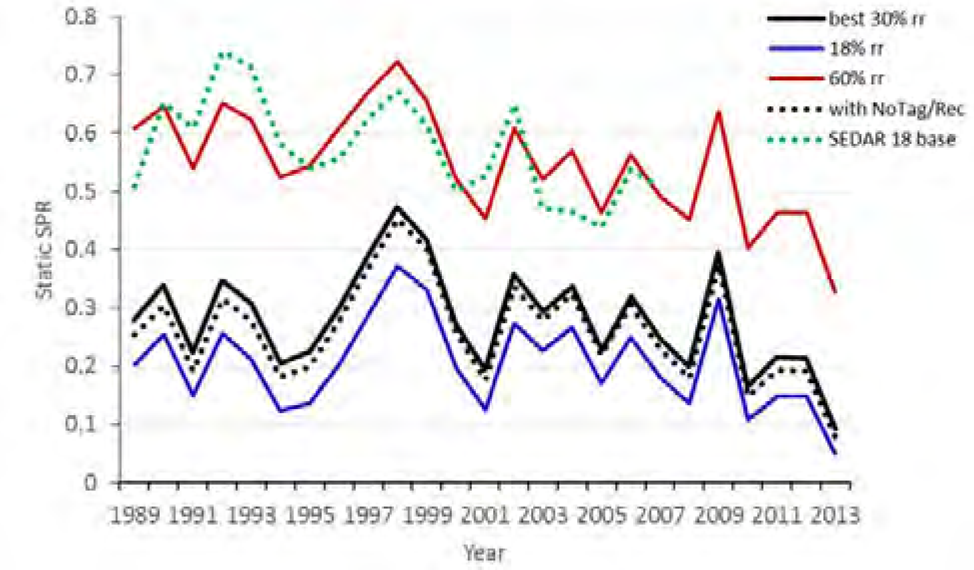


Fig. 2. Likelihood profile over the reporting rate of tagged red drum harvested by recreational anglers with the change in the negative log likelihood relative to the minimum negative log likelihood on the y-axis.

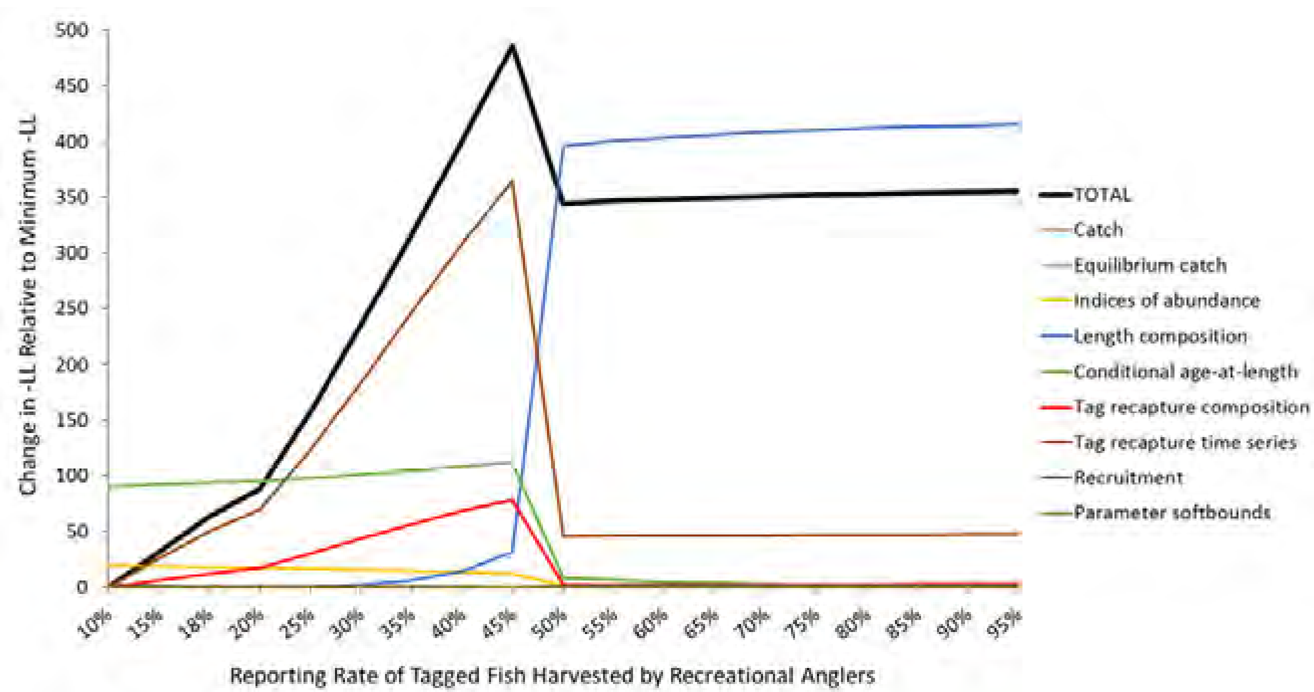


Fig. 3. Likelihood profile over the reporting rate of tagged red drum harvested by recreational anglers with the change in the negative log likelihood relative to the minimum negative log likelihood scaled to a maximum of 1 on the y-axis.

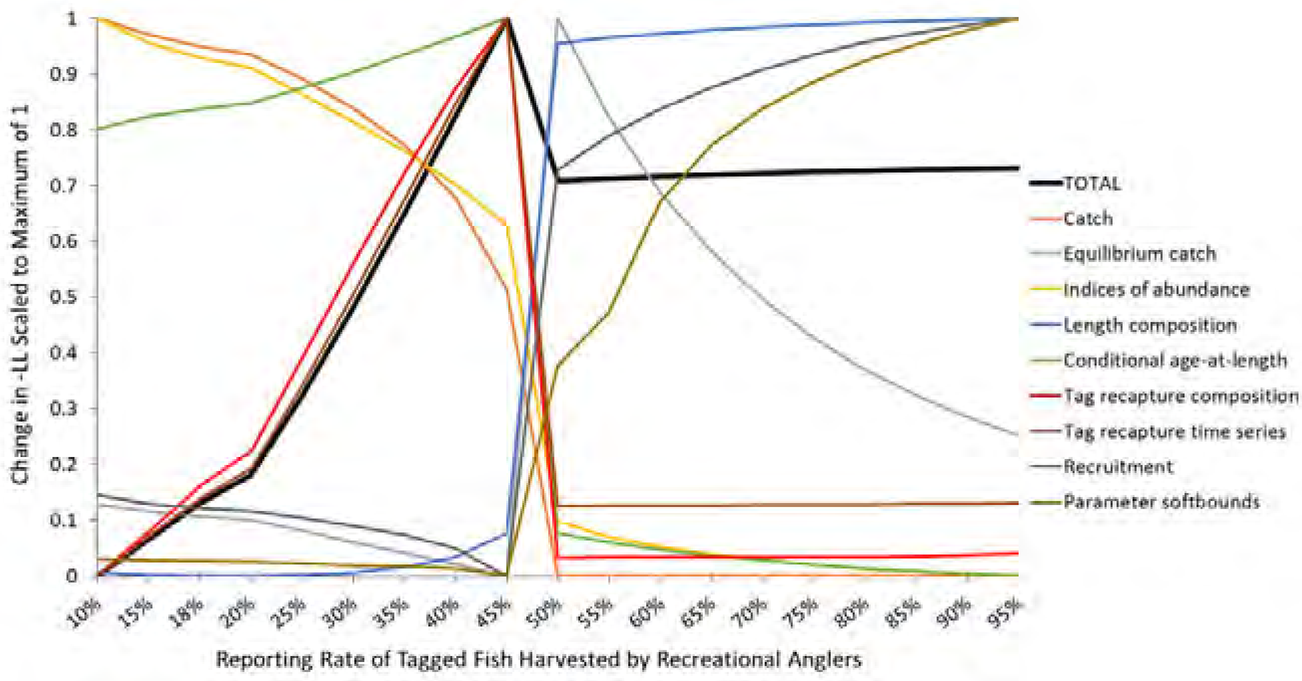


Fig. 4. Spawning potential ratio estimates from the model runs fixed at different reporting rate values for the recreational harvest fleet.

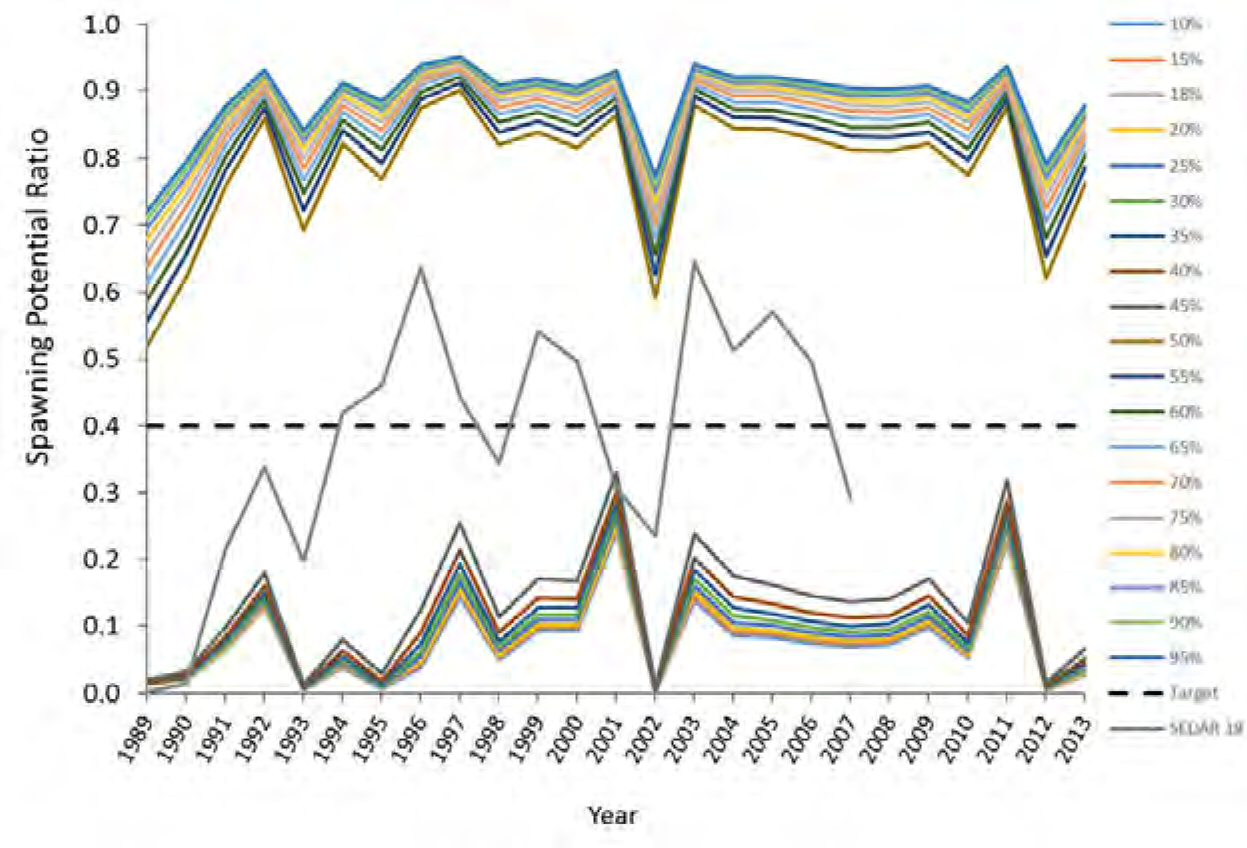


Fig. 5. Age-0 recruitment estimates from the model runs fixed at different reporting rate values for the recreational harvest fleet.

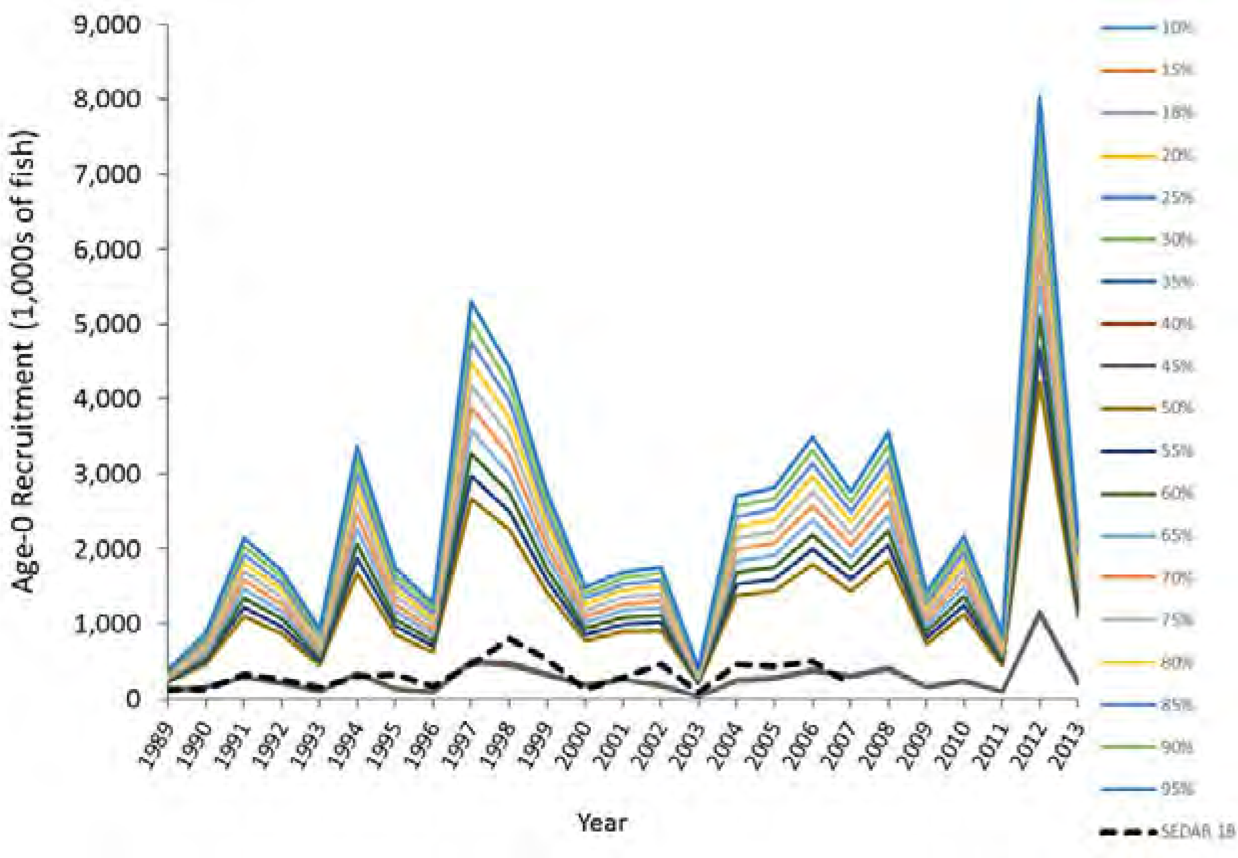


Fig. 6. Likelihood profile over the unfished recruitment from model runs with the reporting rate of the recreational harvest fleet fixed at values from 10-95%. The change in the negative log likelihood relative to the minimum negative log likelihood on the y-axis.

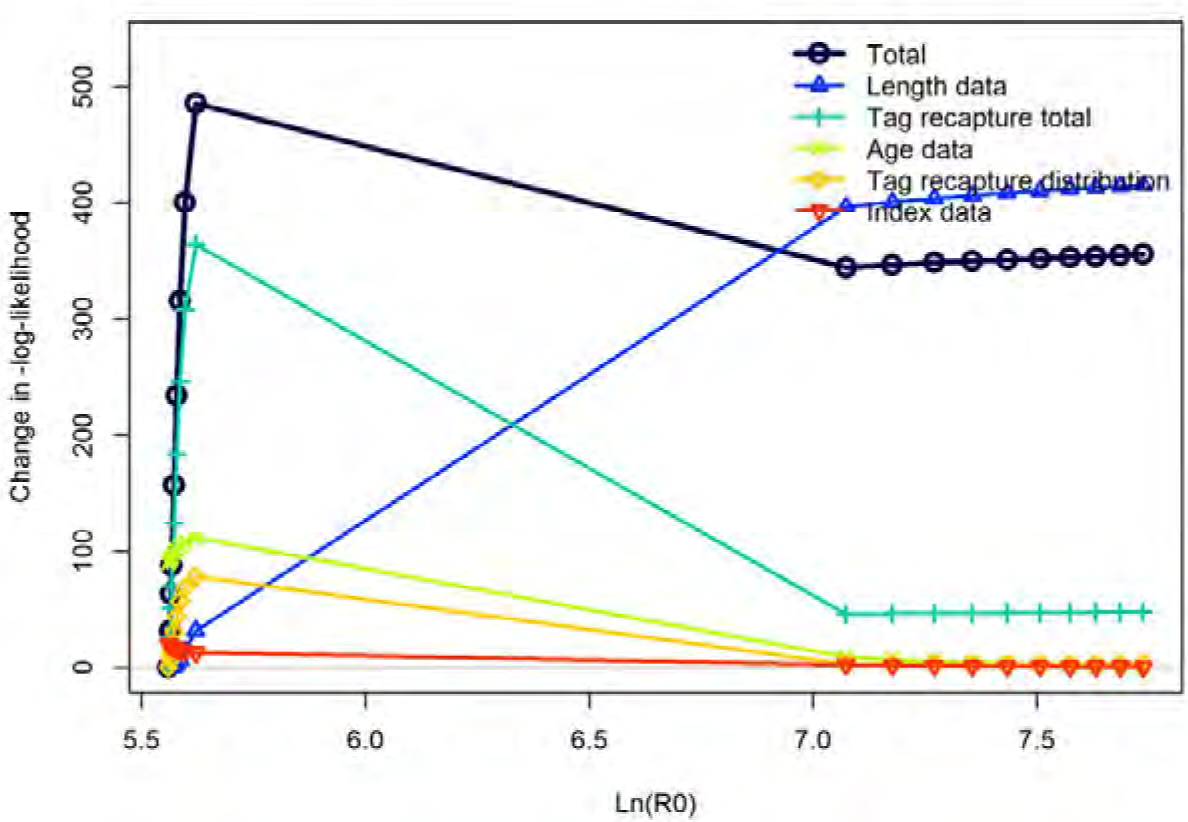
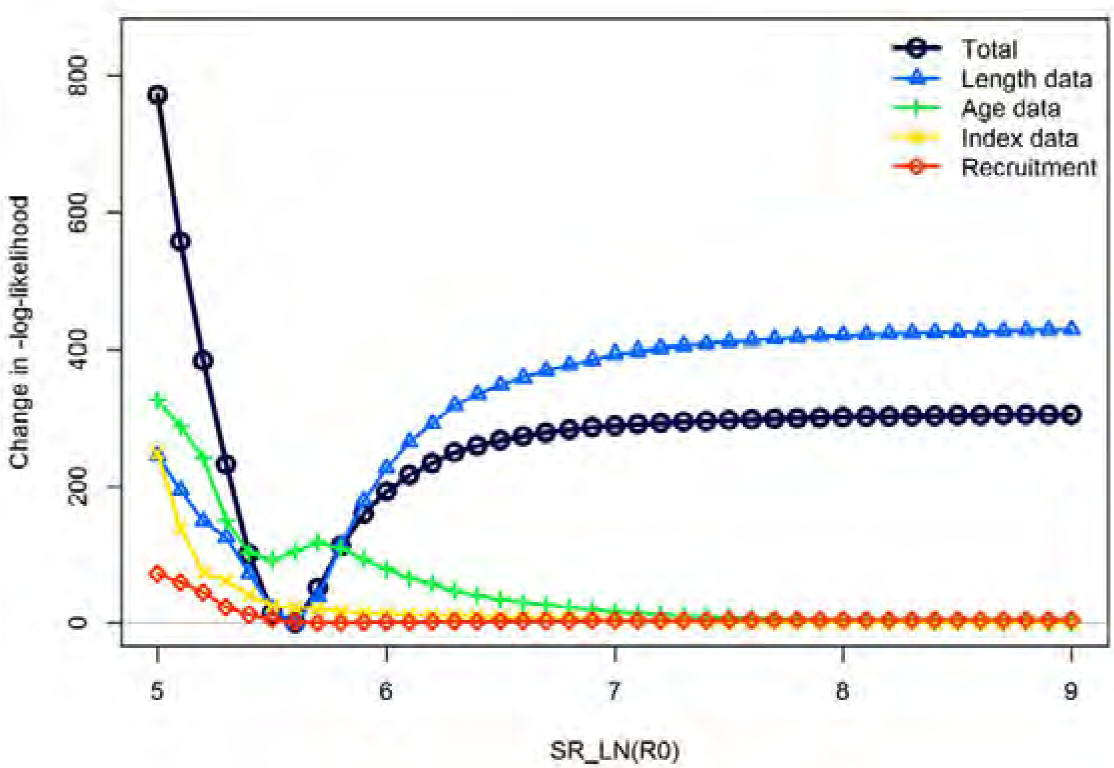


Fig. 7. Likelihood profile over the unfished recruitment from the model without the tag data. The change in the negative log likelihood relative to the minimum negative log likelihood on the y-axis.



The Southeast Area Monitoring and Assessment Program (SEAMAP), formed in 1981, is a State/Federal/University program for the collection, management and dissemination of long-term standardized fishery independent data in the southeastern United States. SEAMAP provides essential fishery independent data for evaluating the status of the Nation's fisheries through the SouthEast Data, Assessment and Review (SEDAR) process, in addition to supporting the regional fishery management councils and enhanced requirements of the Magnuson-Stevens Reauthorization Act.

While SEAMAP's Congressional appropriation has increased since 2013, the amount available for collecting valuable fishery independent has actually decreased for a variety of reasons. Taxes and assessments on SEAMAP's budget now constitute almost 16% of the total SEAMAP appropriation. Taxes and assessments were only 5% in FY2014. Level funding also has impacted days at sea, the number of stations sampled, and the amount of fishery independent data collected. With increasing vessel and personnel costs each year, level funding leads to cuts in data collection.

	FY2013	FY2014	FY2015	FY2016
Congressional Appropriation	$4,779,000	$5,117,000	$5,125,000	$5,125,000
Amount to SEAMAP	$4,424,629	$4,849,906	$4,379,364	$4,313,068

SEAMAP has used other funding sources to help gather critical fishery independent data, but these external funding sources cannot continue to support future SEAMAP sampling. Several states in the Gulf of Mexico have received National Fish and Wildlife Federation (NFWF) grants from NFWF's Gulf Environmental Benefit Fund related to the 2010 Deepwater Horizon oil spill. These SEAMAP partners use the grants to supplement SEAMAP funding and add days at sea to existing SEAMAP surveys or to wholly participate in surveys where SEAMAP funding limitations do not allow them to participate. NFWF supports approximately $4 million in SEAMAP related fishery independent data collection in the Gulf of Mexico. Over the next several years, NFWF grants will be running out and future data collection will be lost unless SEAMAP receives increased funding. State partners have also contributed approximately $500,000 to SEAMAP data collection activities. With limited state budgets, state partners cannot continue to support SEAMAP in this way.

NOAA Fisheries has had an almost 33% decline ($974K down to $659K annually) in SEAMAP funding. Current funding no longer supports payment for plankton sample processing at the Polish Sorting Center with annual funding supported through other SEFSC funding sources. NOAA Fisheries has seen significant reduction in survey support funding for overtime, travel, supplies and equipment with subsequent surveys costs shifted to other SEFSC funding sources. NOAA Fisheries has also seen their SEAMAP staff reduced by 2 employees.

Level funding in the future will lead to the SEFSC's inability to support funding the Polish Sorting Center for the processing of state and federal SEAMAP ichthyoplankton samples. Continued shifting of SEAMAP support to other SEFSC funding sources, potentially impacting the ability of the SEFSC to conduct other regional research activities.

All of the funding reductions detailed below are comparisons between the start of the last 5 year funding cycle (FY2011) and the beginning of this current funding cycle (FY2016).

SEAMAP – South Atlantic

Coastal Trawl Survey

Since the Coastal Trawl Survey's inception in 1986, this survey has provided long-term, fishery independent data on seasonal abundance and biomass of numerous species, including bony fishes, sharks and rays, crustaceans, and cephalopods. In recent years, the survey has also begun collecting data on sea turtles and horseshoe crabs. As the only coastal trawl survey that encompasses the entire Southeast region, the sampling area includes the coastal zone of the South Atlantic Bight from Cape Hatteras, North Carolina, to Cape Canaveral, Florida. Multi-legged cruises are conducted in spring (early April - mid-May), summer (mid-July - early August), and fall (October - mid-November). The Coastal Trawl Survey has provided important data to stock assessments for Spanish mackerel, king mackerel, Atlantic menhaden, spot, and croaker.

- Reduction of funding from $561K to $511K.
- Reduction of sampled stations from 201 to 112.
- Current funding support is for only 50 sea days when about 60 sea days are needed to sample all 112 stations.
- Significant reduction in collecting and processing life history information, including complete elimination of all diet studies.
- Reduction in staff by 1.

Expected reduction in the near future unless additional funding is available:

- Reducing sampling from 3 seasons per year (spring, summer, and fall) to 2 seasons per year. This will reduce the amount of data available for stock assessments by one-third.

Reef Fish Survey and Habitat Characterization

The goal of the SEAMAP-SA Reef Fish Survey is to assist with the expansion of the geographical sampling coverage of the current fishery independent surveys, focusing on either shallow or deep potential live-bottom areas. Designed as a complement to the Marine Resources Monitoring, Assessment and Prediction (MARMAP) program, the Reef Fish Survey funding allows for expanded sampling in marine protected areas (MPAs). The Reef Fish Survey data have been used in stock assessments for red porgy, gag grouper, vermillion snapper, black sea bass, blueline tilefish, snowy grouper, hogfish, gray triggerfish, and red snapper.

- Reduction in funding from $550K to $468K.
- Elimination of an entire program component: the gag ingress study.
- Reduction of number of sea days for the Reef Fish Survey from 35 to 19.5, and a reduction of an equivalent amount of data for stock assessments.
- Reduction of 6 months staff support of data management to include reef fish data into the SEAMAP data base.
- Reduction of 3 months staff support to process life history samples.

Expected reduction in the near future unless additional funding is available:

- Further reduction in sea days or elimination of survey components such as longline sampling. Loss of ability to provide data for stock assessments and management.

- Also, staff has been providing analyses for stock assessments, participated in data workshops, and presented regular updates to SAFMC and others. With a further reduction in staff, we may no longer be able to do this.
- Further reduction in life history processing.

South East Regional Taxonomic Center

The South East Regional Taxonomic Center maintains a reference specimen collection and searchable library for the South Atlantic. To address SEAMAP-SA goals, SERTC concentrates work on stomach content analysis and deciding on level of identification necessary. Additionally, archiving and storage of otoliths and gonadal tissues has proven to be essential for stock assessments.

- Reduction in funding from $82K to $5K.
- This funding reduction all but eliminated SERTC, with the exception of some support to maintain the collections.
- The most serious impact has been the inability to continue support for diet studies that are crucial to ecosystem based fisheries management.

Expected effects in the near future unless additional funding is available:

- Full elimination of SERTC and loss of valuable specimen collections.

Data Management

The primary goal of the SEAMAP-SA Data Management System is to bring all types of SEAMAP-SA project data together into one centralized database that can be accessed by federal and state agencies for things such as stock assessments as well as the public. The data system is envisioned as a relational database for, but not limited to, the long-term surveys (SEAMAP-SA Coastal Survey, the NCDMF Pamlico Sound Survey), the state Coastal Longline Surveys, the Reef Fish Survey.

- Although data management funding increased from $113K to $125K, this merely allowed maintenance of at least one full time staff to manage and update the SEAMAP database.
- SCDNR contributes to server and other hardware maintenance costs, Oracle licensing costs, and internet security and IT support staff for maintaining the SEAMAP-SA data management system. Without these contributions, SEAMAP-SA would not be able to maintain the current level of data management and public access to the SEAMAP-SA data.

Expected effects in the near future unless additional funding is available:

- Inability to include survey data into the SEAMAP database. This may impede the use of the data for stock assessments and management, and complicate compliance with the PARR requirements.

South Carolina Coastal Longline Survey

The South Carolina Coastal Longline Survey is designed to provide a long-term fishery independent database on the distribution, relative abundance, catch per unit effort, size distribution and age composition of adult red drum along the coast of South Carolina.

Additionally, the survey provides information on the relative abundance, size distribution, sex, and maturity of multiple species of small and large coastal sharks.

- Reduction in funding from $74K to $67K.
- Reduction of number of sea days from 15 to 10, and a reduction of an equivalent amount of data for stock assessments. This means that there is no support to sample the full number of sampling stations (sea days needed: 14 days)
- Reduction of supported staff from 12 to 9.5 months.
- SEAMAP-SA contributes only contributes to 46% to 48% of the total survey, other funding must be supplemented and is not dependable.

Expected effects in the near future unless additional funding is available:
- Further reduction in sea days and possible elimination of entire survey.

<u>North Carolina Pamlico Sound and Coastal Longline Survey</u>
The North Carolina Pamlico Sound Survey was designed to provide a long term fishery independent database on the distribution, relative abundance, and size composition of estuarine fish and decapod crustaceans for the Pamlico Sound and associated rivers and bays. Sampling occurs in June and September annually. The Pamlico Sound Survey data has been used for state-managed species such as blue crab, kingfish, and Southern flounder. The data also have been used in ASMFC stock assessments and triggers for weakfish, spot, croaker, Atlantic menhaden, and summer flounder. The North Carolina Coastal Longline Survey is designed to provide a long term fishery independent database on the distribution, relative abundance, catch per unit effort, and size distribution of adult red drum for waters of the Pamlico Sound. Coastal Longline Survey data were used in the red drum stock assessment with the potential of being used in the coastal shark assessments.

Reduction in funding from $112K to $101K.
- Additional funding sources total about $25K annually to keep the surveys running.
- Currently, the surveys are below the funding floor to keep sole staff member allocated to SEAMAP.
- The only reason this survey has been operational until this current funding cycle was staff turnover throughout the grant duration. Unused salary allowed the survey to meet grant objectives.
- Chief scientists' and state staff time for SEAMAP cruises are not accounted for in SEAMAP funding.

Expected effects in the near future unless additional funding is available:

- Inability to include NC survey data (Sound Survey and Longline) into the SEAMAP database. This may impede the use of the data for stock assessments and management, and complicate compliance with the PARR requirements.
- Reduction in number of NC field longline days and a reduction of an equivalent amount of data for stock assessments. This means that there is no support to sample the full number of sampling sites/weeks (72 samples). One week of sampling would be omitted and precision in estimates would be reduced.

Georgia Coastal Longline Survey

Presently, the Georgia Coastal Longline Survey is conducted from May to December. Its random stratified design samples 25 sites monthly (May-August) and adds 10 stations in North Florida for the fall red drum sampling (September to December). The spring and summer (May-August) sampling targets primarily coastal shark species. These information have been used in HMS stock assessments. The red drum data have been included in the recent ASMFC stock assessment.

- Reduction in funding from $86K to $72K.
- Total cost of survey is $140K so funding has been supplemented through other sources for years. Currently, supplemental funding has ceased so survey will need to be modified to match funding outlook.
- Hourly staffing issues: The bulk of the field staff funded on this project have always been hourly part-time employees (PTEs). This dramatically reduced the cost by eliminating the Department's full-time employee (FTE) fringe rate. However, recent Department policies in regard to the Affordable Care Act have limited PTEs to 29 hours per week, or 40 hours per week for no more than 168 consecutive days (24 weeks). Given most sea days exceed 10 hours, the 29 hours per week policy is restrictive, and the 40 hours per week for 24 weeks policy results in constant personnel turnover. Additionally, any PTE working over 40 hours in a week must be paid overtime at a 1.5 times rate.
- Full-time staffing issues: Although this project makes up the bulk of the vessel captain's time from May-December, no SEAMAP funds are directly associated with this position. Fifty percent of the Chief Scientist's time is occupied by this project May-December while none of this time is included in the budget. There is also no time accounted in the grant for data management and analyses conducted by the project P.I.'s.
- SEAMAP presently covers a little more than 50% the costs to fund this survey May to December (8 months, 44 sea days). GADNR has offset the annual costs for years with a combination of state and other federal fund sources to cover personnel services and vessel maintenance. However, these funds continue to be cut and can no longer support 8 months (44 sea days) of sampling.
- The FY2016 budget will eliminate two months of sampling (May and December are proposed), reducing total sea days from 44 to 33.

Expected effects in the near future unless additional funding is available:

- Modify the sampling periodicity to something greater than monthly – every six weeks or every other month
- Eliminate summer sampling – this will impact information collected for shark species. Reduces sea days from 44 to 24.
- Eliminate fall sampling – this will impact information collected for adult red drum. Reduces sea days from 44 to 20.

SEAMAP – Gulf of Mexico

Spring Plankton Survey

The SEAMAP Spring Plankton Survey began in 1982, with the objectives of collecting ichthyoplankton samples in offshore waters of the Gulf of Mexico. Data from the Spring Plankton Survey are used to calculate the abundance and distribution of Atlantic bluefin tuna larvae that are used in stock assessments. Data have also been used in response to the Deepwater Horizon oil spill to determine the larval fish that were likely to be affected by the spill.

- State participation has been reduced by 5 days at sea since 2011.
- Approximately 14 stations will not be sampled due to funding limitations.
- Current funding levels do not allow additional sea days to allow for mechanical or weather delays that may further reduce the number of stations sampled.

Bottom Longline Survey

The SEAMAP Bottom Longline Survey began in 2007, complementing an existing long-term fishery independent longline survey currently conducted by NOAA Fisheries. The SEAMAP Bottom Longline Survey gathers data on coastal shark and finfish species within the shallow waters of the north central Gulf of Mexico. The data are used in stock assessments for coastal sharks and finfish.

- The Bottom Longline Survey design was changed in 2015 to standardize station selection. This design change does not allow a direct comparison between 2011 and 2016 sampling effort.
- The Bottom Longline Survey is currently at a bare minimum of stations where the Survey will be severely impacted if additional stations or survey seasons have to be dropped due to increased costs and level funding.

Vertical Line Survey

The SEAMAP Vertical Line Survey began in 2010 and samples reef fish over artificial reefs, oil and gas platforms, and natural reef areas. Data are used in reef fish stock assessments and provide estimates of natural mortality, fishing mortality, age and fecundity, and abundance estimates.

- The Vertical Line Survey has expanded from 2 states to 3 states now participating.
- Level SEAMAP funding has maintained 38 days at sea while the geographic coverage has increased from off Alabama and a small section of Louisiana to all of Texas, Louisiana, and Alabama.
- Mississippi and Florida use funding from NFWF grants to cover their participation in the Vertical Line Survey.

Reef Fish Survey

The objective of the SEAMAP Reef Fish Survey, which began in 1992, is to assess relative abundance and compute population estimates of reef fish found on natural habitat in the Gulf of Mexico. Relative abundance and life history data from the survey have been used in stock assessments for red snapper, gray triggerfish, gag grouper, red grouper, and greater amberjack.

- Only NOAA Fisheries and Florida participate in this habitat mapping and stationary video camera survey.
- NFWF and Sportfish Restoration funds support the majority of Florida's data collection in this survey.
- SEAMAP funds only support data collection at 75 stations while other funding sources support data collection at 185 stations.

Summer Shrimp/Groundfish Survey

The SEAMAP Summer Shrimp/Groundfish Survey began in 1982 to monitor size and distribution of penaeid shrimp during or prior to migration of brown shrimp from bays to the open Gulf; (2) to aid in evaluating the "Texas Closure" management measure of the GMFMC Shrimp FMP; and (3) to provide information on shrimp and groundfish stocks across the northern Gulf of Mexico from inshore waters to 60 fm. Data from the survey are used in evaluating the abundance and size distribution of penaeid shrimp in federal and state waters to assist in determining opening and closing dates for commercial fisheries; evaluating and plotting the size of the hypoxic zone off of Louisiana; assessing shrimp and groundfish abundance and distribution and their relationship to such environmental parameters as temperature, salinity, and dissolved oxygen; and providing juvenile abundance indices for red snapper, yellowedge grouper, and red grouper stock assessments.

- 12 days at sea representing a loss of approximately 90 stations have been lost due to level funding since 2011.
- Currently there are no back up days for bad weather or mechanical breakdowns. If bad weather occurs or if the vessel breaks down, those sea days are simply lost with no way to sample the impacted stations.
- Florida will use NFWF funds in 2016 to cover their decrease in SEAMAP funding. Without NFWF funding, the majority of the west Florida shelf would not be sampled in 2016.

Fall Plankton Survey

The SEAMAP Fall Plankton Survey began in 1984 and collects ichthyoplankton samples with bongo and neuston gear for the purpose of estimating abundance and defining the distribution of eggs, larvae, and small juveniles of Gulf of Mexico fishes, particularly king and Spanish mackerel, lutjanids, and sciaenids. Data provide a larval index for king mackerel, gray triggerfish, and red snapper that are used in stock assessments. Data have also been used in defining EFH for penaeid shrimp, Spanish mackerel, king mackerel, vermilion snapper, and red snapper.

- 6 days at sea will be lost in 2016 due to level/decreased SEAMAP funding.
- Due to lack of funding and vessel problems, the 2015 Fall Plankton Survey was not able to be completed. Not enough stations were sampled, so data from the 2015 Fall Plankton Survey will not be available for future stock assessments. Usually other partners can sample additional stations if vessel problems prevent a partner from sampling their stations. The lack of SEAMAP funding did not allow this to happen in 2015.

Fall Shrimp/Groundfish Survey

The SEAMAP Fall Shrimp/Groundfish Survey began in 1985. Data from the survey are used in evaluating the abundance and size distribution of penaeid shrimp in federal and state waters to assist in determining opening and closing dates for commercial fisheries; assessing shrimp and groundfish abundance and distribution and their relationship to such environmental parameters as temperature, salinity, and dissolved oxygen; and providing juvenile abundance indices for red snapper, gray triggerfish, and yellowedge grouper stock assessments. Data were also used to estimate shrimp fishery bycatch in the red snapper stock assessment.

- SEAMAP began sampling the west Florida shelf in 2008 as part of the Fall Shrimp/Groundfish Survey.

- Level funding has limited Florida's ability to participate in the Fall Shrimp/Groundfish Survey. Florida did not participate in 2011 and 2012 and very few stations were sampled off Florida during these two years.
- NFWF funding has allowed Florida to again participate in the Fall Shrimp/Groundfish Survey and sample approximately 160 stations on the west Florida shelf.
- Other states have lost an additional 4 days at sea since 2011.
- NFWF funds that supported Florida's participation in the Fall Shrimp/Groundfish Survey will probably be shifted in 2016 to support more of their work during the Summer Shrimp/Groundfish Survey. This will likely mean very few stations on the west Florida shelf will be sampled during the 2016 and future Fall Shrimp/Groundfish Surveys.

Winter Plankton Survey

The SEAMAP Winter Plankton Survey began in 1983, but because of budget limitations, only took place sporadically until 2007. An abbreviated survey was begun in 2007 with full surveys conducted in 2008, 2009, 2012, 2013, and 2015. The Winter Plankton Survey is now a biannual survey. The objectives are to assess the occurrence, abundance and geographical distribution of the early life stages of winter spawning fishes from the mid-continental shelf to deep Gulf waters. The data are used in stock assessments for various grouper species, mullet, and menhaden.

Atlantic States Marine Fisheries Commission

Tautog Management Board

October 25, 2016
1:15 – 3:15 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order (*A. Nowalsky)*	1:15 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	1:15 p.m.
3.	Public Comment	1:20 p.m.
4.	Review 2016 Stock Assessment Update (*J. McNamee*)	1:30 p.m.
5.	Provide Plan Development Team Guidance on Draft Amendment 1 (*A. Harp & A. Nowalsky*)	2:10 p.m.
6.	Update on Tautog Tagging Trial (*A. Harp*)	3:10 p.m.
7.	Other Business/Adjourn	3:15 p.m.

The meeting will be held at the Harborside Hotel; 55 West Street; Bar Harbor, ME; 207.288.5033

MEETING OVERVIEW

Tautog Management Board Meeting
October 25, 2016
1:15 – 3:15 p.m.
Bar Harbor, Maine

Chair: Adam Nowalsky (NJ) *Assumed Chairmanship: 05/15*	Technical Committee Chair: Jason McNamee (RI)	Law Enforcement Committee Representative: Jason Snellbaker
Vice Chair: David Simpson (11/15)	Advisory Panel Chair: VACANT	Previous Board Meeting: August 2, 2016
Voting Members: MA, RI, CT, NY, NJ, DE, MD, VA, NMFS, USFWS (10 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Review the 2016 Stock Assessment Update (1:30 – 2:10 p.m.)

Background

- A benchmark stock assessment for a three-region management approach was approved for management use in February 2015. A regional stock assessment (using the same methodology as the benchmark) for a four-region management approach was approved for management use in August 2016.
- At the August 2016 meeting, a four-region management approach was selected for inclusion in Draft Amendment 1.
- The 2016 update includes data through 2015 for the four regions + coastwide **(Briefing Materials)**

Presentations

- Presentation of the Stock Assessment Update by J. McNamee Report

5. Provide Plan Development Team Guidance on Draft Amendment 1 (2:10 – 3:10 p.m.)

Background • The PDT has developed the background sections for Draft Amendment 1 and will begin developing management options for each region + coastwide (status quo) after the annual meeting and based on stock status. The PDT Chair will provide an overview of the management categories and the Board will have the opportunity to suggest specific management measures be included in the document.
Presentations • Discussion facilitated by A. Nowalsky, Chair • Presentation of Draft Amendment 1 management categories by A. Harp
Board Guidance • Provide the PDT guidance on options in the draft amendment on reference points (See reference point guidance document (**Supplemental Materials**), rebuilding timeframes, monitoring, commercial and recreational regional measures.

6. Update on Tagging Trial (3:10 – 3:15 p.m.)
Background • The Law Enforcement Sub-Committee developed objectives for a commercial harvest tagging program, selected tags to test and reviewed the design of a tautog tank trial to test the feasibility of applying tags to live tautog. • The tank trial, led by New York Division of Marine Resources and Stony Brook University, began on September 28, 2016. The trial was delayed because it was difficult to find enough tautog at any one time for the trial—the pots were in the water for approximately two months. In total, 15 tautog received tags and 6 are untagged for controls. • A final report will be presented at the February 2017 meeting.
Presentations • Tautog Tagging Trial Update by A. Harp
Board Guidance • The Board can instruct the PDT to include the potential for a tagging program under adaptive management in Draft Amendment 1. It would allow a tagging program to be fully developed in an addendum at a later date.

7. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

TAUTOG MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
August 2, 2016

These minutes are draft and subject to approval by the Tautog Management Board
The Board will review the minutes during its next meeting

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INDEX OF MOTIONS

1. **Approval of Agenda by Consent** (Page 1).

2. **Approval of Proceedings of February, 2016 by Consent** (Page 1).

3. **Move to approve the Long Island Sound and New Jersey-New York Bight stock assessment and peer review report for management use** (Page 12). Motion by Dave Simpson; second by Bill Adler. Motion carried (Page 13).

4. **Move to approve four region management approach for Tautog Draft Amendment 1** (Page 16). Motion by Tom Fote; second by Bill Adler. Motion carried (Page 18).

5. **Motion to adjourn by Consent** (Page 22).

ATTENDANCE

Board Members

David Pierce, MA (AA)
Dan McKiernan, MA, Administrative proxy
William Adler, MA (GA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)
Bob Ballou, RI, proxy for J. Coit (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Rep. Craig Miner, CT (LA)
Dave Simpson, CT (AA)
John McMurray, NY, proxy for Sen. Boyle (LA)
James Gilmore (AA)
Steve Heins, NY, Administrative proxy
Emerson Hasbrouck, NY (GA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
John Clark, DE, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Michael Luisi, MD, proxy for D. Blazer (AA)
Rachel Dean, MD (GA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Joe Cimino, VA, proxy for J. Bull (AA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Derek Orner, NMFS
Wilson Laney, USFWS

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Jason McNamee, Technical Committee Chair

Staff

Bob Beal
Toni Kerns
Tina Berger
Pat Campfield
Megan Ware
Ashton Harp
Katie Drew
Amy Hirrlinger

Guests

Mike Millard, USFWS
Debra Lambert, NOAA
Colleen Giannini, CT DEEP
Justin Davis, CT DEEP
Brandon Muffley, NJ DFW
Mike Armstrong, MA DMF
Doug Christel, MA F&G
Steve Doctor, MD DNR
Lynn Fegley, MD DNR
Jeff Deem, VMRC
Jack Travelstead, CCA
Braxton Davis, NC DNR
Aaron Kornbluth, PEW
Arnold Leo, E. Hampton, NY
Raymond Kane, CHOIR
Jenny Zeng, Ofc. of NYS Governor, DC
Jacob Kasper
Andrew Shiels, PA Fish & Boat Comm

The Tautog Management Board of the Atlantic States Marine Fisheries Commission convenedin the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2016, and was called to order at 12:53 o'clock p.m. by Chairman Adam Nowalsky.

CALL TO ORDER

CHAIRMAN ADAM NOWALSKY: Good afternoon, everyone. I would like to call to order the Tautog Management Board.

APPROVAL OF AGENDA

CHAIRMAN NOWALSKY: Our first order of business this afternoon will be to approve the agenda as has been provided. Are there any changes to the agenda? Seeing none; is there any objection to acceptance of the agenda, as provided? Therefore, the agenda is adopted by consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN NOWALSKY: Our next order of business is approval of the proceedings from the February, 2016 board meeting; any discussion about those proceedings? Any objection to accepting them as provided? Seeing none; they are hereby accepted.

PUBLIC COMMENT

CHAIRMAN NOWALSKY: Our next order of business will be public comment for any items that are not on the agenda today. Is there any member of the public that would like to comment on anything not on the agenda? Seeing none; we'll move right along.

REGIONAL STOCK ASSESSMENTS REPORTS

CHAIRMAN NOWALSKY: We'll next go through a couple of presentations about the regional stock assessments that have been done for Long Island Sound and the New Jersey/New York Bight regions. What we'll do is we'll receive those reports on those two assessments. After those two reports have been given, we'll stop and pause for any questions that pertain to those reports.

We'll then go on to the presentation of the Peer Review Panel report, stop after that for questions, and then at that point the decision point before the board would be whether to accept those for management use. We're not making the decision about the amendment; we'll have that discussion afterwards, but we'll just have to decide whether to accept those assessment reports for management use. With that, I'll turn to Ashton, and she can direct the discussion of those stock assessments.

LONG ISLAND SOUND STOCK ASSESSMENT REPORT

MS. ASHTON HARP: I'm actually going to turn it over to Jacob to begin the Long Island Sound Stock Assessment report.

MR. JACOB KASPER: First of all, I would like to thank everybody who is involved in producing the Long Island Sound Stock Assessment and the New York/New Jersey Bight Stock Assessment; Dr. Eric Schultz, my advisory at UConn; Jeffrey Brust, unfortunately he can't be here today, and Jason McNamee is going to be presenting in his absence.

Greg Wojcik, Sandy Dumais, Dr. Katie Drew, Ashton Harp and there was significant input from the Technical Committee and the Stock Assessment Subcommittee. We're presenting here the Long Island Sound Stock Assessment, which is shown in green/yellow, and also the New Jersey/New York Bight, which is shown in orange.

Previously, tautog was assessed by a single stock unit. But there are some flaws in the coastwide single stock unit assumption, such as regional differences in the fishery, strong site fidelity, localized spawning, and variations in life history. In response to that in the previous benchmark stock assessment, an alternative stock assessment structure was presented with three regions.

One was a southern New England, which included the Connecticut portion of Long Island Sound; the region further south from that was the New York/New Jersey, which included a portion of Long Island Sound. There was a highly regarded alternative to that, which grouped Connecticut with New York and New Jersey.

What we're presenting here is a Long Island Sound specific stock assessment, so we've split Long Island into north and south, and the north going to Long Island Sound and the south going to the New York/New Jersey Bight region. This keeps Long Island Sound as a continuous region. In addition to that, new data was accessed and included in this stock assessment.

This stock assessment runs from 1984 to 2014. We have recreational harvest and discards. For the recreational discards we've assumed a 2.5 percent mortality rate, which is consistent with the benchmark stock assessment. Commercial harvest runs from 1984 to 2014. Commercial discards were not included.

The commercial harvest is about 10 percent of the recreational harvest, and obviously, the discards are much lower than that. There wasn't enough data available to estimate that efficiently, so those were not included. There is fishery-independent survey data, fishery-dependent indexes included and also the biological samples are both fishery independent and dependent.

Data was treated in the following manner. Connecticut data was used as is with the assumption that all Connecticut harvest comes from Long Island Sound. New York had to be split to Long Island Sound and South Shore. For the recreational data, starting in 1988 there was a Long Island specific area code; which made the partitioning pretty straightforward.

Prior to that, there was no Long Island Sound specific area code, so we had to use a multiyear average to fill in those earlier years. Similarly, with commercial data, the Long Island Sound VTR statistical area started to be used in 1986, and then prior to that, we used the multiyear average. This is the harvest in metric tons for the time series for Long Island Sound.

As you can see, in the early decade and a half or so of the time series, we have a general decreasing trend and harvest. Since then, there have been pretty inter-annual fluctuations, but the harvest has generally increased. The next figure is the Long Island Sound catch-at-age. On the left we have on the Y axis the age of the fish, and on the X axis is the years. What we can see is in most recent years we have fewer older fish, and fewer smaller fish.

Obviously, the fewer younger fish are following increased regulation of minimum length. The indices included in this assessment are the Connecticut/Long Island Sound Trawl Survey, which is an adult index, the MRFS Catch-Per-Unit-Effort Index, which is also an adult index, New York Trawl Survey, which was used as an Age 1 index and two portions of the western Long Island Sand Survey, which is a young-of-the-year survey. Those sites are from Little Neck Bay and Manhasset. Generally, we see a decreasing trend in all these indices, some inter-annual variations as well. But the indices follow each other; the trends are pretty similar in the indices. The results of our model are as follows: we have our F and in red we have the three-year-average for fishing mortality.

We can see generally increasing F over the time series. Spawning stock biomass is generally decreasing over the time series, and the number of recruits is generally decreasing over the time series; with one large recruitment event most recently in 2013. The Technical Committee approved MSY as the biological reference point for this stock assessment.

There is a strong fit to the stock recruit relationship. We have included the SPR reference points for this, because the New Jersey/New York Bight region relied on SPR reference points. For MSY the target is Fmsy and the threshold is the F that produces 75 percent MSY. In either of these approaches, MSY or SPR were1 both in overfishing and have been overfished.

Looking at the stock status over time, including our target and threshold for fishing mortality, we can see that most of the last ten years, we hit it above our threshold. Here the orange color line is our three year F average. For spawning stock biomass, we are below our threshold for most of the last ten years.

To address model uncertainty, we looked at sensitivity to input data, so we dropped various indices in the survey. We added Millstone Survey Data; Millstone is a power plant in Connecticut which has collected larvae and egg abundances for a number of years tautog; so we included that in one of the sensitivity analyses.

We started in 1988 to eliminate estimation of landings in the early years. We ran it as using a 15-year-plus group instead of a 12-year-plus group, which is the base model. Then to address the issues of estimating the New York harvest, both recreational and commercial in the early years, for those early years we either included all of the New York harvest into Long Island Sound, or we excluded all of the New York harvest into Long Island Sound; to kind of look at the extremes of those assumptions impacted our stock assessment.

We also looked at sensitivity to model structure. We merged our selectivity blocks three and four into one selectivity box, and we ended up with three selectivity blocks. Then retrospective analysis was performed using a six-year peel. Please note that this crosses a selectivity block. There is nothing outstanding in the retrospective analysis, and there are extra slides if people are interested.

The sensitivity results are shown here. We have SSB trajectory. Again, a general decline over the time series and all of the different analyses are relatively similar. For F average, in each of the sensitivity analyses are quite similar and we have a general trend of increasing F. For estimating the number of recruits, generally decreasing over time, similar patterns in all the sensitivity analyses and the strong recruitment event in 2013 is pretty consistent.

Stock status sensitivity. Because of time constraints, we weren't able to calculate F threshold for each sensitivity analysis. Presented here is the terminal F, relative to Fmsy; which is the target and not the threshold. Generally, what we see is terminal F is larger than Fmsy in all but one of our sensitivity analyses. The results of this assessment are that the model is robust to input data and model configuration. The stock is overfished and overfishing is occurring. The status is reasonably consistent with the alternate regional model configuration from the benchmark. In here I presented -- you can see the Long Island Sound MSY and SPR approaches as you've already seen, and in the last column is the Southern New England MSY from the previous benchmark. The trends are quite similar in all of these. That's what I have for Long Island Sound.

CHAIRMAN NOWALSKY: Thank you very much, Jacob, we'll go to Jay next to do the New York/New Jersey Bight, and then we'll come back to questions on both of these reports.

NEW YORK/NEW JERSEY BIGHT STOCK ASSESSMENT REPORT

MR. JASON McNAMEE: My name is Jason McNamee; I work for the Rhode Island Division of Marine Fisheries. Jeff Brust from New Jersey, who is the analyst on this assessment, couldn't attend; so I offered to pinch hit for him. I was involved enough that I think I have a decent feel for it, and Jeff and I talked a lot before this meeting; developing this presentation.

The format. It is very similar to what you just looked at, so at least you'll be seeing the same types of information. Hopefully, you'll be able to track this fairly well. This is now -- we're calling it the New Jersey/New York Bight Assessment. What you can see is we're talking about this orange area now on there, so it is the entirety of New Jersey and the South Shore of New York's Long Island.

Data types. Just to know up front, these are all consistent with choices that were made for the benchmark assessment; more or less. But we used recreational harvest from 1984 to 2014, recreational discards for the same time period, the assumption being that 2.5 percent of them end up as removals.

Commercial harvest for the same time period, commercial discards are not included; and this was also consistent with the benchmark. We did some sensitivity testing on that in the benchmark; we didn't do that here, just because of the timeframe that we were working with. We used fishery-independent survey data, fishery-dependent index data and fishery-independent and fishery-dependent biological samples.

The treatment of the data. The New Jersey data, was used as is; meaning New Jersey was easy to deal with. We just had to grab the New Jersey data; didn't have to do anything special to it. The New York data was split by area, so we had the Long Island Sound piece of New York and the South Shore piece of New York.

Based on the work that Jacob did for the Long Island Sound version, we just removed the remaining New York harvest and that was attributed to the South Shore. The recreational data goes from '88 to 2014. Just as Jacob described, this is when we can kind of pick out, from the MRIP data, this Long Island Sound specific area code. We can kind of identify it as occurring in Long Island Sound.

Prior to that, we used a multiyear average harvest approach, just like Jacob described. Again, the South Shore is all of New York minus New York information that is attributed to Long Island Sound. Commercial data, very similar approach, '88 to 2014, used VTR statistical areas, how we kind of partitioned that information up. Then in the period of time when we didn't have that '84 to '87, we, again, used a multiyear average harvest approach. Here is a look at harvest. You can see the top graph there on the Y axis is metric tons, along the bottom is year. You can see a lot of inter-annual variability; not surprising, given that this is a predominantly recreational fishery, so it is very much dependent on the estimates coming out of MRIP. You see that jagged but basically, you had a higher period of harvest early in the time series that has dropped down to a lower harvest in more recent time.

The bottom chart there, the bubble plot, what you have on the Y axis there is age. It goes from Age 1 up to Age 12 going up the Y axis. Along the bottom, again, is year. The idea here, couple of things you can get out of these plots. I don't know that you get either of them from this plot; but you can track cohorts to some degree. I would show you if I could get my cursor up there, but I can't.

You can use your imagination. What you're looking at is you're following things up diagonally from left to right going up the Y axis, and what you want to see are those bubbles kind of getting smaller in size, and that is kind of the decay that occurs on a cohort through time. It is not as pronounced in this graph. You saw it in Jacob's graph pretty nicely, but as management measures went in, you see that shift in harvest.

I don't know, if you use your imagination, maybe you can see it there, as well, but it showed up real nice in the Long Island Sound version. Okay, the fishery independent information that went into this assessment, the New Jersey Ocean Trawl was the main fishery-independent trawl survey that went into this.

There was also MRFSS or MRIP Catch-Per-Unit-Effort Index that went into this assessment; both of those alias adult portions of the population. Then there was the Jamaica Bay Seine Survey, so this is a piece of the Western Long Island Seine Survey, but this is a piece that we thought was a little more applicable to this stock assessment region; and so we kind of peeled off that data and used that as a young-of-the-year index.

Model results. Just as Jacob described, top left is fishing mortality, so fishing mortality increases going up the Y axis; year increases going along the bottom left to right. What you see is a solid blue line. That is the actual point estimate year to year, it is the median estimate; and then there are some bounds of uncertainty. Those are the hashed lines; 95th and 5th confidence interval.

But for tautog, what we've done in the past and what also came out of the benchmark is a three-year average. A lot of that is due to the inter-annual variability we get, so we use a three-year average and that is what that red line is that seems a little bit smoother; going across the blue line there.

What you can see is that fishing mortality, beginning in the early 2000s to present, has been kind of increasing, again, with some variability. Top right hand side – is that your right, yes, it's your right too – is SSB, spawning stock biomass; same sort of information without that three-year average here. But you've got the solid line as your median, point estimate with bounds of uncertainty, and then bottom left hand side is recruitment information.

Again, the median estimate is the solid blue line there, and you can see, I think there was -- in this case, I'm not sure if it is 2012 or 2013, but later in the time series is a large recruitment event in this information as well, which is interesting.

Biological reference points. In the case of New Jersey/New York Bight, the MSY based reference points were deemed unreliable. There was a poor fit to the spawner-recruit relationship. There is an estimate of steepness that the model produces, and as it gets really close to one, what the model is telling you that there is no information with which to estimate that steepness parameter.

Take home point is we weren't able to use MSY based reference points here; we had to default to SPR based reference points for the New Jersey/New York Bight Stock Assessment. Based on what we agreed to in the benchmark assessment, the targets were 40 percent SPR metrics, and then the threshold was a 30 percent SPR metric; depending on which you're talking about F or SSB.

Again, these are consistent with the benchmark, and in the table there you can see what those targets and thresholds are for both fishing mortality and spawning stock biomass. I've got some graphs, so I won't linger on this too long; but it's here if you wanted us to flip back to it.

Stock status. Take home point here is that the New Jersey/New York Bight region is overfished, and overfishing is occurring. The top graph there is the stock status with regard to fishing mortality, and the orange hashed line is the threshold. The green dashed line is the target, and you can see, in particular when looking at the three-year average, which is the one that we're focused in on, we are above both the threshold and the target since the early 2000s for this region.

Bottom right hand side there is the stock status with regard to spawning stock biomass. Again, the green line is the target, orange line is the threshold, and you can see that spawning stock biomass has been below both for almost starting back in the early 1990s. It looks like it's kind of come up in the most recent period of time, and the uncertainty bounds kind of jump up above the threshold at least. But the terminal estimate for spawning stock biomass is below the reference point.

A little bit about model uncertainty. To test the sensitivity of the model to input data, we dropped individual surveys, reran and saw the effects. We also started in 1995, so that is a later start date to see the effect of some of the information that we interpolated.

Then we fixed the 1995 severe underestimation in the New Jersey recreational harvest. What we mean by that is there was as anomalously low estimate for New Jersey, which has a significant impact on the removals for that year, so we kind of looked at that; tested it by putting in a more averaged value, and so that was another sensitivity. You see how sensitive the model was to that single data point.

Sensitivity to the model structure. The base model had four selectivity blocks, but we added one with three selectivity blocks; and they are kind of outlined, there underneath the years. We chose the years based on major changes to the regulations during those periods.

Retrospective analysis. This was done just like Jacob noted. We did a six-year peel; that peel goes across the selectivity block. It is generally not a good idea to run retrospectives back over selectivity blocks; but the last selectivity block was so short for this model that there really wasn't much of an option there to get a decent retrospective peel, meaning the number of years you kind of go back and start the model over again. In general, nothing was particularly outstanding, so you can make that judgment for yourself. Here are some plots; the top left is average F. You can see that the majority of the sensitivity runs are all pretty tight, not wildly different from each other. I will note the one that catches your eye, or caught my eye, is that blue line that hangs down there. That is the three-block-selectivity run; that's what that is. Effect on F, fishing mortality. Just to the right of the average F plot is the spawning stock biomass, so it is SSB metric tons up the Y axis, year across the bottom; those all look pretty tight. Then recruits on the bottom, again nothing really remarkable there, none of the sensitivities indicated there is some major misspecification in the model.

Stock status sensitivity. I'll orient you to this plot. It always takes me a minute to kind of adjust my brain to what I'm looking at. Here what Jacob showed you, was this same plot, but just with respect to the target. Here we've got both the target and the threshold; so the threshold is blue; the target is the red color.

The different sensitivity runs are the groupings along the X axis there, so those are the different selectivities. What you want to see on this plot is you want those bars to be below one, so you can see on the Y axis one, when you go about one-third of the way up there. You want those bars to be below one; that would mean that you are at or below your target or threshold. What you see in each case here is that with all of the sensitivities, they are all giving the same information, and that is that stock status in this region is not good.

Some conclusions. The smaller regional scale was not as problematic as we anticipated. We were a little nervous going into this. We didn't know if things were going to hang together, and it did. That was good. The models are robust to the input data and the model configuration, as indicated by the sensitivity runs, and the status is consistent with the alternative regional configuration from the benchmark.

We can talk about that. I bet we should probably hold off on talking about that until we get to the Peer Review Panel report. But a long story short, if you look over on the right, there is kind of a grayed out section. That is the Long Island Sound, just so you could kind of look at it and compare. That is Long Island Sound SPR.

But the two comparisons are Long Island Sound, which the Technical Committee preferred MSY, so you can see those targets, thresholds and stock status. Then the New Jersey/New York Bight is just to the right of that, and so it gives you a little bit of a reference there and information in both cases is overfished and overfishing; there's a typo there, sorry about that.

TECHNICAL COMMITTEE RECOMMENDATIONS

MR. McNAMEE: Future assessments. The Technical Committee recommends conducting a benchmark assessment in 2021, so we'd like to dig back in, in a significant way in 2021; but we'll all do an update assessment in 2016. A lot of what we do will depend on the decisions that you make today. I think there are some important decisions that you all will be making later that will dictate how many updates we're doing in the end.

We're only proposing a single update at this time, but only because we don't know what the future holds at this point. When we get to 2016, we're poised to do an update in 2016, but we'll look at whether or not we need to, or we think it's recommended to add another update before that benchmark, which is a ways off. Okay, that is enough from me, so I will stop and take any questions you have. I think you can ask both Jacob and me any questions that you might have.

CHAIRMAN NOWALKY: Thank you, Jay, thank you, Jacob very much for those presentations. We'll turn to the board. We're going to have questions on these reports and the information presented therein. Then we'll get the peer review report, and make a decision whether to accept these for management use. Then we'll have the discussion about how to apply them to Draft Amendment 1. Questions? I had Jim Gilmore and then we'll go to Bill and Dan.

MR. JAMES GILMORE, JR.: That was a great presentation, guys. This question is actually for both of you. You can either team up or do them separately. It has to do with the data sources, and you probably know where I'm going with this. I think, Jason, when you talked about the Western Long Island Sound Study, and you separate out Jamaica Bay, it is pretty easy, because geographically, north and south of Long Island are pretty separate.

I guess overall you both separated the Long Island Sound, and then you had the South Shore of Long Island. But when you get out to the East End and it gets extremely dynamic, because you have the north side of the south fork and the south side of the north fork, and by Gardener's Island or whatever. There are actually three questions here. How did you actually separate all of that out, because that is a big management issue we're going to have to deal with, so how that works.

Secondly, depending on how you separate it out, how do you think that factors into the modeland how much uncertainty that may have added, because you're not exactly sure whether it was from Long Island Sound data or South Shore data. Lastly, we all know the unreported landings in this may be pretty significant, so how that was factored, and particularly for the retrospective analysis; because that could maybe change that from nothing exciting to maybe something significant. Thanks.

CHAIRMAN NOWALSKY: Great, and I'll turn to the presenters for attempts at those three.

MR. McNAMEE: I guess I'll start with your first question about the data, how did you parse it out? It's a good question. First I'll offer a note of thanks to Greg Wojcik from Connecticut, who did a lot of that work. There are a couple of different things going on here, so you've got recreational and commercial data.

It was pretty tricky, and Greg did a lot of work digging into the MRIP data looking at the information available in there. There is an area designation that is in there, so long story short, Greg was able to parse it out. He also did a little work on whether there was a lot of scatter in that information; whether there was reason to believe that yes, the area code is X but it could have been X plus Y; or he could have gone way out of Long Island and could have been fishing in Narragansett Bay or something like that.

From the information that we looked at, it seems pretty reasonable to assume that – and I think a lot of it has to do with the nature of tautog fishing – but we didn't feel that there was a lot of reason to believe that people were dispersing very far from the areas that they were reporting. Hopefully, that answers it on the recreational side. On the commercial side there is a little less information to work with. We worked with statistical area to the extent possible. As far as assumptions go, keep in mind that the commercial portion of the harvest is very small; so if we were off there the impact on the overall model is probably not – not to say it's not important – but it's not very impactful to the outcome.

There was a lot of work done on that very issue, because that is the difficult issue with creating this assessment. It is, in fact, why we did not do it originally. But a lot of work went into that. I think it is good work. The Technical Committee was pretty comfortable with that and felt we did as good a job as we could; and felt it was pretty reliable; anything to add, Jacob?

MR. KASPER: Not right now.

MR. McNAMEE: Great. While I've been yammering away, Jim, I forgot the second part of your question.

CHAIRMAN NOWALSKY: Jim's second question was about how the modeling accommodated those data issues.

MR. McNAMEE: Okay. I think, in general, the movement to the statistical model helps that. You don't have to assume that catch is known perfectly, so there is statistical estimation going on in the model. Again, I think what we produced was pretty reliable as far as tautog data goes; so I'm pretty confident that if we were off here and there, I don't think it would have large impacts on the results.

CHAIRMAN NOWALSKY: Comments regarding how unreported catch might have factored into the modeling.

MR. McNAMEE: I can't say too much about that, Jim, other than to say in the Long Island Sound version of the universe, there wasn't a big retrospective pattern. A lot of times when you have missing catch, that can be one of the way it manifests. It is not always the reason for retrospective patterns, but the retrospective in the Long Island Sound version was not bad at all.

If there is a lot of unreported catch, of course, it's not a good thing. That means we're not working with good information, but again with regard to the fact that we're using a lot of uncertainty in the model, and that we're estimating things statistically; I think that helps that to some degree. If it is massive, two or three times what the actual harvest is, that is a problem that's not going to be solved by statistical estimation of a model.

CHAIRMAN NOWALSKY: Jim, if you have any questions during the Coastal Sharks Board, you'll need to get somebody else to ask them for you; next up, Bill Adler.

MR. WILLIAM ADLER: Going back to one of those charts for the New York Bight, New Jersey one with the SSB. It showed a little up, turn up, not good enough yet, not up to the threshold. Any reason why all of a sudden that happened like that? Is that a good sign that something good is happening down there?

MR. McNAMEE: Conjecture on my part, but it is coincidental with some pretty significant regulations that went into place during that period of time. I don't know if that's the cause, but that is something that is coincidental with that uptick in SSB.

MR. DAN McKIERNAN: Jay and Jacob, later in this meeting we're going to be talking about a tagging program, for the reasons that I think we just mentioned, the unreported commercial catch. In our conversations with Law Enforcement, there is a feeling that the unreported commercial catch may be, in some discreet geographic areas, two or three times what is reported.

Our commercial quota is only 50,000 pounds in a year; and we've had some stunning busts with huge volumes of fish post season. There is that feeling. I don't know if you can address it either today or in the future. I think it probably should be addressed before we undertake such a massive administrative program to accomplish a solution to the problem; if the problem isn't really clearly manifested in the assessment.

Maybe not today, but maybe you could tease out those parameters in the assessment that could reveal we've accomplished some goal going forward, if we are solving this localized poaching issue. I guess that is my question. If we do solve the localized poaching issue, which parameters would reveal that in the model?

DR. KATIE DREW: Ideally, what we would hope to see would be some kind of response for the stock, so that if you eliminate the source of mortality that the overall total mortality on the stock would be less, and the stock would be able to grow faster. Right now, part of the problem is, the model really uses total catch as a way to scale some of the trends we see in the indices and in the age composition.

If you're missing catch, what you're going to see is the stock looks smaller than it really is, and fishing mortality looks higher, and the productivity of the stock looks lower, if you're taking out all these secret catches. The model can fit that. It just is basically thinking the catch that it sees is having more of an impact on the stock than it really is.

If we can eliminate some of this unreported catch, then hopefully, you would see the stock begin to recover, you'd see those F rates come down, and you'd see an uptick in the population. That ideally would be what we would want to look for. If there is a way we could get some better information on the scale of the problem, and a way that we can go back in time and maybe back calculate some of these things, we can try and look at that from sort of a modeling perspective. But ideally, the result of improving our control over the fishery removals would be a better stock.

CHAIRMAN NOWALSKY: Any other questions on these two reports before we go to the Peer Review Panel Report on them? Okay, seeing none, we'll turn to Pat.

PEER REVIEW PANEL REPORT

MR. PATRICK A. CAMPFIELD: Because we did follow up regional assessment work after the original benchmark peer review, the commission organized a desk review for these new regional assessments; as we've seen Jacob and Jay presented Long Island Sound and New Jersey/New York Bight results. That is what the desk reviewers evaluated. We had two technical peer reviewers. In combination and expertise in population dynamics, stock assessment modeling, statistics and tautog biology. Their review focused on the data inputs that were selected and used in the models, and the overall quality of the assessment. As you have received, the products from the work are the stock assessment report for both sub-regions and the Desk Review Report. The two desk reviewers were Dr. Cynthia Jones from Old Dominion University, and Joe O'Hop from Florida Fish and Wildlife Commission's Wildlife Research Institute.

I'll note that Dr. Jones was the Chair of the Benchmark Review Panel. We asked her to continue in this desk review for consistency and her familiarity with not only tautog, but the assessment models we've used over time. The desk review took place; they received their reports in late June and concluded their desk review about three weeks later.

Let me stop and mention that the Review Panel commended the strong work that the Assessment Workgroup conducted here since the benchmark was completed, to tease out the data and develop these new regional assessments. They said it was very well done. Their overall review findings are that the Long Island stock they agreed is overfished and overfishing was occurring in the terminal year of 2014, and the same case for the New Jersey/New York Bight Sub-Region.

The panel finds that the regional stock assessments are acceptable for management use. You saw these two figures in the earlier presentations, but on the left you have the fishing mortality trends for Long Island Sound, and again fishing mortality is above the target and threshold. That is also the case in New Jersey/New York Bight Region.

The first review Term of Reference was to evaluate the assessment data, how the assessment team selected or excluded data, and how they use them and the ASAP model. The panel concluded that all potential fishery-dependent and fishery-independent data sources were thoroughly reviewed and selected appropriately.

The Assessment Workgroup used four criteria to decide which datasets to use, such as the duration of a time series was at ten years or more, were there adequate sample sizes, et cetera. The tautog assessments, of course, rely heavily on the MRIP recreational survey estimates. The review agreed that although there are low sample sizes generally speaking for tautog, the MRIP data were sufficient for use in the stock assessment.

They did note in future assessments, most likely for the next benchmark, to keep an eye on the changes in the MRIP survey; notably the effort survey and new calibrations to the catch data that will result from that change in MRIP effort surveys. The panel also noted that in future assessment work, the team should explore correction to the growth curve parameterization where fishery dependent data are used.

This figure, it’s a little small for you to see, but it is in the desk review report in your materials. There were challenges in estimating weights at age for the earliest age classes one and two. Because of the selectivity of the fisheries, because of the minimum sizes, they don’t pick up a lot of these younger fish.

The second Term of Reference was to evaluate stock structure and geographical scale of the regional assessments. Very similar to the benchmark assessment and review findings, the growth rates were found to be similar from Connecticut to New Jersey. The growth information does not make an easy distinction between areas within Connecticut to New Jersey. Also, the genetic studies that have been completed to date are inconclusive relative to trying to split out Long Island Sound and the New Jersey/New York Bight Region; although there is a new genetic study underway coastwide for tautog. They found that the new regions are reasonable and acceptable, but not necessarily any better than the various regions that were assessed in the benchmark.

The third Term of Reference was to evaluate the methods and models used to estimate population parameters. Their overall review findings were that the age-structured-assessment-program model is appropriate for use of the selected input data. Compared to other models, this ASAP model is able to pull in a lot of the available data, and its results are justified for use in making management decisions.

Again, they did see some concerns relative to the weight at age and growth curve analyses, and encouraged the Assessment Committee to explore those further in future assessments. TOR 4; evaluate the methods to characterize uncertainty. The panel’s conclusions were that sensitivity to a range of data inputs and model structures were well addressed and understood; as Jay and Jacob mentioned or displayed in their sensitivity runs. The overall outcomes relative to stock status are robust.

Relative to retrospective patterns, the Long Island Sound model had relatively small retrospectives, and are not a concern for management action. In the New Jersey/New York Bight model, there are larger retrospective biases. The panel said that they were worried about this, and that the retrospectives indicate the F and SSB estimates are more uncertain.

But they also noted that the direction of the retrospective patterns switched over time and actually switched to a more favorable pattern in the most recent time period. Again, they think these results are still useful; but to continue to keep an eye on retrospective patterns. The fifth Term of Reference was to evaluate estimates of stock biomass abundance and exploitation.

The panel concluded that the ASAP model and associated reference points provide the best estimates for determining stock biomass abundance and exploitation. They did raise minor concerns relative to the plus group designations, looking at 12 plus versus 15 plus; and otherwise model estimates are robust.

In a less concerning situation, you would see similar results regardless of these relatively high plus group designations, but they did see some different results. Again, they are encouraging the assessment team to explore plus group designation in the future. For New Jersey/New York Bight, there is greater uncertainty overall in the model outputs.

I think Jay touched on this. This is relative to a poor stock recruitment relationship and the larger retrospective patterns. Jay and Jacob also touched on this, but the desk reviewers had a notable concern about the erosion of older age classes. For tautog, this is one of four plots that were in your material, but it shows if you look at, these are time on the X axis and the biomass on the Y axis, broken down into the various age classes.

What they wanted to highlight is you can see sort of the last part of those bars, the green at the top. That is the plus group, and it used to comprise roughly 20 percent of the overall composition in a given year. That was the case in the eighties and even into the nineties, but in the most recent years it's really less than 10 percent or even 5 percent of the biomass by age, so really the beginning of a truncation of the age structure for tautog. Finally, the last Term of Reference was to evaluate reference points and methods used to estimate them and recommend stock status.

The panel agreed with the stock assessments conclusions, and found that you could use either a spawning per recruit or MSY reference points for Long Island Sound; but should only use the SPR based reference points in the New Jersey/New York Bight region. Again, agreed with the overall conclusions that both regions are overfished and overfishing in the terminal year and that the Desk Review Panel finds the stock assessment acceptable for management use.

CONSIDER ACCEPTANCE OF REPORTS FOR MANAGEMENT USE

CHAIRMAN NOWALSKY: Questions for Pat on his presentation? Okay, seeing none; the next step before the board would be to consider using these as acceptable for management use. That is not a determination of which approach we're going to use in Amendment 1, but if we're going to consider them, we would need a motion to accept them for management use. I've got Dave Simpson's hand up.

MR. DAVID G. SIMPSON: Yes, move approval of the Long Island Sound and New Jersey/New York Bight stock assessments for management use.

CHAIRMAN NOWALSKY: Bill Adler will second that motion. We'll get that up on the board. Okay, move to approve the Long Island Sound and New Jersey/New York Bight stock assessments for management use; motion by Mr. Simpson, seconded by Mr. Adler. Any discussion on the motion? Emerson.

MR. EMERSON C. HASBROUCK: In thinking about this motion, I actually do have a couple of questions for Patrick. Can I ask those at this time?

CHAIRMAN NOWALSKY: Go ahead.

MR. HASBROUCK: In the review of these two assessments, there were several issues that were highlighted. The models had some problems with weight at age and growth curve, and the selectivity estimates in one of the time blocks may indicate misspecification in the model. You mention those in your presentation, but are those issues going to be addressed or if we vote on this motion we're accepting it as it is, without any of the corrections to the model?

MR. CAMPFIELD: The nature of those concerns was relatively minor. They may change, for example, the fits of the growth curves. But they would not change the stock status results. In the communication with the Assessment Team, actually during the desk review with some of their preliminary findings, I think the approach moving forward was during the update and certainly through future benchmarks to explore those suggestions; but they didn't see it as a show stopper at this point, minor concerns.

CHAIRMAN NOWALSKY: As Pat was giving that answer, a brief sidebar with Katie. She indicated that if, depending on the discussion that goes on with the next item, those concerns would be discussed in a next assessment update; and Katie is nodding her head. Any other discussion on the motion, Tom Fote and then we'll go to Joe.

MR. THOMAS P. FOTE: We've put a lot of work -- the Technical Committee and the staff has put a lot of work into bringing out this information. Even if there is not much difference, I think we should go ahead with this plan. We talked about regionalization, about breaking areas down into specific catch areas. We've talked about that with many species, and this is the first opportunity to do this.

We might be able to refine it a couple years from now; we might find that you actually push southern New Jersey into a different area. But once we start with this information, we should continue using it, because even if it doesn't make much difference right now on the mortality or what we have to do. It is a good base to start from, and in the future, we accumulate more data; it will be very helpful, and to prove that we can do this with other species. That's what I'm looking at, so I support the motion.

MR. JOE CIMINO: I just want to thank this group for the work that they've done. Well, I guess it's a question. We recently had a weakfish assessment that was done by an outside group, and I know work is being done to transition that over so that staff -- and that we can move forward with updates to that in the traditional way that we have been, and I'm wondering if that's the same case with the Long Island Sound assessment. Is an update going to be able to be done in-house, or are there considerations for how that will happen?

DR. DREW: Unlike the weakfish assessment, all of these assessments are using the same software and the same programs; so basically, it's just a matter of making sure that we have the same data input files, and we can go forward with that. It's not a significant problem or hindrance here.

CHAIRMAN NOWALSKY: Any other discussion on the motion? Okay, seeing no other hands up I'll give the states a moment to caucus, and then I will ask if there is any objection to the motion. All right, all the states have had an opportunity to caucus. **Is there any objection to the motion as presented? Seeing none; the motion carries**.

CONSIDER SPECIFIC REGIONAL MANAGEMENT APPROACH FOR DRAFT AMENDMENT 1

CHAIRMAN NOWALSKY: That will then take us on to the next agenda item, Considering Specific Regional Management Approach. Question before we go on to that. Bill Adler.

MR. ADLER: Yes, it does say in the agenda; do we have to approve the Peer Review report, as well? I mean that motion didn't do it. Is that something that needs to be approved?

CHAIRMAN NOWALSKY: Accepting them for management use implies we've accepted all the reports.

MS. TONI KERNS: **If you just add Stock Assessment and Peer Review Report, because it is one report, the whole thing; the Peer Review and the Assessment is one individual report.**

CHAIRMAN NOWALSKY: **Is there any objection from the board in proceeding in that manner? Okay, so the previous motion will then include the Peer Review Report, as well**. Thank you, Bill. Okay. We'll turn to Ashton for a presentation on regional management approaches, how we're potentially going to use these for Draft Amendment 1.

MS. ASHTON HARP: This presentation is really just to give food for thought for the future discussion that is going to happen, which is considering a regional management approach for Draft Amendment 1. Right now, you'll see a timeline, and I want to caveat that this timeline is kind of assuming that the board will choose a three or four region management approach; although I will present other actions that the board could take. But as you can see August at this meeting, we have reviewed the Long Island Sound and New York/New Jersey Bight assessment, and it has been approved for management use.

Now the TC would meet and provide a stock assessment update prior to the annual meeting. The results would be presented at the annual meeting. The PDT would also have a meeting prior to the annual meeting where they would review the Catch Reduction Analyses, and all that would then be presented at the annual meeting.

After that happens, the board would look at the results, and then they would task the PDT to kind of start developing the options for Draft Amendment 1. Draft Amendment 1 would then be presented at the February meeting, and as you can see, we would move forward with public hearings in the spring and possibly implementing Draft Amendment 1 at the May meeting.

But if there were any kind of difference, there could be changes to the timeline if a management approach is not chosen at this meeting. It could potentially have delays. Right now, I want to present to you the three regions. The three-region approach, which is one, Massachusetts through Rhode Island, two, Connecticut, New York and New Jersey, and three, Delaware, Maryland and Virginia.

Those are the regions in the three-region approach versus the four region approach, which is Massachusetts and Rhode Island; again, Long Island Sound, New York/New Jersey Bight and Delaware, Maryland and Virginia. These are the kind of two that we're asking the board to consider at this board meeting.

Then I want to review some of the potential actions the board could take. The board could opt to select a management region out of the three region, or the four region at this meeting. It is the preferred approach from the TC and the PDT, because then it would allow the TC to kind of move forward on a specific management area for the stock assessment updates, and it would allow the PDT to review the Catch Reduction Analyses prior to the annual meeting.

Just kind of like a streamline approach, we know exactly what we're going to do next if this option is chosen. However, there are other ways the board could go. I've already done Number 1, so Option Number 2 is the board could select a management region out of the three or four-region management approach at the annual meeting, so after the stock assessment update has been revealed, the results have been presented.

This would recognize that the TC would have to complete five regional stock assessment updates instead of either a three or a four region, so it does add additional work on behalf of the TC. The last option to consider is to include both the three and four region management approaches into Draft Amendment 1.

This would recognize that the TC and PDT would have a significantly higher workload when developing the potential management options. There is a highly likely possibility that Draft Amendment 1 could be delayed if this option were chosen. With that, I will take questions myself, or Jay or Katie can refer to the stock assessment, as well.

CHAIRMAN NOWALSKY: Ashton, I'll ask you to put that last slide up on the board. Just to reiterate with those three options, the first one is we pick three or four region approach today. The assessment update that is going to take place later this year, with the most recent data available, would only apply to that and the status quo coastal update. We would just get that information back at the annual board meeting.

If the board went with Option 2 here, we would essentially be tasking the TC to do an update on all of those regions, and we would then get that information back at the annual board meeting. The third option here would then be further putting that decision off until some point in time, where we would get the update information later this year.

Then once we had that update information, we would then leave the decision point out into the draft amendment for public comment to determine which of those regional approaches we would chose as part of the entire amendment process.

The decision here today would be whether or not we want to narrow down the approach to the three or four region, or we want to allow the TC to go ahead, do the updates, and then get that back; review those at the annual meeting and potentially make a decision at the next board meeting. First, let me ask if there are any questions about those potential processes and options. Okay, question? Jim, go ahead.

MR. GILMORE: Just so I understand, on 2 and 3; they are sort of additive, so you're still, if you do Number 3, you're going to have to go through all the stock assessment updates; so that is going to be included in that. It just makes it a little bit longer.

CHAIRMAN NOWALSKY: Let me add first that yes, we would be making that decision further down the road, and it would be a question of whether the public weighs in on those decisions or not; and Katie wanted to add as well.

DR. DREW: The extra work on top of Number 3 would also be developing management options for all of the potential regions when we go forward with how much of a reduction we're going to take; so things like bag limit, size limit, season analyses, those would have to be done for all of the regions for both potential sets of regions.

In addition, just to point out that this decision or this question also went out to the public already in the form of the public information document. The public has had a chance to weigh in on this initial question, then it would be a matter of weighing in on the regions as well as the management options as part of that whole document. As you can imagine, that adds a tremendous amount of work for the TC, the PDT and staff in developing that third option.

MR. GILMORE: Katie, you're going to do size, season and bag for any one of those options. It is just that on Option 3, you are just going to have to do a lot more iterations on it.

DR. DREW: Right, so we would do a set of management options for all of the regions that the board wants to look at. If the board wants to make a decision on the options here today and say, okay going forward, we're going to break this stock into three regions; then the TC will update all three regional assessments; we'll do the catch reductions for all three regions; we'll do a size, season and bag limit analysis for all of those options; that would then go into the document and be reviewed. But if the board does not make that decision here today or at annual meeting, then the TC would do that for the three-region assessment and the four-region assessment models. Depending on where the board makes that decision, that is the timeline.

CHAIRMAN NOWALSKY: Just so I can clarify, Katie, the size, season, bag limit reductions, if the board does not make a decision today, those are going to be done as part of the assessment update later this year? It was my belief those would not come until the board specifically tasks the TC/PDT to do those in constructing the draft amendment to go out for public comment.

DR. DREW: Right, we were tasked to present, or our understanding is that we were tasked to present overall catch reductions at the annual meeting. Basically saying, with this set of reference points you need to reduce F by this much; therefore, you need to reduce catch in this region by this much.

The options of how those would be handled would be then presented when the PDT is tasked with developing those options, so that would be the next meeting after that. That would be part of the third option, basically. Number 2, we're only doing the assessment update and the overall catch reductions. Option 3, we would be also adding the management options.

CHAIRMAN NOWALSKY: Today I think we're at the 1 or 2 decision point; you would agree?

DR. DREW: Yes.

CHAIRMAN NOWALSKY: Additional questions on the options here. Okay, I see Bill Adler has got his hand up for discussion or a motion, if applicable.

MR. ADLER: You know last time we had the meeting the discussion arose as to whether we could split off Long Island Sound into a separate area, and then the Technical Committee did that. I don't understand why, since we have this already at our fingertips, why we can't go ahead with that; I guess you would say it is the four-area instead of three.

Because it seems like at the last meeting, we were looking for something like this. I don't know what the disadvantage would be, but somebody else may know it, why we can't just proceed on the four region, give them the job of doing the four-region option; unless somebody says no, we want the three or whatever. What do you think?

CHAIRMAN NOWALSKY: The only gain from the board's perspective is that we would then see the latest stock assessment update for both the three and the four-region approach. That would be the reason for not making a decision today; I don't know, does that help you?

MR. ADLER: No, I just thought to move this ahead, if we picked the four region one, and then proceed with whatever they have to do. If we're moving ahead on the four-region approach that we could make that decision today and send the Technical Committee off to do whatever they would do, rather than wait around and say, well should we do the three, should we do the four; and then wait another two months before we make that decision. I just thought why not move it ahead a little.

CHAIRMAN NOWALSKY: Well, that is the will of the board. Tom Fote.

MR. ADLER: Okay, do I make a motion that we pick the four region approach?

CHAIRMAN NOWALSKY: Well, I've got two more hands up. Let me go through those hands, and if there is no other motion at that point then we can come back to that. Go ahead, Tom.

MR. FOTE: I would like to make a motion that we actually go to the four-region. The reason I propose that motion right now is because we're right after the stock assessment. If we think the four-region is the best idea, I don't want to get between when we have three regions or four regions and start cherry picking which is the advantage to one place over another.

If we do this before the stock assessment, we're saying this is the right method of doing this, because we basically are able to sample out of areas that we wanted to do purposefully. I don't want to know whether it is an advantage if I'm in a three regional or four regional. I want to make the decision now, and I'm taking a chance whether it's good or bad; but I think it's the proper thing to do. **With that, I'll make a motion that we go to the four-region approach and only the four-region approach, which I think is Option 1.**

CHAIRMAN NOWALSKY: Do I have a second to that motion, Bill Adler. Okay, discussion on the motion; let me see a show of hands of those people who would like to speak in favor of the motion. I've got Jim, Russ. Bob, do you want to speak in favor, also? Can I get a show of hands who would like to speak against the motion? All right, Tom, do you have anything additional to say in support of your motion before I go to the speaker list?

MR. FOTE: Yes, I'm looking to cut down the load on the Technical Committee. When we require more information, when we require all that, it is tasking people that are overworked, overstressed already; and basically I'm trying to be conservative on their time. I know we have limited amount of personnel in New Jersey that can do this, so we're asking one person to do a lot of the tasks.

If we really think that this is the best approach and we're able to do it, that would actually give us regions. The only reason that will make us wait for the stock assessment is if we wanted to cherry pick. But like I said, well, this way I only have to make this much reduction or that reduction. It is not really planning to do the right thing. That is why I'm saying we should do this now.

CHAIRMAN NOWALSKY: I'll go to Jim Gilmore next, speak against the motion.

MR. GILMORE: I'm not completely against the motion, it is a conditional issue. Maybe to get to Bill Adler's question before. The problem we have is biologically, the assessments are fine, and I understand them. That is why we are in complete agreement; I think the assessments were done right. I think biologically, it makes sense.

Management wise it becomes extremely difficult for the east end of Long Island. It is probably one of the super border areas, because even like separations between Delaware and New Jersey or New York and New Jersey, they are relatively fine areas. You get to the east end of Long Island, and you try to split it; it gets very difficult to enforce it. That really goes to my questions about size limits. The only way this would work is if we have some incredible cooperation about having the same relative size, season and bag limits for that area. But it is a chicken and egg thing right now. If we're going to go with a four-region approach, and we have that commitment that that is what is going to happen, then I have less of a concern about it.

However, if we go with a four-region approach, and then we've got very different limits between Long Island Sound and New England and then the New Jersey Bight Area or whatever, it is going to be a mess and it is going to be unenforceable. I think one of the things we need to get through this is some feedback from the Law Enforcement Committee about, if we go with very disparate measures, are we going to shoot ourselves in the foot?

Because if this looks good on paper but it can't be enforced, we're going to have overharvest; just everyone is going to go out and do what they want to do. That is why it's a conditional opposition to this is that we really need to get a commitment that if we're going to go down this road, we have to have the same measures in the New York and Long Island Sound area, or else this is not going to work.

CHAIRMAN NOWALSKY: Russ, in favor.

MR. RUSS ALLEN: I think this is the right way to move forward at this point. We've tasked the Technical Committee, the PDT, everyone to do a heck of a lot of work; and they've come back and given us what we were looking for. I think this is the best time to move forward this way. I understand Jim's concerns, because we all have those concerns for different areas in all our states.

But I think that can be part of the amendment as it's going forward, and some of the concerns that the PDT can look into and how to manage that area as best as possible. That doesn't alleviate all Jim's concerns that's for sure, but we would be willing to work with New York and trying to make sure we could do the best we can.

I mean, that's all we can put out there for now, until we see exactly what the options are. As I said, they've done a yeoman's job on coming up with the different assessments for the different areas, and done everything we've asked them to do over the last couple years; and I think it's time to move all of this forward as fast as possible.

CHAIRMAN NOWALSKY: Do I have any other speakers against the motion? Emerson Hasbrouck.

MR. HASBROUCK: In addition to the issues that Jim raised, which I agree with, one of the recommendations or one of the comments in the review of the two new assessments was that the new regions are reasonable and acceptable; but not necessarily better than the benchmark regions. The review said yes, they're good, but they're not necessarily any better. Why are we going to go through a process that may not be any better than what we had with the benchmark assessment?

CHAIRMAN NOWALSKY: Bob Ballou, speaking in favor of the motion.

MR. BOB BALLOU: I support the motion. It seems to me, the crux of this is whether we try to fit the management to the region or the region to the management. I think it is the former, and I think that is what this motion would do. Just in response to Jim's comments. As soon as you move down the road of regional management, you're going to inevitably have an issue of disparity, or potential disparity, between the regions.

Whether you take a three-region approach or four, you still have that same issue; maybe it just moves a little bit, but you still have that issue of how you deal with differences between the regions. The fact that we seem to be inevitably moving down the road toward regional management for tautog, I do think the four-region approach makes the most sense; and I support the motion.

CHAIRMAN NOWALSKY: Okay, let me get another show of hands, anyone who would like to speak against the motion; anyone else to speak in favor of the motion, Tom Fote.

MR. FOTE: What I wanted was to do is clarify Emerson's statement. When the stock assessment was done, it was done on one region. What they recommended was that we split up regions, we do different regions; because with the original stock assessment it, was based on one region, not multiple regions.

CHAIRMAN NOWALSKY: Let me let Katie respond to that as well.

DR. DREW: Right, so the most recent benchmark assessment did have the three-region approach, and I think the peer reviewers comments were more to the fact that we don't have strong biological reasons to split the stock at Long Island Sound versus lumping New Jersey in with that region. The evidence is very muddy. There is no clear biological ways to draw the line. In light of that, then management priorities can take over.

If the priority is to keep a consistent region across New Jersey, New York, Connecticut then you would go with a three region. If the management concern is that we want separate information on the Long Island Sound portion versus the New York/New Jersey Bight area, then you would go with the four-region. There isn't strong scientific or biological evidence as it is now, as the data stand now to support one regional breakdown over the other; and thus management concerns can take priority in this case.

CHAIRMAN NOWALSKY: Okay, let me make one last call for anyone to speak for or against the motion. Seeing no one else wishing to speak, **the motion before the board is move to approve the four-region-management approach for Tautog Draft Amendment 1. Motion by Mr. Fote, seconded by Mr. Adler**, we'll take a moment to caucus.

Okay, we'll now put the question before the board. All those in favor of the motion, please raise your right hand, one vote per state, please. Put your hands down, please. All those opposed. **One opposed; any abstentions, two abstentions, any null votes? Motion carries.** Okay, that concludes that agenda item.

We'll now move on to a brief update on the Commercial Harvest Tagging Program, and we'll also have a question for the board about how that may interact with the amendment; before we go on to that, Dave.

MR. SIMPSON: One question for the next step is when or have we already made a decision about reference points, whether we use MSY in some areas or SPR in some areas? When do we revisit that, or do we revisit that? I just want to make sure I know where we are with that.

CHAIRMAN NOWALSKY: Is it the intention of the TC, PDT to do the update with both of those, right now?

DR. DREW: Yes, it is very simple to present the SPR versus the MSY reference points when we come back with the updated information, so we can make that decision then.

CHAIRMAN NOWALSKY: Dave, a follow up?

MR. SIMPSON: Yes, just follow up to that. It would be great to see more elaboration on the stock recruitment relationship. I'm skeptical that there is one. I would like to see better evidence. When I look at a time series that I have confidence in, I see a period over time rather than relationship to the stock.

One of those is a parallel with the Millstone Environmental Data they've been sampling for forty years, and we see a lot of consistency between tautog larval abundance and cunner larval abundance. One is fished and one is not. But I think they're both responding to similar environmental conditions, so I'm really interested in that.

CHAIRMAN NOWALSKY: Okay, we're good with that. We'll move on to Ashton's presentation on the Tank Trial.

UPDATE ON THE COMMERCIAL HARVEST TAGGING PROGRAM, THE TAUTOG TANK TRIAL

MS. HARP: I'm going to present a bit of an update on the Commercial Harvest Tagging Program, the Tautog Tank Trial. An overview, the Law Enforcement Subcommittee was developed by the Tautog Board in 2015. This subcommittee has met numerous times via conference call to develop program objectives; the goal is to see if our commercial harvest tagging program is viable. To do that, first the subcommittee developed program objectives, which I'll review.

That has been done; the board approved those at the February, 2016 meeting. Then staff procured potential tags to include in this program. These were reviewed with the subcommittee, and law enforcement tested these tags in person as well, and gave feedback via conference call. Then next the staff did commercial harvester interviews to kind of get a better idea of the handling practices that were used to capture tautog and how long they had tautog, and these were all used to then develop the tank trial or the parameters of the tank trial.

Now the next step is the tank trial, which is underway; which I will review now. But first, I wanted to go over the objectives that the board approved; this is a paraphrased version of them. It was to implement a tagging program to reduce illegal, unreported and unregulated fishing that we know has been prevalent in this fishery for quite some time. To standardize tags across states, instead of having different tags across states, we wanted one simple tag.

It is also a little bit harder to find a tag that works on a live fish, so it is easier just to find one tag and use it across all states in general. The tag needed to be a single use tag. It needed to be -- if one were to take it off they couldn't reuse it on another fish and therefore perpetuate illegal fishing. It needed to be easy to put on but hard to take off. As the last goal, it also needed to accommodate the live market fishery, so it needed to have an applicator, for ease of use for fishermen.

It also needed to not affect fish quality for its resale. With that in mind, staff presented about 12 to 15 different tags that could be used in a tank trial and eventually in a commercial harvest tagging program. The Law Enforcement Subcommittee reviewed these tags and selected three tags to move forward with in a tank trial. The three tags are up here and I also have some on me; so if you want to see some after this meeting I can show you them.

There is a button tag, which is commonly used actually in live stock, so we're testing this on a fish to see if it is actually even possible. The metal one is a strap tag, which one is used on fish. It comes with an applicator. The bottom one is a Rototag, and this one is used on fish in aquaculture purposes.

These will all be then applied to live fish. We're first applying these dead fish to see exactly where we would put them on the fish, and then they will be applied to live fish; and I'll go over that. Next for the harvester feedback, I talked to a couple of fishermen over the phone about the potential for this program.

I just wanted their feedback on how they fish for tautog, what the market is like, what their handling practices are like. They said the tautog fishery was very much linked to the black sea bass fishery. They target tautog when the black sea bass fishery closes, and when the black sea bass fishery is open, they usually catch tautog as incidental catch; I mean, catch they still retain and will sell, but it is not the main fish that they are going out for.

They generally fish out to ten miles, but will go further if targeting black sea bass. They noted that tautog is not as resilient in warm water or during spawning, so tags could increase mortality during this time. After reviewing to them, okay, when you come back to the dock, who are you selling to? Who then sells to that person, we realized that it is a very decentralized market, with lots of small scale dealers and buyers; and a couple of wholesalers.

It is not just, you go to one dealer and then that dealer goes to the end market to the restaurant, it's you know it goes to one dealer then it could go to another dealer before ending up at a buyer and then go to a restaurant. We realized the next point is that live tautog is held by buyers and dealers for weeks, it could even be months at a time.

When I asked how long do you generally keep these fish, or do you know that they're in captivity, they said, well, you can keep a tautog alive as long as you want. They are very hardy fish. We know what to do; we know how to keep them alive. It is not like this fish is coming out of the water, hitting the dock and then going on to someone's plate. There is quite some time that passes in between catching the fish and then eating the fish.

There is a full list of harvester comments that is in the May Law Enforcement Subcommittee meeting summary. I also have a different presentation, a longer presentation I presented to the Law Enforcement Subcommittee on this issue as well. Now, I'm going to go over the parameters of the tank trial. This is being led by the New York Division of Marine Resources and Stony Brook University. Currently fish traps are collecting tautog and New York DMR modified lobster traps to become fish traps to collect tautog. They actually created a huge pen to then hold the tautog at the dock until we have the number of fish needed to then move them to the wet lab, and overall they plan to collect 80 tautogs to then transfer to the wet lab; and it will be in two different batches.

We're going to do 40 fish and then 40 fish. Each tag will be applied to 20 fish; so 60 fish in total. There are going to be 20 fish that will serve as the control group; thereby equaling 80 fish. Each fish will be tagged and monitored for four weeks. We went back and forth on the length of time that the tags should be on the fish and determined that four weeks is long enough to see if it would affect the fish, if there would be any kind of infections with the fish from the tag; and to make sure to see if there is any mortality as a result of the tag on the fish.

The trial is expected to begin this month. It is going to be underway shortly. Looking ahead, I just kind of wanted to give an update on next steps. At the annual meeting the results of the tagging tank trial will be presented. I'll also have a Law Enforcement Subcommittee meeting before the annual meeting as well, so they can review the results and they can give recommendations and feedback that will also be presented at the annual meeting.

Then at the annual meeting the board can opt to task the PDT with developing Draft Amendment 1 options for a commercial harvest tagging program; because the goal of the Law Enforcement Subcommittee was really to investigate the feasibility of such a program. If the board thinks it is a viable program, the tags are working, the fish are not dying. Then the board could task the PDT with developing options for Draft Amendment 1. With that, I'll take questions.

CHAIRMAN NOWALSKY: With reference to Ashton's last slide, there is no decision point here today; but the public information document that went out included as an item, the unreported harvest; and it has certainly been an issue before this board for some time. When we first looked at the timeline it seemed that the two actions would need to be decoupled, to keep the draft amendment moving forward.

When the decision was made to do the Long Island Sound Assessment, basically at this point we're looking at a decision next year and implementation likely in 2018. That would potentially present the opportunity to include the commercial harvest tagging program now, as part of the draft amendment, if we chose to task the PDT to develop options at the annual meeting.

That is where we're at. There is no decision that needs to be made today, but I wanted to bring that to the attention of the board that where it had previously looked like it was going in a decoupled manner, there may be the opportunity to bring the two back together again. With that, any questions for Ashton on her presentation?

MR. JOHN CLARK: Ashton, I was curious as to why the trial is only for four weeks. If I recall, they said that a lot of times these fish are kept for up to six months, even longer in tanks. If we're going to get an idea what the shedding rate of these tags might be, that seems kind of short; considering how long they're kept.

MS. HARP: Like I said, there was a bit of discussion on the length of the trial, and just from talking to people there was such a variability in how these fish were kept and the length that they were kept; that it was really hard to mimic exactly the conditions that the fish would be going through if it was actually going through the supply chain. When I talked to them about, what are the different tanks sizes, what is the water flow size? It was so different across the different fishermen; that you couldn't exactly have a trial that would replicate any one way that this fish went through the supply chain. Four weeks was seen as a compromise.

CHAIRMAN NOWALSKY: Any additional questions? Bob Ballou.

MR. BALLOU: Ashton, you may have already covered this, but it just occurs to me. Why the need to explore tags other than those that have traditionally been used to track fish for migratory purposes. I mean, clearly those have demonstrated their efficacy. Is there any thought given to just using the same tags that have always been used; maybe a different color, to see how they compare with these new styles?

MS. HARP: Yes, there was and that would be definitely the easiest option and would be preferred, although it didn't meet one of the objectives put forth by the Law Enforcement Subcommittee, which was that it needed to be a one-time-use tag. When looking at those tags, those tags could just be easily ripped out of the fish and then reused again; therefore defeating the purpose.

MR. ROY MILLER: Many years ago I recall using those particular metal jaw tags in tagging Salmonids, and if memory serves, those particular tags caused the decrease in the growth rate of the animal when it was released back into the wild; thus providing a competitive disadvantage for tag fish violating one of the tagging assumptions. But I assume, since these are tanks and these fish will be fed ad libitum, or in other words as much as they'll eat, that won't be a consideration in these particular trials.

MS. HARP: The growth rate of the fish after it's captured was not a consideration for this trial.

CHAIRMAN NOWALSKY: Follow up, Roy.

MR. MILLER: Yes, I was not so concerned about the growth rate, it is just about the condition of the fish that would be a factor in its marketability.

CHAIRMAN NOWALSKY: That was definitely the major concern of the harvesters; and we hope to get some information from the trials on that. Ashton.

MS. HARP: Just when talking to the harvesters about this program, there were only two, I mean there weren't a lot of people, there were like ten people that I was talking to; but only two people were dramatically opposed to such a program. They did see that there is a problem in this fishery with the black market and with illegal and unreported fishing going on.

They were happy that I had called them and happy to kind of get feedback on them. They hoped that such a program would work for them. I mean, they clearly don't want to have any more -- they don't want this to affect the amount of time that they put into this fishery, but if it could help them, then they were for it.

ADJOURNMENT

CHAIRMAN NOWALSKY: Okay, is there any other business to come before the board today? Okay seeing none; and having covered the business on the agenda, the board is hereby adjourned. Thank you everyone.

(Whereupon the meeting ended at 2:27 p.m. on August 2, 2016)

Atlantic States Marine Fisheries Commission

2016 Tautog Stock Assessment Update

October 2016

Vision: Sustainably Managing Atlantic Coastal Fisheries

Prepared by the Tautog Technical Committee and Stock Assessment Subcommittee

Jason McNamee, TC Chair, Rhode Island Division of Fish and Wildlife
Jeffrey Brust, SASC Chair, New Jersey Division of Fish and Wildlife
Nichole Ares, Rhode Island Division of Fish and Wildlife
Deborah Pacileo, Connecticut Department of Energy and Environmental Protection
Sandra Dumais, New York State Department of Environmental Conservation
Linda Barry, New Jersey Division of Fish and Wildlife
Scott Newlin, Delaware Division of Fish and Wildlife
Alexei Sharov, Maryland Department of Natural Resources
Craig Weedon, Maryland Department of Natural Resources
Katie May Laumann, Virginia Marine Resources Commission
Tom Wadsworth, North Carolina Division of Marine Fisheries
Katie Drew, Atlantic States Marine Fisheries Commission
Ashton Harp, Atlantic States Marine Fisheries Commission

In collaboration with the Tautog Long Island Sound Regional Working Group

Jacob Kasper, University of Connecticut
Eric Schultz, University of Connecticut
Greg Wojcik, Connecticut Department of Energy and Environmental Protection

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Executive Summary

The regions accepted for management use are defined as:

- Massachusetts - Rhode Island (MARI)
- Long Island Sound (LIS), which consists of Connecticut and New York waters north of Long Island
- New Jersey – New York Bight (NJ-NYB), which consists of New Jersey and New York waters south of Long Island
- Delaware, Maryland and Virginia (DelMarVa)

Although the TC considers the coastwide stock unit inappropriate for the management of tautog, the coastwide model was updated in this assessment to provide the appropriate status quo options for management consideration.

All regions were updated with landings and index data through 2015 using the statistical catch-at-age model ASAP. Short-term projections to determine the level of harvest required to have a 50% and 70% probability of achieving the F target for each region, as well as the probability of being at or above the SSB threshold, in 2020 were conducted with AGEPRO.

All regions were overfished in 2015.

Overfishing was not occurring in the MARI or DelMarVa regions, although F was still above the target in the MARI region. F was at the target in the DelMarVa region.

Overfishing was occurring in the LIS and NJ-NYB regions in 2015.

The coast was overfished and experiencing overfishing in 2015.

Region	F_{target}	$F_{threshold}$	F_{3yravg}	SSB_{target}	$SSB_{threshold}$	SSB_{2015}	Status
MARI	0.14	0.28	0.23	3,631 mt	2,723 mt	2,196mt	Overfished, overfishing not occurring
LIS	0.28	0.49	0.51	2,865 mt	2,148 mt	1,603 mt	Overfished, overfishing
NJ-NYB	0.20	0.34	0.54	3,154 mt	2,351 mt	1,809 mt	Overfished, overfishing
DMV	0.16	0.24	0.16	1,919 mt	1,447 mt	621 mt	Overfished, overfishing not occurring
Coast	0.17	0.24	0.38	14,944 mt	11,208 mt	6,014 mt	Overfished, overfishing

The MARI, LIS, and coast need to take harvest reductions in order to have a 50% or 70% probability of being at the F_{target} in 2020. These range from a 55-56% reduction from 2015 levels in MARI and a 47-53% reduction from 2015 levels in LIS, to an 18-24% reduction from 2015 levels for the coast. Harvest levels for the NJ-NYB and DMV region that are at or slightly above 2015 levels will result in a 50-70% probability of F being at or below F_{target} for those regions.

Even at the target F levels, the probability of SSB being above the $SSB_{threshold}$ in 2020 is small for all regions.

1 Stock Identification

Historically, tautog has been assessed as a coastwide stock, consistent with the management unit, which includes all states from Massachusetts through Virginia. In the 2015 benchmark stock assessment (ASMFC 2015), the Tautog TC investigated new stock unit definitions based on life history data, fishery and habitat characteristics, and available data sources. A subsequent 2016 regional assessment analyzes two additional regions to comprise a four-region management scenario (ASMFC 2016). The regions used in this assessment update are defined as:

- Massachusetts - Rhode Island (MARI)
- Long Island Sound (LIS), which consists of Connecticut and New York waters north of Long Island
- New Jersey – New York Bight (NJ-NYB), which consists of New Jersey and New York waters south of Long Island
- Delaware, Maryland and Virginia (DelMarVa)

Although the TC considers the coastwide stock unit inappropriate for the management of tautog, the coastwide model was updated in this assessment to provide the appropriate status quo options for management consideration.

2 Life History

Tautog are a relatively slow growing, long-lived fish. Individuals over 30 years have been recorded in Rhode Island, Connecticut, and Virginia. Tautog also grow to large sizes, up to 11.36 kg (25 lbs). They mature at 3 to 4 years of age, and spawn from April – September.

They undergo seasonal inshore-offshore migration in some parts of their range, but tagging data indicate they return to the same reefs year after year and do not make extensive north-south migrations.

The 2015 benchmark assessment explored a number of different ways of estimating natural mortality (M). Maximum age based methods gave a result of M=0.15 for most regions and M=0.16 for the DelMarVa region, consistent with what has been used in previous assessments.

3 Data

The MARI, DelMarVa, and coastwide update assessments use the same data sources as the 2015 benchmark stock assessment. The LIS and NJ-NYB update assessments use the same data sources as the 2016 regional assessment. All regions incorporate data through 2015. The recreational discard mortality rate of 2.5% was used for all regions.

3.1 Massachusetts-Rhode Island

3.1.1 Landings

Recreational anglers account for upwards of 90% of landings in this region. In the MARI region, recreational landings peaked in 1986 at nearly 2.7 million fish and fell sharply to about 13% of its peak by the mid-1990s. Since then landings have remained low and have varied in the range of 200,000 to 50,000 fish. The 2013-2015 average recreational landings are 167,085 fish (Table 3.1.1, Figure 3.1.1). The majority (nearly 75%) of tautog recreational harvest in the MARI region comes from the private/rental boat mode. The remaining 25% is split relatively evenly among the shore and for-hire (party/charter boat) modes.

Commercial landings in the MARI region peaked in 1991 at approximately 725,300 lbs (329 mt), declined to 97,000 lbs (44 mt) in 1996, and since then has varied in the range of 110,000 – 200,000 lbs (50 to 90 mt) (Table 3.1.1, Figure 3.1.1). The 2013-2015 average landings in the MARI region were approximately 121,250 lbs (55 mt).

Total removals in the MARI region, including recreation harvest, recreational release mortality, and commercial landings averaged 390 mt, with 337 mt taken in 2015.

3.1.2 Indices

The set of indices available in the MARI region consists of two trawl survey indices, one seine survey which aliases the young of the year segment of the population, and a fishery dependent index using MRIP information (Table 3.1.2, Figures 3.3.2-5). For all indices, statistical model-based standardization of the survey data was conducted to account for factors that affect tautog catchability.

The Massachusetts Division of Marine Fisheries (MADMF) runs a synoptic coastal trawl survey performed in the spring and autumn utilizing a stratified random design.

The Rhode Island Division of Fish and Wildlife (RIDFW) research trawl survey has two components, a seasonal survey with a random stratified design which began in 1979, and a monthly fixed station survey which began in 1990 that is conducted monthly throughout the year. For the tautog stock assessment only the fall segment of the RI trawl survey was used, consistent with the benchmark assessment.

The RI Seine Survey has operated from 1986 to the present, with a consistent standardized consistent methodology starting in 1988. It is a fixed site survey that takes place throughout the extent of Narragansett Bay Rhode Island.

The Tautog TC developed a fishery dependent index of abundance from MRIP recreational survey data, using “logical guilds” to identify tautog trips.

3.1.3 Biosampling and Age-Length Keys

For the MARI region, age-length samples are collected from a combination of recreational fishermen and fishery independent surveys. There was a total of 756 length-age samples collected in the MARI region from 2013-2015 (approximately 250 per year) to characterize the age structure in the region.

3.2 Long Island Sound

3.2.1 Landings

The update assessment estimates of commercial and recreational landings and recreational discards (Table 3.2.1, Figure 3.2.1) have been revised in all years from those used in the previous LIS regional assessment (ASMFC 2015). Total removals in LIS (recreational harvest, recreational dead discards and commercial harvest) peaked in 1987 at 1,386 mt. In recent years landings have been a fraction of that; for example, the 2015 landings were 430 mt or 21% of the peak. Commercial harvest accounts for approximately 12% of total catch, recreational harvest accounts for 86% and recreational discards for about 2%.

3.1.1 *Indices*

The model was fit to both the total standardized index (catch per tow or catch per trip) and index-at-age of the Connecticut Long Island Sound Trawl Survey and MRIP CPUE (Table 3.2.2, Figure 3.2.2-3). The New York Peconic Bay Trawl Survey (Table 3.2.2. Figure 3.2.4) was used as a year one index. The New York Western Long Island Seine Survey (Table 3.2.2, Figure 3.2.5) was treated as a young-of-year index and was lagged forward one year (e.g., the observed 1984 YOY index value was represented as the predicted 1985 age-1 index value).

3.1.2 *Biosampling and Age-Length Keys*

The update assessment uses an ALK that has been updated from the previous LIS regional assessment (ASMFC 2015) upon incorporation of 2015 fishery independent indices. Data used in the LIS ALKs include LISTS, the Rhode Island Trawl Survey (RI) and New York Port Sampling (NY-N) (Table 3.2.3). An average of 415 samples were used per year with a minimum sample size of 109 and a max of 859. Rhode Island age-length data were included as needed to a fill size gaps in the key. New York data included only fish that were collected from the North Shore of Long Island. Size gaps that remained were filled using age distributions estimated from a key that pooled all years of data. The length range of the ALK is narrower than the estimated catch (ALK: 15 to 60 cm; estimated catch: 8 to 83 cm). Lengths below 16 cm and above 60 cm were accordingly binned into single groups.

3.3 New Jersey – New York Bight

3.3.1 Landings

Tautog is predominantly a recreationally caught species, with anglers accounting for about 90% of landings within the NJ-NYB region. Between 2013 and 2015, annual recreational landings have shown high interannual variability without a trend, ranging from approximately 150,000 to

400,000 fish, with an average of 242,000 fish (Table 3.3.1, Figure 3.3.1). For this assessment update, a change was made to how New York recreational harvest was split between LIS and south shore for the years 2004+. The June 2016 regional assessment used a post-stratification SAS code to separate harvest from the two regions, but this method does not weight sites based on activity. For this update, harvest by region was estimated using MRIP data which does account for site activity. Seven of eleven years are within 10% of the value used in the benchmark assessment, but four years (2007, 2009, 2010, and 2013) resulted in increases of 13% to 45% using the new methodology.

In the NJ-NYB region, commercial harvest during 2013 to 2015 has shown a declining trend falling from 99,207 lbs (45 mt) in 2013 to nearly 86,000 lbs (39 mt) in 2015 with an average harvest of 90,389 lbs (41 mt) for this time period (Table 3.3.2, Figure 3.3.1).

Trends in harvest can be obscured by high interannual variability in catch and relatively high harvest measurement error. An unquantified illegal live fish market contributes to uncertainty in harvest estimates.

3.3.2 Indices

The Western Long Island (WLI) Seine Survey, New Jersey (NJ) Ocean Trawl Survey, and recreational survey were used in the assessment update.

The NJ-NYB portion (Jamaica Bay) of the WLI seine survey encompasses 19 different stations. As not all stations were sampled continuously, only the eight stations sampled annually in at least 20 years were included in the model. An abundance index for tautog was created using a negative binomial generalized linear model (GLM) including station and water temperature. The WLI seine index captures mainly age-0 fish, so was lagged forward one year and treated as an age-1 index. (This is an improvement over the 2016 regional assessment that did not lag the index appropriately.) The index identifies three periods of recruitment separated by 3-5 years of near zero recruitment with successively higher peaks. There was a time series high of 2.7 fish per tow in 2012, and an average catch of 1.5 fish for the period 2012-2015 (Table 3.2.2, Figure 3.3.2).

An abundance index for tautog was developed for the NJ Ocean Trawl survey using a negative binomial generalized linear model (GLM) including year, bottom temperature, depth, and bottom salinity as factors. The index was variable, but indicated a period of high abundance at the beginning of the time series, declined through the late 1990s, then recovered to moderate abundance between 2000 and 2010 (Table 3.3.2, Figure 3.3.3). CPUE dropped by more than 50% in 2011-2012, but recovered to previous levels around 0.5 fish per tow in recent years.

A fishery dependent index of abundance from the MRFSS/MRIP recreational survey data was developed using the logical guild methodology described in the regional benchmark assessment. Abundance was estimated using a negative binomial GLM, with the final model specified as

Total catch ~ Year + State + Wave + Mode, offset =ln(Angler_Hours).

During development of this assessment update, it was determined that the recreational CPUE index used in the 2016 regional assessment for the NJ-NYB region was incorrect. This error has been corrected for this assessment update. Generally, the two indices follow a similar pattern, but the corrected index exhibits slightly greater interannual variability.

Results of the NJ-NYB recreational CPUE index are shown in Table 3.3.2 and Figure 3.3.4.

All three indices were used in the assessment model. The WLI seine index captures mainly age-0 fish, so was lagged forward one year and treated as an age-1 index. (This is an improvement over the 2016 regional assessment that did not lag the index appropriately.) The NJ ocean trawl and MRFSS indices were treated as adult indices (ages 1-12+), with survey age distribution estimated using survey specific length frequency data and the NYNJ ALKs, assuming a plus group of ages 12+.

3.3.3 Biosampling and Age-Length Keys

For the NJ-NYB region, recreational harvest length frequency was evaluated separately for NJ and NY south shore. Unweighted lengths from MRFSS/MRIP intercepts from NJ were the only source of information used to characterize recreational harvest length distributions in New Jersey, while the south shore harvest was characterized using combined region specific data from MRFSS/MRIP and the New York Headboat Survey (NYHBS) sampling program. The sum of the recreational harvest at length for NJ and NY south shore was used to estimate total regional harvest at length. As the tautog fishery is predominantly recreational, the length frequency distributions obtained from this sector were applied to the commercial harvest.

Numerous sources contributed to estimate the length frequency of discarded fish in the NJ-NYB region. Region specific discard length data from the American Littoral Society Volunteer Angler Program (ALS) (1982-present) and MRIP Type 9 sampling of fish released alive from headboats (2004-present) were available for both NJ and south shore of NY. In addition, fishery dependent samples were also available for NY south from the NYHBS sampling program (1995-present).

Prior to 1995, raw age data by state were not consistently available. As a result, ALKs for the NJ-NYB region could only be created for 1995 forward. This still required pooling across regional boundaries to ensure the full range of sizes were covered by each regional key. As a result, the NJ-NYB key includes some data from Long Island Sound and Delaware. The distribution of the NJ-NYB harvest for the years 1989-1994 was assumed to follow the same distribution as the age distribution of the NJ Ocean Trawl survey.

3.4 DelMarVa

3.4.1 Landings

Recreational landings were obtained from the NMFS MRIP data collection program. Recreation harvest (A+B1) of tautog in DelMarVa has declined from 241,064 fish in 2010 to 22,215 in 2015 (Table 3.4.1, Figure 3.4.1). The decline coincided with the protective regulatory measures (minimum size increase and seasonal closures) instituted in 2012 to reduce fishing mortality. Recreational landings in 2015 were the lowest in time series.

Recreational discards have also declined from 686,392 released fish in 2010 to 125,258 fish in 2015 (Table 3.4.1). Due to low number of intercepted fishing trips that had tautog, annual estimates of recreational landings and discards in MD and VA had low precision (Proportional Standard Error (PSE) values exceeded 50% in three out four of the most recent years).

Commercial landings reported by each state (DE, MD, VA) in annual compliance reports were combined to derive region specific landings for the 2013-2015 period and added to the time series compiled for the DelMarVa region in 2013 benchmark assessment. Commercial landings in DelMarVa region were declining in recent years, primarily due to a decline in Virginia (Table 3.4.1. and Figure 3.4.1). Average commercial landings for 2013-2015 were 10,740 pounds (4.9 mt), with 2015 being much lower at 6,233 lbs (2.8 mt). Data on commercial discards were not available, but discards are believed to be minimal.

3.4.2 Indices

There are no fishery independent indices available for the DelMarVa region. The only index of relative abundance used in the 2013 benchmark assessment was catch per trip derived from MRFSS / MRIP data. Total catch per trip was modeled with GLM method using a suite of potentially important covariates (year, state, wave, mode) with an effort offset based on angler hours for the trip. The MRIP based index was updated through 2015. The MRIP index suggested a continuing decline in the relative abundance of tautog in DelMarVa region (Table 3.4.2, Figure 3.4.2).

3.4.3 Biosampling and Age-Length Keys

Biological sampling for tautog is conducted by each state on annual basis with the goal to collect at least 200 samples per year for each state. Samples for length, weight, sex and age are taken mostly by intercepting the catch of recreational fishermen. However, some samples were taken from commercial fishery as well. Annual age length keys were constructed by combining paired length - age samples from all three states. Total number of age and size samples used to construct annual ALK for 2013 -2015 ranged from 677 to 840, covering 23-76 cm size range and ages 1-29.

Length frequency of the recreational harvest was characterized using length frequency of the data collected by MRIP for each state. State specific MRIP annual harvest estimates were applied to state specific length frequency of the recreational harvest (A+B1) to obtain harvest in numbers by size group. Size frequency of discards (B2) was characterized by combining the MRIP Type 9 and ALS raw data on the size of released fish by state. State specific data were pooled to obtain regional estimate of total harvest (A+B1) and discards.

Due to low or absent commercial fishery size sampling, size frequency of recreational harvest was used to describe commercial catch at size. State specific recreational harvest, dead discards and commercial harvest in numbers of fish by size were combined into regional estimate and converted into catch at age using regional year specific age length keys.

3.5 Coastwide

3.5.1 Landings

Coastwide recreational harvest peaked in 1986 at over 7 million fish and has declined since then (Table 3.5.1, Figure 3.5.1). Average recreational harvest from 2013-2015 was 708,136 fish, with 2014 nearly double the harvest of 2013 and 2015: over 1 million fish compared to approximately 545,282 fish in 2015. The 2014 estimate was also more uncertain than the 2013 and 2015 estimates, with a PSE of 24.7% compared to 16-17% in 2013 and 2015.

The proportion of tautog released alive on the coast has increased over time. From 1982-1986, an average of 17.7% of the catch was released alive, while from 2013-2015, 81% of the catch was released alive (Figure 3.5.2). Tautog are very hardy; it is estimated that 2.5% of the fish that are released alive die as a result of being caught. This translates into an average of 73,551 tautog from 2013-2015. Although the proportion of fish released alive was not significantly different in 2014, the total numbers of fish released alive was also nearly double the levels of 2013 and 2015.

Commercial harvest showed a similar pattern to recreational harvest, although the magnitude is smaller, representing approximately 9% of the total harvest over the entire time series (Figure 3.5.3). It peaked in the late 1980s at 1.2 million lbs (525 mt), and declined to an average of 0.27 million lbs (124 mt) in 2013-2015. Commercial harvest in 2014 was 0.28 million lbs (129 mt), not significantly different from the 2015 harvest of 0.26 million pounds.

Total removals have declined in all regions across the coast (Figure 5.4.4). The proportion of harvest from each region has fluctuated somewhat over the years, with the DMV's proportion declining in recent years and the LIS region's proportion growing (Figure 5.4.4). From 2013-2015, MARI accounted for 27% of coastwide removals, LIS accounted for 35%, NJ-NYB accounted for 32%, and DMV accounted for 5%.

3.5.2 Indices

The coastwide assessment used the same indices as used in the regional assessments. This results in a total of seven fishery independent indices (three recruitment indices and four age-1+ surveys) and one fishery dependent index (age 1+).

A single MRIP CPUE for the coast was developed using the same technique as for the regional assessment; a comparison of the coastwide and regional trends is shown in Figure 5.3.5. Additionally, the New York seine survey for the coast was developed from all bays sampled instead of split north and south of Long Island.

The age-1+ indices showed similar trends over all, higher in the 1980s and lower through the 1990s to the present (Table 3.5.2, Figure 3.5.6). The recruitment indices were variable and also showed similar patterns, alternating periods of high and low recruitment (Table 5.3.3, Figure 5.3.7). Recruitment indices in 2013-2015 were near their long term average.

3.5.3 *Biosampling and Age-Length Keys*

Two regional age-length keys were developed for the coast, with samples from MA – NY forming a northern key and samples from NJ – VA forming a southern key. MRIP catch-at-length was pooled by region for the recreational harvest and also applied to the commercial harvest. MRIP Type 9 lengths and ALS lengths were pooled by region and applied to the recreational releases.

4 Model

All regions used ASAP (Age Structured Assessment Program v. 3.0.17, part of the NOAA Fisheries Toolbox) as the base model. ASAP is a forward-projecting, statistical catch-at-age model that uses a maximum likelihood framework to estimate annual fishing mortality, recruitment, population abundance and biomass, and other parameters from catch-at-age data and indices of abundance.

ASAP provides estimates of the asymptotic standard error for estimated and calculated parameters from the Hessian. In addition, MCMC calculations provide more robust characterization of uncertainty for F, SSB, biomass, and reference points.

4.1 Massachusetts-Rhode Island

The time series used for the MARI region was from 1982 through 2015, and uses a 12 plus age group as the final age class estimated by the model. There were no significant departures from the benchmark stock assessment for this regional model. The model was fit to both the total standardized index (catch per tow or catch per trip) and index-at-age data for the MADMF and RIDFW trawl surveys, and the MRIP CPUE indices. The RIDFW seine survey data was treated as a young-of-year index and was lagged forward one year (e.g., the 1983 age-1 predicted index value was fit to the observed 1982 YOY index value). The MARI region used three selectivity blocks which were selected based on periods of large regulatory changes: 1982-1996, 1997-2006, and 2007-2015. Unlike other regions, the MARI region has not undertaken any significant regulatory changes since 2007, therefore only three selectivity blocks are used for this region.

4.2 Long Island Sound

The ASAP model used a single fleet representing total removals in weight and removals-at-age from the recreational harvest, recreational release mortality, and commercial catch. Selectivity of the fleet was described by a logistic curve with a 12 year plus group. Data from 1984-2015 were divided into four selectivity blocks (1984-1986, 1987-1994, 1995-2011, and 2012-2015) based on the schedule of Connecticut regulatory changes.

Adult indices were fit to index-at-age data assuming a single logistic selectivity curve and constant catchability. YOY indices had a fixed selectivity pattern of 1 for age-1 and 0 for all other ages, and also assumed constant catchability.

Recruitment was estimated as deviations from a Beverton-Holt stock recruitment curve, with parameters estimated internally.

4.3 New Jersey-New York Bight

The NJ-NYB base model included years 1989-2015. Harvest at age was estimated from NJ and NY south commercial and recreational harvest, 2.5% of recreational discards, and available length frequency data. The coefficient of variation (CVs) on harvest were estimated as a weighted average of NY and NJ PSE and the respective state proportion of total NJ-NYB harvest. PSEs calculated in this fashion during MRFSS years (1989-2003) were corrected for underestimation by increasing them 30% as in the benchmark assessment.

Four single logistic selectivity blocks were established based on major regulatory and data collection changes that would be expected to alter the size distribution of the catch (pre-FMP = 1989-1997, FMP implementation 1998-2003, collection of Type 9 data 2004-2012, Addendum 6 regulations 2012-2015).

Following completion of a base model run, index CVs were adjusted upwards to bring RMSEs of the indices close to 1.0. Subsequently, effective sample size for the catch and aged indices were adjusted using ASAP's estimates of stage 2 multipliers for multinomials.

4.4 DelMarVa

The ASAP model was run from 1990 to 2015 for DelMarVa region based on the catch at age and MRIP index data covering ages 1-12, where age 12 was treated as a plus group. Removals were modeled as a single fleet that included total removals in weight and numbers-at-age from recreational harvest, recreational release mortality, and commercial catch. Selectivity of the fleet was described by a single logistic curve. Four selectivity blocks were used: 1982-1996, 1997-2006, 2007-2011 and 20013-2015. Breaks were chosen based on implementation of new regulations. Adult indices were fit to index-at-age data assuming a single logistic selectivity curve and constant catchability. No YOY indices are available for DelMarVa region.

All likelihood components weightings (lambda values) were retained from the 2013 benchmark assessment. CVs on total catch for the 2013 2015 were set equal to the last five years (2008-2012) average MRIP PSE values inflated for missing catch that were used in the 2013 benchmark assessment. The input ESS were adjusted using ASAP's estimates of stage 2 multipliers for multinomials.

A limited number of sensitivity runs were conducted to examine the effects of input data and model configuration on model performance and results. These included: addition of the NJ trawl index to examine the influence of individual data streams on model results; use of catch at age developed with size frequency of recreational catch based on the state biological sampling; different starting values for estimated parameters; use of 3 selectivity blocks for the catch instead of 4; fixing steepness at 1 (i.e., no relationship to SSB and fitting deviations to an average recruitment value; and truncating the time-series.

4.5 Coastwide

For the coast, ASAP was configured similarly to the regional models with a single fleet, four selectivity blocks (1982-1994; 1995-2006; 2007-2012; 2013-205), including a new 2013-2015 block, and age 12+ as the plus group. The model was run from 1982 – 2015. MRIP PSEs were used as the CV on catch, while index CVs were based on the GLM-standardized CVs and adjusted to bring their RMSE values close to one.

5 Results

5.1 Massachusetts – Rhode Island

5.1.1 Fishing Mortality and Selectivity Patterns

In general, fishery selectivity patterns shifted as expected with each block, with younger ages being less vulnerable to the fishery in the later two blocks compared to the earliest block pre-FMP implementation (Figure 5.1.1.). There was not a significant shift in selectivity between the 1997-2006 block and the 2007-2015 block.

In the MARI region, total F was highly variable, driven by large swings in estimated recreational harvest from year to year (Table 5.1.1, Figure 5.1.2). Since the terminal year of the benchmark assessment (2013), total F has been slowly declining to a point estimate of 0.22 in 2015. The terminal three year average total F was 0.23.

5.1.2 Spawning Stock Biomass and Abundance

Total abundance and spawning stock biomass declined rapidly from 1982 until 2000 (Table 5.1.2, Figures 5.1.3 and 5.1.4). Despite a period of slightly increased abundance in the early to mid-2000s, the overall trend has been flat from 2000 until 2015. Total abundance declined from a high of 10.9 million fish to the current estimate of 2.8 million fish in 2015. Spawning stock biomass decreased from 8,994 mt in 1985 to the current estimate of 2,196 mt in 2015.

5.1.3 Recruitment

Recruitment was generally highest in the early years of the time-series, with a couple of average recruitment years in the mid-2000s (Table 5.1.2, Figure 5.1.5). Observed recruitment has increased from time series lows during the 2013 – 2015 period, but remain below average in general.

5.1.4 Retrospective Analysis

Retrospective analyses were performed by ending the model in earlier and earlier years and comparing the results to the output of the model that terminated in 2015. As the most recent selectivity block began in 2007, a 7 year peel retrospective analyses was performed.

In the retrospective analysis, the MARI region showed a retrospective pattern of overestimating F (Mohn's rho = 0.36) and underestimating SSB (Mohn's rho =-0.08) (Figure 5.1.7). Recruitment tended to be more variable, was also underestimated on average, and was stable in the final 4 years (Mohn's rho = -0.27) (Figure 5.1.7). This overestimation of F and underestimation of SSB and recruitment are generally considered conservative estimates with regard to stock status.

5.1.5 Model Sensitivity and Uncertainty

The main sensitivity testing done in the MARI region was to run the model with one of the fishery independent indices dropped from the analysis. This was done for each of the four indices used in the assessment. It was found that there were some minor changes to the magnitude of the outputs, but the trend in the information was the same, and the stock status and terminal estimates were fairly close to the base model estimates. The one notable change occurred when the MRIP index was dropped from the analysis, the terminal year F was much higher than in the other model formulations, though trends and reference points were all similar to the other formulations. In general, the model was found to be robust to these changes.

5.2 Long Island Sound

5.2.1 Fishing Mortality and Selectivity Patterns

Estimated fishery selectivity patterns shifted in the expected direction between the all selectivity block (Figure 5.2.1).

In LIS, fishing mortality (F) calculated from the average of the currently fully recruited ages ranged between about 0.07 and 0.61 over the full time series which peaked in the early to mid-1990s at 0.61 and then declined until the mid-2000s (Table 5.2.1 and Figure 5.2.2). F is currently near its historic maximum (F_{2015}=0.58, F_{3yr} = 0.51).

5.2.2 Spawning Stock Biomass and Abundance

Total abundance and spawning stock biomass declined rapidly from 1984 until the mid to late 1990s. Despite a period of slightly increased abundance in the early to mid-2000s, the overall trend has been a slower but consistent decline since 1995 (Table 5.2.2, Figure 5.2.3). Total estimated abundance declined by more than half, from 8 million fish (1984) to 3.5 million fish (2015). Spawning stock biomass decreased by more than 75%, from over 6,350 mt at the beginning of the time-series to the current estimate of 1,551 mt.

Abundance at age in the stock of the terminal year shows a dominance of fish aged 1 and 3, fewer age 2 fish and declining abundance from age 4 through age 12 (Figure 5.2.4).

5.2.3 Recruitment

Recruitment was highest in the early years of the time series and again in 2013 and 2015 (Table 5.2.2, Figure 5.2.5. The two recent peaks in recruitment bracketed the lowest recruitment year on record.

The stock-recruitment relationship is shown in Figure 5.3.6. Steepness was estimated at 0.71. Estimates of steepness in the benchmark assessment were relatively robust to model configuration and there was good contrast in the stock size and recruitment levels over the time-series, suggesting the relationship was reliable for BRP calculations.

5.2.4 Retrospective Analysis

Retrospective analyses were performed by ending the model in progressively earlier years and comparing the results to the output of the model that terminated in 2015. In the retrospective analysis starting in 2012, F (Mohn's rho = 0.303, Figure 5.2.7A) was underestimated in the last five years while SSB (Mohn's rho = - 0.147, Figure 5.2.7B) and recruitment (Mohn's rho = -0.237, Figure 5.2.7C) were overestimated for the LIS region over the time series.

5.2.5. Model Sensitivity and Uncertainty

For the LIS region, the LIS portion of the NY recreational harvest was revised for the years 2005-2015 which resulted in a decrease of up to 45% of the total recreational harvest. Additionally, the LIS portion of the NY commercial harvest was revised for the years 2008-2015, which resulted in a decrease harvest estimate of 20%. These estimates as based on numerous data streams and are a source of uncertainty. As the data is updated annually the model will be updated to reflect the most up-to-date estimates. Additionally, unquantified illegal live fish harvest from the region is not accounted for in the stock assessment, and this may be an influential mortality source.

5.3 New Jersey – New York Bight

5.3.1 Fishing Mortality and Selectivity Patterns

Estimated fishery selectivity patterns shifted in the expected direction between the first and second selectivity blocks, but the model estimated an increase in selectivity at age for the third time block despite increased regulation. The reason for this is unknown but may be due to changes in data availability or sampling design. The 2012 size limit increase (via Addendum VI) shifted selectivity to the right as expected, with 50% selectivity between ages 5 and 6 (Figure 5.3.1).

Consistent with previous assessments, including the 2015 benchmark, a three year moving average F was used to smooth the time series of fishing mortality (F). Fully exploited fishing mortality (F-mult) shows high interannual variability, but suggests a cyclical pattern in exploitation over time, with ranges generally between 0.2 and 0.6 (Table 5.3.1, Figure 5.3.2). The declines in F are generally consistent with changes in regulations which often included increases in minimum size. F would then increase over the next few years as the fish grew into the new size limit. Terminal year fishing mortality is estimated as F_{2015} = 0.45 (90% confidence interval 0.23 - 0.88; Figure 5.3.3) with the three-year average F_{avg} = 0.54.

5.3.2 Spawning Stock Biomass and Abundance

SSB shows a general decline from approximately 6,000 mt in 1989 to around 1,900 mt by 1996 (Table 5.3.2, Figure 5.3.3). Regulations in 1997 and 2003 allowed slight increases in SSB in subsequent years, but these gains were short lived as F rebounded. From 2006 to 2011, SSB declined from around 2,000 mt to 1,000 mt, but has since recovered to 1,835 mt (90% confidence intervals 1,352 - 2,489 mt).

Abundance at age in the stock of the terminal year shows a dominance of fish aged 1 through 3 with declining numbers from age 4 through age 12 (Figure 5.3.4).

5.3.3 Recruitment

During the early 1990s, recruitment (age 1) follows a similar pattern as SSB (Table 5.3.3, Figure 5.3.5), declining from 1.5 million in 1989 to less than 1 million by 1993. From 1993 to 2011, recruitment varied without trend between approximately 560,000 and 1,010,000 fish annually. Estimates of recruitment in the last four years of the model were all over 950,000 fish, with an apparent strong year class in 2014, estimated at 2.26 million.

5.3.4 Retrospective Analysis

The NJ-NYB region retrospective analysis spanned from 2015 to 2009, which extended into the previous selectivity block. SSB is overestimated relative to the base model in every year of the model but shows a stabilization close to the final estimates within the last selectivity block from 2012 to 2015 (Mohn's rho = 0.42; Figure 5.3.6). The retrospective pattern in fishing mortality switches at the change in selectivity (Figure 5.3.7), from overestimated F in recent years to underestimating F during the third selectivity block (Mohn's rho=0.079). The earliest estimate is underestimated by over 100% while the first year in the final selectivity block is overestimated by nearly 100%. The pattern in recruitment shows an overestimate of recruits in 2009, but the values for the following years fall below the final base run estimates (Mohn's rho=-0.094; Figure 5.3.8).

5.3.5 Model Sensitivity and Uncertainty

Two sensitivity runs were conducted for the NJ-NYB region to evaluate model sensitivity to data inputs and assumptions. During development of the update assessment, two errors were found in the indices used in the regional benchmark (NY seine and MRFSS; see appropriate section for details). Both errors were corrected for the update, but a sensitivity run was conducted using the incorrect indices to evaluate model performance. Similarly, the Tautog TC questioned the validity of the third selectivity block estimate for the NJ-NYB region, so a sensitivity run was conducted fixing the third selectivity as the average of the 2nd and 4th time periods. Neither of the runs had a significant impact on the results. Most notable, the incorrect indices resulted in a slightly lower fishing mortality rate in recent years ($F_{3year\text{-}avg}$ = 0.47 for sensitivity vs 0.54 for preferred model) and slightly higher SSB and recruitment trends in the last five years. For the run using a fixed 3rd selectivity block, terminal and recent year estimates were nearly identical to the preferred run, but fishing mortality for the years of that selectivity block (2004-2011) increased over the preferred run. This is consistent with the retrospective pattern which indicates F was underestimated in those years. F reference points were consistent among the runs, as was stock status with respect to F.

5.4 DelMarVa

5.4.1 Fishing Mortality and Selectivity Patterns

Fishing mortality has declined in 2013 - 2015 relative to the earlier period (Table 5.4.2, Figure 5.4.2). The terminal year (2015) F was estimated at 0.08, while the three year average for 2013 – 2015 was estimated as 0.16.

5.4.2 Spawning Stock Biomass and Abundance

Both total abundance and spawning stock biomass have declined steadily in the DelMarVa region since 2009, and SSB reached historically low level of 609 mt in 2015 (Table 5.4.3, Figure 5.4.3). Total abundance declined from a stable level of about 2.5 million fish in 2002-2009 period to the current low of 0.86 million fish in 2015.

5.4.3 Recruitment

Recruitment appears to have been on the decline since 2009, reaching the lowest level in 2013 at 110,620 fish, but began to increase thereafter (Table 5.4.3, Figure 5.4.4). Overall, recruitment has exhibited low variability and lack of sharp inter-annual changes.

5.4.4 Retrospective Analysis

Retrospective analyses were performed by shortening the data time series by one year at a time and comparing the results to the output of the model with full time series (1990-2015). The analysis was completed for time series ending in 2015, 2014, 2013, 2012, and 2011 (a five year peel).

As in the 2013 benchmark assessment, the DelMarVa region showed a strong retrospective pattern, consistently underestimating F (Mohn's rho = -0.65; Figure 5.4.5) and overestimating SSB (Mohn's rho=0.83; Figure 5.4.5). Retrospective bias in F and SSB in this assessment update appears to be larger than estimated before in 2013. Recruitment has the largest positive bias being overestimated (Mohn's rho=2.2; Figure 5.4.5); this may be due in part to the lack of a YOY index in this region. The estimates of R, F and, in particular, SSB do not converge when going back in time.

5.4.5 Model Sensitivity and Uncertainty

A limited number of sensitivity runs were conducted to examine the effects of input data and model configuration on model performance and results.

The base model results were insensitive to changes in starting values of model parameters (initial numbers at age, steepness, selectivity, catchability, etc). The model was converging on the same parameters estimates, within a range of initial starting values, indicating stability of model solution. Fixing steepness parameter at 1, thus assuming no stock recruitment relationship, had very little effect on the final model results. The model was also insensitive to the introduction of the additional, 4th selectivity block covering 2012-2015 period. Estimates of F and SSB were nearly identical to those from the model run with three selectivity blocks, where the third block covered the period of 2007 -2012.

Forcing the model to fit the catch information exactly (by reducing catch CVs to a very small value) is one of the few outcomes where the results are rather different – the SSB estimates appear to be significantly larger, particularly in the most recent period (SSB in 2015 is 57% higher than the base run), while the fishing mortality is significantly lower (55% of the base run estimate in 2015. Truncation of the time series (starting the model in 1995 rather than in 1990) leads to a slightly lower SSB and higher F estimates relative to the base run. Addition of NJ trawl index as the geographically nearest fishery independent survey resulted in very small changes in SSB estimates, but slightly higher F relative to the base run.

Overall, the model estimates appear to be stable and not sensitive to changes explored in various sensitivity runs.

5.5 Coastwide

5.5.1 Fishing Mortality and Selectivity Patterns

On the coast, the selectivity pattern of the fishery has shifted towards the right over time, with tautog fully selected by age 7 in the earliest time block, prior to implementation of the ASMFC FMP, and fully selected by age 9 in the most recent block, from 2013-2015 (Figure 5.5.1). However, the model estimated an increase in selectivity at age for the third time block, 2007-2012, despite increased regulation. This was also seen in other regions, and may indicate issues with the length and age sampling data for this time block.

Fishing mortality has been variable from year to year, but overall shows cyclical patterns of increasing and decreasing F (Table 5.5.1, Figure 5.5.2). The variability is somewhat smoothed out by the three year moving average of F. Full F peaked in the late 1980s, the mid-1990s and around 2010. F declined sharply from 2010 to 2011, but has been increasing again since then. In the terminal year, F_{2015} was 0.33, while the three-year average of 2013-2015 was 0.38.

5.5.2 Spawning Stock Biomass and Abundance

Spawning stock biomass peaked at the beginning of the time series, at around 26,000 mt before declining to a low of 5,138 mt in 2011 (Table 5.5.2, Figure 5.5.3). SSB has increased somewhat since then, with SSB in 2015 estimated at 6,014 mt.

Abundance has declined over this time period as well, from a high in the early 1980s of approximately 28 million fish to a low in 2011 of 8.4 million fish, with a slight increase since then (Figure 5.5.4). Total abundance in 2015 was 9.9 million fish. The age structure of the population has contracted over this time period as well, with older fish (ages 8-12+) making up a smaller proportion of the population in the most recent years (Figure 5.5.4).

5.5.3 Recruitment

Recruitment has declined since the beginning of the time series, from approximately 5.9 million age-1 fish in 1982 to a low of 1.75 million fish in 1996 (Table 5.5.2, Figure 5.5.5). Recruitment has fluctuated around a mean of 2.2 million fish since then. Recruitment in 2015 was estimated at 2.1 million fish, slightly below the time-series mean of 2.75 million fish.

The spawner-recruit relationship is shown in Figure 5.5.6. Steepness was estimated at 0.55, indicating a moderately productive species.

5.5.4 Retrospective Analysis

A retrospective analysis was conducted by iteratively removing one year of data, from 2015 – 2009. It should be noted that this analysis crosses the 2013-2015 selectivity block, meaning removing data from the terminal selectivity block, as well as the 2007-2012 block, will hinder the model's ability to estimate F and selectivity in those years.

In general, the model overestimated F (Mohn's rho=0.37) and underestimated SSB (Mohn's rho = -0.088) and recruitment (Mohn's rho = -0.30), although for some years of the analysis, this pattern was reversed (Figure 5.5.7).

5.5.5 Model Sensitivity and Uncertainty

The use of the ASAP model is an improvement over previous coastwide assessments' use of the VPA model because of ASAP's ability to handle uncertainty in catch and indices. However, the TC does not recommend the coastwide model for management use, given the biology and life history of tautog. The coastwide model averages the trends over a number of discrete population units and increases the risk of overfishing individual regions. Although the precision of MRIP estimates is best at the largest spatial scale, the coastwide model is also sensitive to the same data uncertainties as the other regions, including the lack of dedicated fishery independent indices for tautog, especially in the southernmost part of the range and low sample size for age data.

6 Biological Reference Points and Stock Status

Overfishing status is evaluated based on average F from 2013-2015. Annual estimates of F are highly variable due to the annual variability in catch, which is more likely due to the imprecision of the MRIP estimates. Therefore, the TC recommends the use of the three-year running average to evaluate overfishing status to smooth out the somewhat artificial inter-annual variability in F and allow management to respond to genuine trends. Overfished status is determined by SSB in 2015. Estimates of SSB are more stable, so the TC finds the terminal year estimate appropriate to determine overfished status.

Regions with adequately estimated stock-recruitment relationships used MSY-based reference points to determine stock status. Regions without stock-recruitment curves used SPR-based reference points for F, and used the projection model AGEPRO to project the population forward in time under constant fishing mortality ($F_{30\%SPR}$ and $F_{40\%SPR}$) with recruitment drawn from the model estimated time-series of observed recruitment to develop an estimate of the long-term equilibrium SSB associated with those fishing mortality reference points.

6.1 Massachusetts-Rhode Island

Estimated steepness of the MARI regional model was deemed credible by the TC during the benchmark assessment, and the TC therefore recommends MSY-based benchmarks for this region. The steepness parameter was similar to that estimated during the benchmark (steepness = 0.45), therefore MSY reference points were used for this update to be consistent with the benchmark recommendations. Because there was considerable discussion by the TC regarding the utility of the different reference point models, SPR-based reference points are also provided for the MARI region.

6.1.1 Overfishing Status

F_{target} was defined as F_{MSY} with $F_{threshold}$ set at the F value necessary to achieve the SSB threshold, 75%SSB_{MSY}, in the long term. These two reference points are F_{target} = 0.14 and $F_{threshold}$ = 0.28. The three year average of F for 2013-2015 is 0.23. This value is below the threshold, indicating overfishing is not occurring, but it is still above the target (Figure 6.1.1).

For SPR estimates, the 3-year average value of F_{3yr} = 0.23 was below both F_{Target} = 0.28 and $F_{threshold}$ = 0.49 (Figure 6.1.3), thus indicating by the SPR reference points that this stock is not experiencing overfishing and is at a fishing mortality rate that is below the target.

6.1.2 Overfished Status

For the MARI region, SSB_{target} was defined as SSB_{MSY} = 3,631 mt and $SSB_{threshold}$ was defined as 75% of SSB_{MSY} = 2,723 mt. SSB_{2015} was estimated at 2,196 mt, below both the target and the threshold, indicating the stock is overfished (Figure 6.1.2).

For SPR estimates, the point estimate of SSB_{2015} = 2,196 mt is below the SSB_{Target} = 2,684 mt but is above the $SSB_{threshold}$ = 2,004 mt (Figure 6.1.4), thus indicating that the stock is not overfished but is not yet rebuilt to the SSB target.

6.2 Long Island Sound

6.2.1 Overfishing Status

F_{target} was defined as F_{MSY} and $F_{threshold}$ was defined as the F rate that would maintain the population at 75%SSB_{MSY}. F_{target} for Long Island Sound was 0.28 and $F_{threshold}$ was 0.49.

For comparison with other regions, both MSY and SPR values are reported. Both methods indicated that overfishing is occurring in Long Island Sound. In 2013-2015, F ranged from 0.35 to 0.59. The 3 year-average estimates of F (F_{3yr} = 0.51) exceeded both the MSY target and threshold (Table 6.2.1, Figure 6.2.1) and the SPR target and threshold ($F_{40\%SPR}$=0.27 and $F_{30\%SPR}$=0.46; Table 6.2.1, Figure 6.2.2).

6.2.2 Overfished Status

The ASAP model runs using both MSY and SPR methods indicated that the tautog stock is overfished in Long Island Sound. SSB_{2015} (1,603 mt, Table 6.2.1, Figure 6.2.1) is below MSY target and threshold (SSB_{MSY} = 2,865 mt and $SSB_{75\%MSY}$ = 2,148 mt) as well as SPR target and threshold ($SSB_{40\%}$ = 2,980 mt and $SSB_{30\%SPR}$ = 2,238 mt; Table 6.2.1, Figure 6.2.2).

6.3 New Jersey – New York Bight

6.3.1 Overfishing Status

In the NJ-NYB regional model, data were not sufficient to allow credible estimation of the stock-recruit relationship, so the TC considered the MSY-based reference points unreliable. Consistent with the regional assessment, fishing mortality target and threshold reference points in the NJ-NYB region are defined as $F_{40\%SPR}$ and $F_{30\%SPR}$, respectively. ASAP model estimated values for the target and threshold are $F_{40\%}$ = 0.20 and $F_{30\%}$ = 0.34. The ASAP model runs indicated overfishing was occurring in the NJ-NYB region in 2015. Both the point estimate of F_{2015} = 0.45 and the 3-year average value of F_{3yr} = 0.54 were above the fishing mortality threshold (Figure 6.3.1).

6.3.2 Overfished Status

Long term equilibrium projections conducted in AgePro estimate that spawning stock biomass reference points for the NJ-NYB region as SSB_{target} = 3,154 mt and $SSB_{threshold}$ = 2,351 mt. The ASAP model run indicates that the NJ-NYB tautog population is overfished in 2015. SSB_{2015} was estimated at 1,809 mt, approximately 23% below the SSB threshold and 43% below the target (Figure 6.3.1).

6.4 DelMarVa

6.4.1 Overfishing Status

For DelMarVa, F_{target} is defined as $F_{40\%SPR}$ = 0.16, and $F_{threshold}$ is defined as $F_{30\%SPR}$ = 0.24. The three year average F from 2013-2015 was 0.16, equal to the target and below the threshold, indicating overfishing is not occurring (Figure 6.4.1).

6.4.2 Overfished Status

The SSB target for DelMarVa is the long-term equilibrium SSB associated with $F_{40\%SPR}$, equal to 1,919 mt. The SSB threshold is the SSB associated with $F_{30\%SPR}$ = 1,447 mt. Terminal year SSB 2015 estimate is 620.9 mt, below both the target and the threshold (Figure 6.4.1). According to the probability distribution of SSB estimates based on the MCMC analysis, there is 100% chance that SSB in 2015 was below $SSB_{threshold}$ (Figure 6.4.2), indicating the stock is overfished.

6.5 Coastwide

6.5.1 Overfishing Status

For the coast, F_{target} was defined as F_{MSY} and $F_{threshold}$ was defined as the F rate that would maintain the population at 75%SSB_{MSY}. F_{MSY} for the coastwide population was 0.17 and $F_{75\%SSB}$ was 0.24. The 2013-2015 average F was 0.38, above both the MSY-based target and the threshold, indicating overfishing was occurring (Figure 6.5.1).

For comparison, $F_{30\%SPR}$ was 0.43 and $F_{40\%}$ was 0.25. The 2013-2015 average F was between those two values (Figure 6.5.2).

6.5.2 *Overfished Status*

SSB_{target} was defined as SSB_{MSY}, estimated at 14,944 mt, and $SSB_{threshold}$ was 75% of SSB_{MSY}, or 11,208 mt. In 2015, SSB was 6,014 mt, below both the target and the threshold, indicating the stock was overfished (Figure 6.5.1).

For comparison, the $SSB_{30\%}$ associated with $F_{30\%SPR}$ was 7,091 mt and the $SSB_{40\%}$ associated with $F_{40\%SPR}$ was 9,448 mt. SSB in 2015 was below both of these values as well (Figure 6.5.2).

7 Projections

AgePro (v. 4.2, NOAA Fisheries Toolbox), was used to conduct short term (2016-2020) projection scenarios to determine constant harvest levels that would result in 50% chance and 70% chance of achieving the regional F targets in 2020, as well as to project trends under status quo removals. Biological parameters (maturity, M, weights at age) for the projection model were the same used in the ASAP population model, with the exception that projection catch weights at age were set equal to the average catch weight at age in the most recent selectivity block. The model assumed empirical recruitment drawn from the ASAP estimated observed recruitment vector for SPR reference points, and Beverton and Holt recruitment with lognormal error using parameter estimated by ASAP for MSY-based reference points. Fishery selectivity was input as that estimated by ASAP in the most recent selectivity period. Harvest for 2016 and 2017 were assumed equal to the most recent three year average harvest. An iterative process was used to determine a constant harvest rate in 2018-2020 that resulted in 50% and 70% probabilities of achieving $F_{target.}$

7.1 Massachusetts – Rhode Island

Probability estimates of achieving MSY reference points ($F_{MSYTarget}$ and $SSB_{75\%MSY}$) and SPR reference points ($F_{40\%SPR}$ and $SSB_{30\%}$) in 3 years from short term projections (2017 through 2020) are shown in Table 7.1.1 and Figures 7.1.1 and 7.1.2. Under status quo conditions (2013-2015 average landings of 390 mt), using MSY reference points there is 0% probability of achieving F_{Target} and 0% probability of reaching $SSB_{Threshold}$ (Table 7.1.1, Figure 7.1.1). Similarly, under status quo conditions, using SPR reference points there is 0% probability of achieving $F_{40\%}$ but a 4.1% probability of reaching $SSB_{30\%SPR}$ (Table 7.1.1, Figure 7.1.2).

Reducing landings to 151 mt (approximately 55% of 2015 landings) and using MSY reference points results in a 50% probability of achieving F_{target} and 2.2% probability of achieving $SSB_{Threshold}$ (Table 7.1.1, Figure 7.1.3). With MSY reference points, landings of 148 mt (a 56% reduction from 2015 landings) results in a 70% probability of achieving F_{target} and 2.3% probability of achieving $SSB_{Threshold}$ by 2020 (Table 7.1.1, Figure 7.1.4).

Using SPR reference points, a harvest reduction of 24% from 2015 landings to 257 mt results in a 50% probability of achieving $F_{40\%SPR}$ and 23.2% probability of achieving $SSB_{30\%SPR}$ (Table 7.1.1, Figure 7.1.5). Annual landings of 253 mt (a 25% reduction from 2015 levels) results in a 70%

probability of achieving $F_{40\%SPR}$ and 24.3% probability of achieving $SSB_{30\%SPR}$ (Table 7.1.1, Figure 7.1.6).

7.2. Long Island Sound

Under status quo conditions (2013-2015 average landings of 500 mt), using MSY reference points, there is 1.7% probability of achieving F_{Target} and 0.6% probability of reaching $SSB_{Threshold}$ (Table 7.2.1, Figure 7.2.1). Similarly, under status quo conditions, using SPR reference points there is 0% probability of achieving F_{Target} and 0.6% probability of reaching $SSB_{Threshold}$ (Table 7.2.1).

Reducing landings to 264 mt (a 39% reduction from 2015 levels) and using MSY reference points results in a 50% probability of achieving F_{target} and 34% probability of achieving $SSB_{Threshold}$ (Table 7.2.1, Figure 7.2.2). With MSY reference points, landings of 229 mt (a 47% reduction from 2015 levels) results in a 70% probability of achieving F_{target} and 40% probability of achieving $SSB_{Threshold}$ by 2020 (Table 7.2.1, Figure 7.2.3).

Using SPR reference points, a harvest reduction of 41% (to 255 mt) results in a 50% probability of achieving $F_{40\%SPR}$ and 28% probability of achieving $SSB_{30\%SPR}$ (Table 7.2.1, Figure 7.2.4). Annual landings of 229 mt (47% reduction from 2015) results in a 70% probability of achieving the SPR $F_{40\%SPR}$ and 33% probability of achieving $SSB_{30\%SPR}$ (Table 7.2.1, Figure 7.2.5).

7.3 New Jersey – New York Bight

Probability estimates of achieving F_{Target} and $SSB_{Threshold}$ in 2020 years from short term projections (2016 through 2020) are shown in Table 7.3.1 and Figures 7.3.1 – 7.3.3. Under status quo conditions (2013-2015 average landings of 461 mt), there is a 45% probability of achieving F_{Target} and an 85% probability of being at or above $SSB_{threshold}$ in 2020 (Table 7.3.1, Figure 7.3.1).

Constant harvest of 450 mt (a 2.3% reduction from the 2013-2015 average but a 35% increase from 2015 levels) results in a 50% probability of achieving F_{target} and 86% probability of being at or above $SSB_{threshold}$ (Table 7.3.1, Figure 7.3.2). Annual landings of 410 mt (an 11% reduction from the 3-year average and a 23% increase from 2015 levels), provides a 70% probability of achieving F_{target} and an 88% probability of being at or above $SSB_{threshold}$ (Table 7.3.1, Figure 7.3.3).

7.4 DelMarVa

If the constant catch of 77.0 mt was maintained during 2016-2020 (status quo scenario), the probability of the fully-recruited F being at or below the F target by the year 2020 is expected to be 99.64%, while the probability of SSB being at or above SSB threshold is 18.15 % (Table 7.4.1, Figure 7.4.1). Fishing mortality will rise to 0.13 in 2016 and will decline thereafter to F=0.076 by 2020 (Figure 7.4.1). SSB is projected to grow but the median will reach only 1320.5 mt (Figure 7.4.1).

A 50% probability for F being at or below $F_{threshold}$ by year 2020 can be achieved by maintaining total annual removals at 136 mt, an increase from both the 3 year average and 2015 levels;

however, this results in a very low chance (9.9%) of SSB reaching the SSB threshold (Table 7.4.1; Figure 7.4.2).

A 70% chance of F being at or below $F_{threshold}$ by year 2020 requires to maintain annual removals in 2018-2020 at 125 mt, but the chance for SSB reaching SSB target is only 11.9% (Table 7.4.1; Figure 7.4.3).

7.5 Coastwide

Under status quo harvest (the average of the last three years, 1,270 mt), there is zero probability of attaining the F_{target} in 2020, and less than 1% probability of being at or above the SSB threshold (Table 7.5.1, Figure 7.5.1).

To have a 50% chance of being at or below the F target in 2020, harvest for 2018-2020 needs to be reduced to 737 mt, an 18.5% reduction from 2015 harvest (Table 7.5.1, Figure 7.5.2). This results in a 0.9% chance that SSB will be at or above the threshold in 2020 (Figure 7.5.2).

To have a 70% chance of being at or below the F target in 2020, harvest for 2017-2020 needs to be reduced to 682 mt, a 24.6% reduction from 2015 harvest (Table 7.5.1, Figure 7.5.3). This results in a 1% chance that SSB will be at or above the threshold in 2020 (Figure 7.5.3).

These calculations were done using the MSY-based target and threshold reference points.

Status quo harvest results in a 2.7% chance that F will be at or below $F_{40\%SPR}$ in 2020, and a 29.4% chance that SSB will be at or above $SSB_{30\%}$ (Table 7.5.1, Figure 7.5.4).

To have a 50% chance of achieving $F_{40\%SPR}$, harvest in 2018-2020 needs to be 968 mt, a 23.8% reduction from the 2013-2015 average harvest, but a 7% increase from 2015 harvest (Table 7.5.1, Figure 7.5.5). This results in a 50.2% probability of SSB being at or above $SSB_{30\%}$ (Figure 7.5.5).

To have a 70% chance of being at or below $F_{40\%SPR}$, harvest in 2018-2020 needs to be reduced to 895 mt, a reduction of 1% from 2015 harvest levels and a reduction of 29.5% from the 2013-2015 average harvest (Table 7.5.1, Figure 7.5.6). This results in a 55.3% probability of SSB being above $SSB_{30\%}$ (Figure 7.5.5).

8 Research Recommendations

For all regions, the TC recommends expanding the biological sampling of catch and discards, both commercial and recreational, as well as increased MRIP sampling levels to improve estimates of total catch, as high priorities to improve the assessment. In addition, establishing standardized multi-state fishery independent surveys using gear appropriate for structure-oriented species (e.g., fish pots or traps) is a high priority to improve the quality of fishery independent abundance information for the assessment. Genetic analyses with up-to-date methodologies could also help refine regional boundaries. Better monitoring of illegal harvest to develop more accurate estimates of these removals and improve compliance would also be useful to both the assessment and management of this species.

9 Literature Cited

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10 Tables

Table 3.1.1. Total removals by sector for the MARI region.

Year	Recreational (#s of fish) Harvest (A+B1)	Released Alive (B2)	Commercial (lbs)	Total Harvest (mt)
1982	1,265,960	36,347	155,600	1,888
1983	916,304	160,239	200,200	1,206
1984	748,384	264,958	402,800	1,341
1985	216,345	48,304	466,500	487
1986	2,652,311	436,693	528,900	4,739
1987	747,797	204,966	670,500	1,334
1988	829,478	261,695	606,000	1,579
1989	366,583	76,860	566,900	882
1990	386,877	117,368	500,158	812
1991	468,851	179,847	725,943	1,152
1992	551,735	101,425	652,058	1,354
1993	335,328	118,493	361,929	684
1994	160,787	282,698	167,781	401
1995	127,031	270,111	130,287	313
1996	135,326	249,188	97,396	344
1997	109,703	179,952	103,841	265
1998	81,118	172,650	111,623	242
1999	143,612	305,683	101,709	318
2000	126,239	203,737	139,720	361
2001	155,651	278,909	140,395	372
2002	165,085	419,193	198,080	460
2003	166,869	386,438	140,855	392
2004	146,235	288,030	124,757	420
2005	232,562	445,497	142,186	615
2006	161,250	530,434	194,238	410
2007	216,537	680,682	159,253	534
2008	137,997	264,226	121,896	333
2009	110,295	283,101	105,600	233
2010	242,805	304,734	119,373	551
2011	52,132	348,649	105,217	150
2012	129,221	310,096	117,998	345
2013	193,926	512,749	123,597	436
2014	169,065	544,881	116,581	398
2015	138,264	476,747	108,892	337

Table 3.1.2. Indices of relative abundance for the MARI region.

Year	MA Trawl Survey	RI Fall Trawl Survey	MRIP CPUE	RI Seine Survey (YOY)
1982	0.83	0.302	0.694	
1983	0.423	1.026	1.926	
1984	0.912	1.729	1.707	
1985	0.643	0.949	0.712	
1986	2.159	3.030	3.105	
1987	0.894	1.227	0.903	
1988	0.582	0.053	0.878	
1989	2.351	0.478	1.257	7.567
1990	0.224	0.269	0.916	13.758
1991	0.079	0.203	1.104	5.391
1992	0.594	0.137	1.662	7.353
1993	0.105	0.040	1.269	9.007
1994	0.371	0.111	0.990	3.507
1995	0.060	0.103	0.736	0.968
1996	0.173	0.670	0.892	0.877
1997	0.207	0.041	0.459	7.065
1998	0.158	0.071	0.428	2.658
1999	0.034	0.109	0.335	4.764
2000	0.019	0.526	0.272	5.313
2001	0.153	0.150	0.304	15.026
2002	0.170	0.392	0.350	8.700
2003	0.117	0.231	0.465	9.291
2004	0.041	0.510	0.300	15.669
2005	0.263	0.137	0.554	7.656
2006	0.290	0.021	0.489	13.442
2007	0.129	0.035	0.348	2.595
2008	0.200	0.198	0.334	8.851
2009	0.237	0.127	0.934	2.408
2010	0.022	0.158	0.498	2.339
2011	0.146	0.195	0.654	3.042
2012	0.077	0.071	0.514	1.340
2013	0.043	0.178	0.480	4.115
2014	0.130	0.148	0.414	4.149
2015	0.090	0.079	0.456	5.194

Table 3.2.1. Total catch by sector for the LIS region.

	Recreational (#s of fish)		Commercial	Total Harvest
Year	Harvest (A+B1)	Released Alive (B2)	(lbs)	(mt)
1982				
1983				
1984				825
1985				805
1986			285,285	1,071
1987			350,842	1,386
1988	664,341	382,998	257,615	1,103
1989	515,322	340,698	309,486	907
1990	459,765	428,202	171,706	792
1991	565,449	605,198	168,070	898
1992	466,681	501,359	164,039	788
1993	383,309	360,578	132,385	624
1994	224,172	270,393	78,186	339
1995	172,826	302,923	53,087	306
1996	84,582	125,904	116,817	186
1997	68,375	149,719	74,831	150
1998	123,043	413,306	66,734	255
1999	150,639	261,363	33,700	332
2000	29,464	53,732	34,067	75
2001	29,425	147,165	60,019	93
2002	514,233	734,039	65,833	995
2003	229,112	385,144	86,447	443
2004	260,173	532,607	89,922	578
2005	110,291	261,960	79,281	246
2006	324,274	579,285	86,640	642
2007	505,230	997,400	120,319	1,007
2008	393,542	634,734	82,226	807
2009	270,515	457,807	52,732	523
2010	217,978	426,213	71,036	433
2011	76,506	265,894	88,481	179
2012	220,194	880,195	65,710	523
2013	122,376	629,212	85,312	326
2014	342,430	2,420,049	99,944	743
2015	199,800	1,031,494	76,525	431

Table 3.2.2. Indices of abundance for the LIS region.

Year	CT Long Island Sound Trawl Survey	MRIP CPUE	NY Peconic Bay Trawl (Age-1)	NY WLI Seine Survey (YOY)
1982		1.225		
1983		1.091		
1984	1.697	1.546		0.369
1985	0.956	1.453		
1986	1.033	1.258		0.052
1987	0.829	1.367	0.207	0.033
1988	0.617	3.379	0.218	1.244
1989	0.771	2.668	0.900	0.026
1990	0.787	1.229	0.354	0.187
1991	1.039	1.608	0.286	2.932
1992	0.465	1.804	0.132	0.450
1993	0.257	1.471	0.227	0.009
1994	0.277	1.279	0.076	
1995	0.142	0.692	0.089	0.065
1996	0.206	1.046	0.233	0.043
1997	0.278	0.577	0.177	0.281
1998	0.365	0.395	0.250	0.215
1999	0.505	0.342	0.170	1.004
2000	0.454	0.222	0.085	1.772
2001	0.543	0.229	0.326	0.034
2002	0.955	0.687	0.137	0.548
2003	0.393	0.782	0.208	0.935
2004	0.349	0.626	0.145	0.045
2005	0.294	0.683		0.331
2006	0.396	1.072		0.172
2007	0.366	0.781	0.219	0.064
2008	0.379	0.676		0.040
2009	0.264	0.599	0.924	
2010	0.170	0.750	0.424	0.010
2011	0.177	0.550	0.103	0.008
2012	0.285	0.452	0.161	0.402
2013	0.286	0.364	1.133	0.025
2014	0.328	0.772	0.407	0.448
2015	0.354	0.327	0.477	1.296

Table 3.3.1. Total catch by sector for the NJ-NYB region.

Year	Recreational (#s of fish) Harvest (A+B1)	Recreational (#s of fish) Released Alive (B2)	Commercial (lbs)	Total Harvest (mt)
1982	910,502	151,180		
1983	654,074	231,774		
1984	660,719	153,337	130,073	
1985	1,399,406	315,718	125,663	
1986	2,968,005	324,116	121,254	
1987	1,485,251	691,974	127,868	
1988	962,326	485,103	198,416	
1989	1,061,967	486,647	105,822	927
1990	1,411,498	556,687	154,323	1,183
1991	1,564,192	1,270,467	176,370	1,696
1992	1,283,981	800,674	147,710	1,554
1993	1,075,591	1,002,991	169,756	1,195
1994	330,877	450,591	216,053	419
1995	773,402	1,079,342	156,528	935
1996	541,233	625,146	112,436	641
1997	253,456	503,556	68,343	319
1998	24,308	536,624	50,706	62
1999	227,131	1,264,625	44,092	351
2000	522,799	1,003,171	55,116	944
2001	500,795	1,232,142	85,980	790
2002	563,610	1,274,528	57,320	948
2003	170,085	588,524	92,594	250
2004	125,255	571,272	110,231	237
2005	52,744	286,363	103,617	130
2006	324,041	956,020	114,640	556
2007	371,566	1,385,999	127,868	646
2008	265,054	1,228,194	125,663	447
2009	289,079	1,102,538	74,957	450
2010	418,343	1,452,652	114,640	602
2011	197,397	975,357	114,640	329
2012	73,025	580,820	70,548	165
2013	170,248	700,017	99,208	331
2014	409,612	832,050	85,980	716
2015	180,343	910,732	85,980	334

Table 3.3.2 Indices of relative of abundance for the NJ-NYB region

Year	NY Jamaica Bay Seine Survey (YOY)	NJ Ocean Trawl	MRIP CPUE
1982			0.363
1983			0.244
1984			0.209
1985			0.312
1986			0.631
1987	0.083		0.499
1988	0.234		0.525
1989	1.280	1.269	0.714
1990	0.994	1.565	0.767
1991	0.407	0.988	0.660
1992	0.421	1.324	0.782
1993	0.013	0.692	0.399
1994	0.121	0.434	0.194
1995	0.090	0.601	0.523
1996	0.052	0.203	0.370
1997	0.000	0.112	0.315
1998	0.052	0.296	0.087
1999	0.853	0.618	0.169
2000	0.634	0.334	0.205
2001	1.112	0.287	0.383
2002	0.135	1.482	0.531
2003	0.240	0.605	0.148
2004	1.859	0.353	0.250
2005	1.477	0.662	0.164
2006	0.622	0.760	0.257
2007	1.041	0.357	0.369
2008	0.423	0.897	0.268
2009	0.042	0.572	0.524
2010	0.000	0.435	0.228
2011	0.066	0.140	0.247
2012	2.745	0.248	0.204
2013	0.706	0.424	0.157
2014	0.922	0.724	0.178
2015	1.829	0.456	0.305

Table 3.4.1. Total catch by sector for the DMV region.

	Recreational (#s of fish)		Commercial	Total Harvest
Year	Harvest (A+B1)	Released Alive (B2)	(lbs)	(mt)
1982	244,032	20,010		
1983	586,271	67,004		
1984	278,415	34,292		
1985	154,444	37,016	4,334	
1986	469,671	108,559	5,162	
1987	317,012	93,003	7,610	
1988	570,381	110,900	9,511	
1989	569,114	160,508	12,016	
1990	218,991	135,294	6,655	203
1991	323,823	201,118	9,468	497
1992	275,976	203,969	6,195	280
1993	443,190	489,045	5,562	504
1994	454,837	475,896	12,046	662
1995	566,031	450,207	27,746	713
1996	291,893	157,455	29,560	454
1997	257,493	246,349	26,810	374
1998	120,019	275,906	20,681	267
1999	158,369	450,855	26,179	296
2000	168,540	465,256	17,503	298
2001	103,241	374,054	16,330	180
2002	253,709	744,271	26,892	426
2003	152,972	318,839	16,505	270
2004	230,001	345,543	26,445	390
2005	149,444	457,085	10,326	269
2006	231,059	579,466	14,503	424
2007	203,905	525,183	14,378	338
2008	177,247	349,010	15,951	319
2009	218,374	390,535	14,469	379
2010	241,064	686,392	8,969	399
2011	103,777	200,094	17,968	181
2012	65,846	234,530	15,940	121
2013	48,195	168,605	15,070	74
2014	76,878	135,106	10,917	117
2015	22,215	125,258	6,233	41

Table 3.4.2. Indices of relative abundance for the DMV region.

Year	MRIP CPUE
1982	0.166
1983	0.159
1984	0.145
1985	0.049
1986	0.250
1987	0.099
1988	0.204
1989	0.237
1990	0.079
1991	0.114
1992	0.122
1993	0.221
1994	0.185
1995	0.166
1996	0.181
1997	0.105
1998	0.049
1999	0.082
2000	0.052
2001	0.064
2002	0.104
2003	0.084
2004	0.137
2005	0.108
2006	0.123
2007	0.084
2008	0.149
2009	0.096
2010	0.137
2011	0.078
2012	0.064
2013	0.069
2014	0.039
2015	0.027

Table 3.5.1. Total catch by sector for the coast.

	Recreational (#s of fish)		Commercial	Total
Year	Harvest (A+B1)	Released Alive (B2)	(lbs)	Harvest (mt)
1982	2,986,485	292,887	419,656	3,969
1983	2,698,478	676,332	427,919	2,800
1984	2,116,432	647,964	677,615	2,754
1985	2,507,219	717,194	734,370	2,292
1986	7,021,004	1,105,043	941,012	8,107
1987	3,325,947	1,406,300	1,157,280	4,574
1988	3,030,988	1,240,696	1,071,017	4,721
1989	2,524,897	1,068,964	1,016,631	3,355
1990	2,480,559	1,241,464	873,510	2,751
1991	2,930,104	2,256,855	1,110,344	4,200
1992	2,583,622	1,611,027	1,012,176	3,957
1993	2,242,205	1,972,309	698,493	3,028
1994	1,172,943	1,479,937	459,529	1,800
1995	1,642,468	2,103,424	375,567	2,271
1996	1,059,640	1,158,675	357,434	1,618
1997	700,458	1,080,041	280,912	1,121
1998	357,976	1,409,850	254,186	801
1999	688,186	2,283,012	208,825	1,283
2000	852,597	1,730,087	247,456	1,686
2001	791,531	2,038,259	305,487	1,426
2002	1,501,151	3,173,716	351,451	2,704
2003	731,222	1,684,236	340,552	1,263
2004	770,885	1,737,957	300,749	1,497
2005	558,644	1,454,562	292,194	1,229
2006	1,041,858	2,649,092	350,580	1,991
2007	1,312,420	3,629,994	340,925	2,493
2008	974,529	2,495,252	310,940	1,827
2009	891,158	2,309,219	243,644	1,696
2010	1,123,910	2,881,613	287,851	1,950
2011	430,793	1,915,440	266,387	837
2012	498,225	2,026,298	238,013	1,155
2013	540,708	2,187,380	278,148	964
2014	1,038,418	4,065,321	284,842	1,942
2015	545,282	2,573,361	255,481	905

Table 3.5.2. Indices of relative abundance for the coast (Age-1+).

Year	MA Trawl Survey	RI Fall Trawl Survey	CT LISTS	NJ Ocean Trawl
1982	0.830	0.302		
1983	0.423	1.026		
1984	0.912	1.729	3.469	
1985	0.643	0.949	1.797	
1986	2.159	3.030	1.720	
1987	0.894	1.227	1.213	
1988	0.582	0.053	0.901	
1989	2.351	0.478	1.259	1.269
1990	0.224	0.269	1.162	1.565
1991	0.079	0.203	1.147	0.988
1992	0.594	0.137	1.025	1.324
1993	0.105	0.040	0.570	0.692
1994	0.371	0.111	0.584	0.434
1995	0.060	0.103	0.253	0.601
1996	0.173	0.670	0.563	0.203
1997	0.207	0.041	0.508	0.112
1998	0.158	0.071	0.644	0.296
1999	0.034	0.109	0.761	0.618
2000	0.019	0.526	0.800	0.334
2001	0.153	0.150	0.895	0.287
2002	0.170	0.392	1.167	1.482
2003	0.117	0.231	0.898	0.605
2004	0.041	0.510	0.694	0.353
2005	0.263	0.137	0.760	0.662
2006	0.290	0.021	0.841	0.760
2007	0.129	0.035	0.614	0.357
2008	0.200	0.198	0.727	0.897
2009	0.237	0.127	0.482	0.572
2010	0.022	0.158	0.247	0.435
2011	0.146	0.195	0.446	0.140
2012	0.077	0.071	0.581	0.248
2013	0.043	0.178	0.578	0.424
2014	0.130	0.148	0.696	0.724
2015	0.090	0.079	0.616	0.456

Table 3.5.3. Recruitment indices for the coast.

Year	RI Seine Survey	NY Peconic Bay Trawl Survey	NY WLI Seine Survey
1982			
1983			
1984			
1985			0.259
1986			0.024
1987		0.207	0.348
1988		0.218	0.088
1989	7.567	0.900	1.206
1990	13.758	0.354	0.304
1991	5.391	0.286	0.345
1992	7.353	0.132	2.429
1993	9.007	0.227	0.587
1994	3.507	0.076	0.014
1995	0.968	0.089	0.053
1996	0.877	0.233	0.135
1997	7.065	0.177	0.102
1998	2.658	0.250	0.204
1999	4.764	0.170	0.170
2000	5.313	0.085	1.193
2001	15.026	0.326	1.577
2002	8.700	0.137	0.249
2003	9.291	0.208	0.548
2004	15.669	0.145	0.880
2005	7.656		0.291
2006	13.442		0.782
2007	2.595	0.219	0.357
2008	8.851		0.301
2009	2.408	0.924	0.081
2010	2.339	0.424	0.017
2011	3.042	0.103	0.007
2012	1.340	0.161	0.167
2013	4.115	1.133	1.055
2014	4.149	0.407	0.244
2015	5.194	0.477	0.527

Table 5.1.1. Fishing mortality estimates for the MARI region

Year	Annual F	3-year Average F
1982	0.19	
1983	0.13	
1984	0.12	0.15
1985	0.07	0.11
1986	0.35	0.18
1987	0.22	0.21
1988	0.21	0.26
1989	0.17	0.20
1990	0.16	0.18
1991	0.21	0.18
1992	0.32	0.23
1993	0.20	0.25
1994	0.18	0.24
1995	0.48	0.29
1996	0.51	0.39
1997	0.31	0.43
1998	0.40	0.41
1999	0.33	0.35
2000	0.27	0.33
2001	0.27	0.29
2002	0.27	0.27
2003	0.30	0.28
2004	0.17	0.25
2005	0.23	0.23
2006	0.27	0.22
2007	0.34	0.28
2008	0.26	0.29
2009	0.21	0.27
2010	0.36	0.28
2011	0.14	0.24
2012	0.20	0.23
2013	0.24	0.19
2014	0.24	0.22
2015	0.22	0.23

Table 5.1.2 Spawning stock biomass and recruitment estimates for the MARI region

Year	SSB (mt)	Recruitment (numbers of fish)
1982	8,528	1,997,640
1983	8,592	1,382,280
1984	8,813	961,360
1985	8,994	890,150
1986	8,285	1,150,630
1987	6,978	1,234,600
1988	6,249	1,611,130
1989	5,775	1,454,970
1990	5,646	1,219,490
1991	5,560	1,072,770
1992	5,197	900,490
1993	4,849	687,180
1994	4,693	546,600
1995	4,072	470,120
1996	3,105	403,810
1997	2,549	494,110
1998	2,235	574,970
1999	1,978	642,590
2000	1,885	613,540
2001	1,889	560,550
2002	1,926	580,420
2003	1,951	626,540
2004	2,021	739,200
2005	2,123	697,760
2006	2,187	708,500
2007	2,195	610,950
2008	2,215	879,990
2009	2,290	670,720
2010	2,345	478,040
2011	2,413	505,250
2012	2,502	340,830
2013	2,461	492,040
2014	2,321	581,390
2015	2,196	541,250

Table 5.2.1. Fishing mortality estimates for the LIS region.

Year	Annual F	3-year Average F
1984	0.18	
1985	0.17	
1986	0.19	0.18
1987	0.24	0.20
1988	0.27	0.24
1989	0.32	0.28
1990	0.25	0.28
1991	0.22	0.27
1992	0.32	0.26
1993	0.57	0.37
1994	0.51	0.47
1995	0.46	0.51
1996	0.50	0.49
1997	0.28	0.41
1998	0.27	0.35
1999	0.21	0.25
2000	0.07	0.18
2001	0.07	0.12
2002	0.24	0.13
2003	0.17	0.16
2004	0.16	0.19
2005	0.11	0.15
2006	0.20	0.16
2007	0.42	0.24
2008	0.61	0.41
2009	0.58	0.53
2010	0.52	0.57
2011	0.31	0.47
2012	0.49	0.44
2013	0.34	0.38
2014	0.59	0.48
2015	0.58	0.50

Table 5.2.2. Spawning stock biomass and recruitment estimates for the LIS region.

Year	SSB (mt)	Recruitment (Numbers of age-1 fish)
1984	6,351	1,239,780
1985	6,201	1,012,980
1986	5,928	1,483,620
1987	5,433	1,252,980
1988	4,934	1,176,970
1989	4,425	1,116,580
1990	4,050	669,600
1991	3,894	834,930
1992	3,576	872,760
1993	2,871	642,600
1994	2,204	586,920
1995	1,878	679,730
1996	1,695	556,290
1997	1,653	602,590
1998	1,718	834,760
1999	1,798	948,390
2000	2,032	851,300
2001	2,416	936,260
2002	2,666	573,760
2003	2,805	792,940
2004	2,925	782,850
2005	3,065	467,610
2006	3,155	507,820
2007	2,834	458,790
2008	2,181	519,690
2009	1,624	530,370
2010	1,331	622,420
2011	1,261	461,660
2012	1,314	583,840
2013	1,388	1,114,870
2014	1,439	458,710
2015	1,551	1,131,070

Table 5.3.1. Fishing mortality estimates for the NJ-NYB region.

Year	Annual F	3-Year Average F
1989	0.23	
1990	0.30	
1991	0.49	0.34
1992	0.61	0.47
1993	0.65	0.59
1994	0.32	0.53
1995	0.58	0.52
1996	0.45	0.45
1997	0.25	0.43
1998	0.09	0.26
1999	0.19	0.18
2000	0.32	0.20
2001	0.41	0.31
2002	0.50	0.41
2003	0.23	0.38
2004	0.18	0.30
2005	0.11	0.17
2006	0.31	0.20
2007	0.45	0.29
2008	0.41	0.39
2009	0.45	0.43
2010	0.87	0.58
2011	0.58	0.63
2012	0.39	0.61
2013	0.52	0.50
2014	0.64	0.52
2015	0.45	0.54

Table 5.3.2. Spawning stock biomass and recruitment estimates for the NJ-NYB region.

Year	SSB (mt)	Recruitment (Numbers of age-1 fish)
1989	6,053	1,457,890
1990	5,807	1,266,380
1991	4,978	1,345,660
1992	3,802	1,050,720
1993	2,898	874,380
1994	2,521	708,030
1995	2,242	736,110
1996	1,865	625,610
1997	1,769	765,210
1998	1,869	1,010,370
1999	2,048	755,120
2000	2,144	650,820
2001	2,038	635,230
2002	1,801	680,660
2003	1,685	717,240
2004	1,762	769,020
2005	1,901	827,810
2006	1,967	711,530
2007	1,816	723,020
2008	1,625	784,000
2009	1,494	557,000
2010	1,237	680,910
2011	992	898,200
2012	1,031	950,390
2013	1,231	1,682,490
2014	1,395	2,263,150
2015	1,809	976,150

Table 5.4.1. Fishing mortality estimates for the DMV region.

Year	Annual F	3-Year Average F
1990	0.18	
1991	0.33	
1992	0.19	0.23
1993	0.29	0.27
1994	0.26	0.25
1995	0.42	0.32
1996	0.33	0.34
1997	0.50	0.42
1998	0.31	0.38
1999	0.33	0.38
2000	0.35	0.33
2001	0.21	0.30
2002	0.46	0.34
2003	0.29	0.32
2004	0.35	0.37
2005	0.29	0.31
2006	0.46	0.37
2007	0.34	0.36
2008	0.32	0.37
2009	0.45	0.37
2010	0.69	0.49
2011	0.75	0.63
2012	0.39	0.61
2013	0.16	0.44
2014	0.26	0.27
2015	0.08	0.17

Table 5.4.2. Spawning stock biomass and recruitment estimates for the DMV region.

Year	SSB (mt)	Recruitment (Numbers of age-1 fish)
1990	1,692	894,740
1991	1,821	1,225,120
1992	1,997	893,280
1993	2,347	605,820
1994	2,509	344,000
1995	2,382	233,200
1996	2,023	200,010
1997	1,587	362,550
1998	1,216	434,520
1999	1,088	452,890
2000	1,044	617,210
2001	1,092	682,840
2002	1,179	707,980
2003	1,275	496,380
2004	1,427	609,230
2005	1,459	663,570
2006	1,438	613,070
2007	1,416	621,720
2008	1,445	574,720
2009	1,424	379,640
2010	1,228	339,840
2011	926	194,940
2012	775	119,980
2013	742	110,620
2014	653	162,630
2015	614	240,090

Table 5.5.1. Fishing mortality estimates for the coast.

Year	Annual F	3-year Average F
1982	0.18	
1983	0.13	
1984	0.12	0.14
1985	0.12	0.12
1986	0.36	0.20
1987	0.30	0.26
1988	0.34	0.33
1989	0.28	0.31
1990	0.21	0.28
1991	0.33	0.27
1992	0.42	0.32
1993	0.42	0.39
1994	0.34	0.39
1995	0.45	0.40
1996	0.30	0.36
1997	0.21	0.32
1998	0.15	0.22
1999	0.24	0.20
2000	0.24	0.21
2001	0.25	0.24
2002	0.32	0.27
2003	0.23	0.27
2004	0.24	0.26
2005	0.21	0.23
2006	0.33	0.26
2007	0.45	0.33
2008	0.42	0.40
2009	0.47	0.45
2010	0.53	0.47
2011	0.26	0.42
2012	0.32	0.37
2013	0.34	0.31
2014	0.47	0.38
2015	0.33	0.38

Table 5.5.2. Spawning stock biomass and recruitment estimates for the coast.

	SSB (mt)	Recruitment (numbers of age-1 fish)
1982	25,607	5,917,750
1983	25,332	4,819,550
1984	26,835	4,166,080
1985	26,378	3,686,250
1986	25,907	4,175,220
1987	19,830	4,095,620
1988	17,720	4,092,240
1989	14,508	3,521,710
1990	15,769	2,930,290
1991	15,519	2,927,600
1992	13,285	2,356,060
1993	10,807	1,934,090
1994	9,229	1,734,280
1995	8,813	1,905,420
1996	8,921	1,745,130
1997	8,631	2,290,090
1998	9,290	2,918,670
1999	6,609	3,062,530
2000	7,575	2,666,160
2001	8,009	2,558,730
2002	7,931	2,354,610
2003	8,424	2,379,110
2004	8,593	2,514,320
2005	8,728	2,237,200
2006	8,667	1,863,210
2007	7,864	1,869,730
2008	6,790	2,172,410
2009	5,931	1,924,410
2010	5,289	2,042,000
2011	5,138	1,790,050
2012	5,386	1,949,270
2013	5,509	2,601,020
2014	5,618	2,236,500
2015	6,014	2,106,580

Table 7.1.1. Short-term projection results for the MARI region.

MSY Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (390 mt)	0%	0.00%
151 mt	50%	2.20%
148 mt	70%	2.30%

SPR Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (390 mt)	0%	4.10%
257 mt	50%	23.2%
253 mt	70%	24.3%

Table 7.2.1. Short-term projection results for the LIS region.

MSY Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (500 mt)	1.70%	0.60%
264 mt	50%	34%
237 mt	70%	40%

SPR Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (500 mt)	0%	0.60%
255 mt	50%	28%
229 mt	70%	33%

Table 7.3.1. Short-term projection results for the NJ-NYB region.

SPR Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (461 mt)	45%	85%
450 mt	50%	86%
410 mt	70%	88%

Table 7.4.1. Short-term projection results for the DMV region.

SPR Reference Points		
Landings (mt) for 2018 -2020	Probability of being at or below F Target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (77 mt)	100%	18%
139 mt	50%	10%
125 mt	70%	12%

Table 7.5.1. Short-term projection results for the coast.

MSY Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (1270 mt)	0%	0.6%
737 mt	50%	0.9%
682 mt	70%	1.0%

SPR Reference Points		
2018-2020 Landings Scenario	Probability of being at or below F target in 3 years	Probability of being at or above SSB threshold in 3 years
Status quo (1270 mt)	3%	29.4%
968 mt	50%	50.2%
895 mt	70%	55.3%

11 Figures

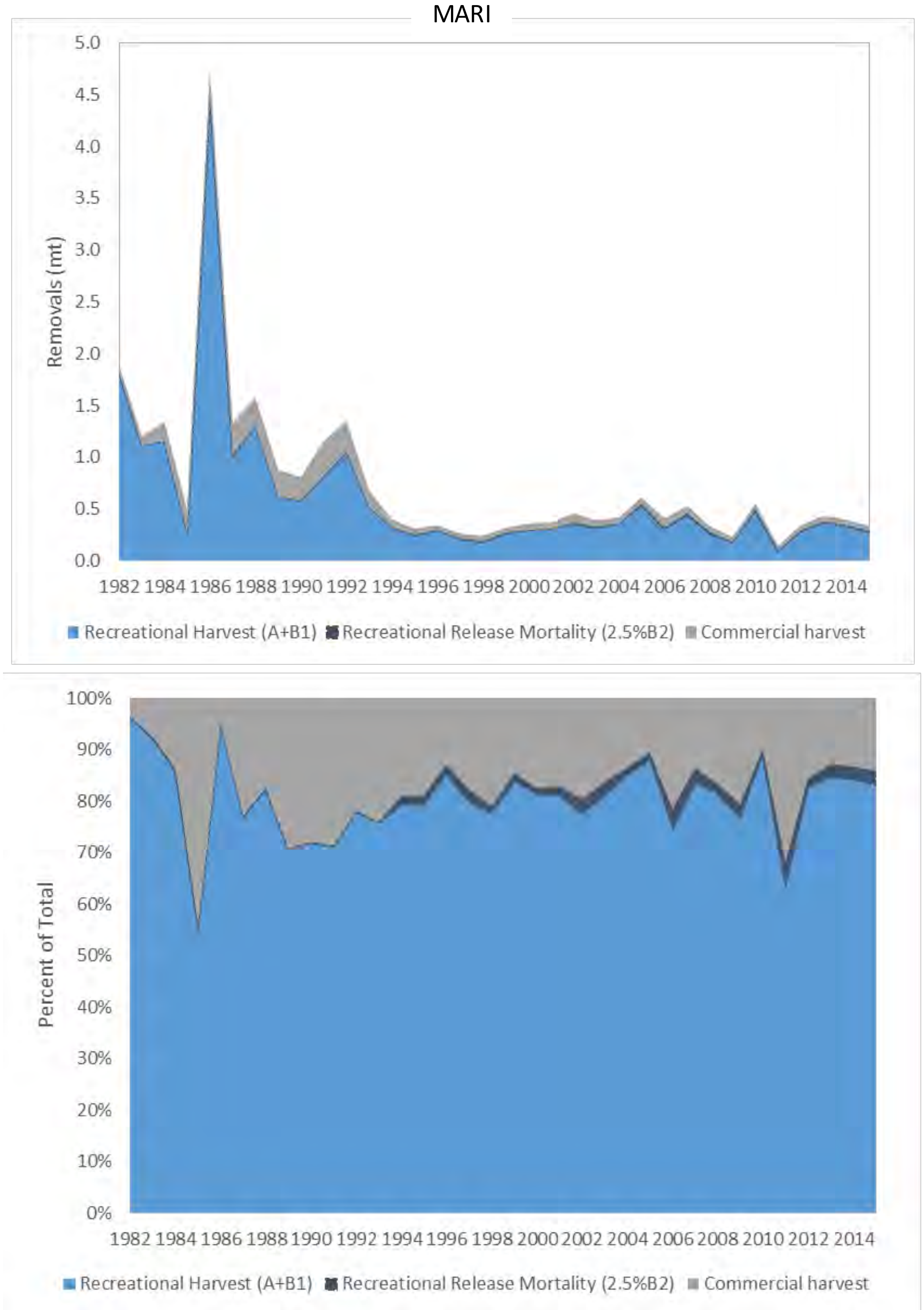


Figure 3.1.1. Total removals by sector for the MARI region.

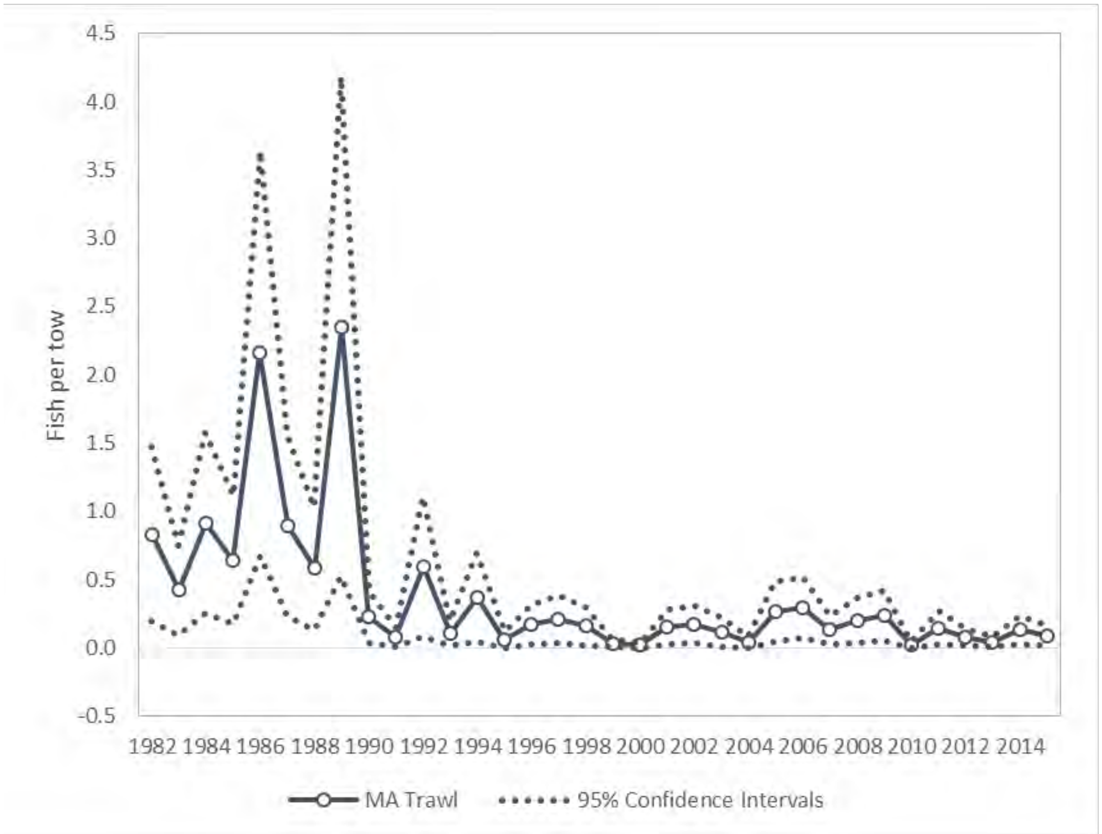


Figure 3.1.2. MA Spring Ocean Trawl index of abundance.

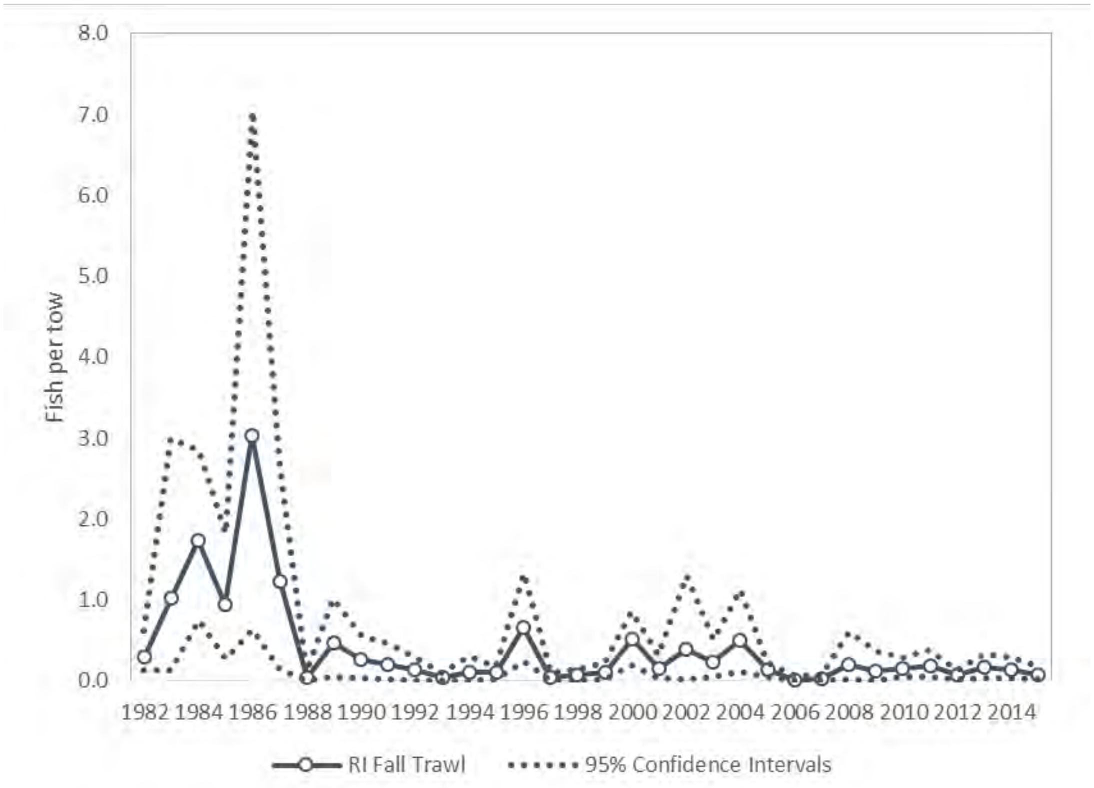


Figure 3.1.3. RI Fall Trawl Survey index of abundance.

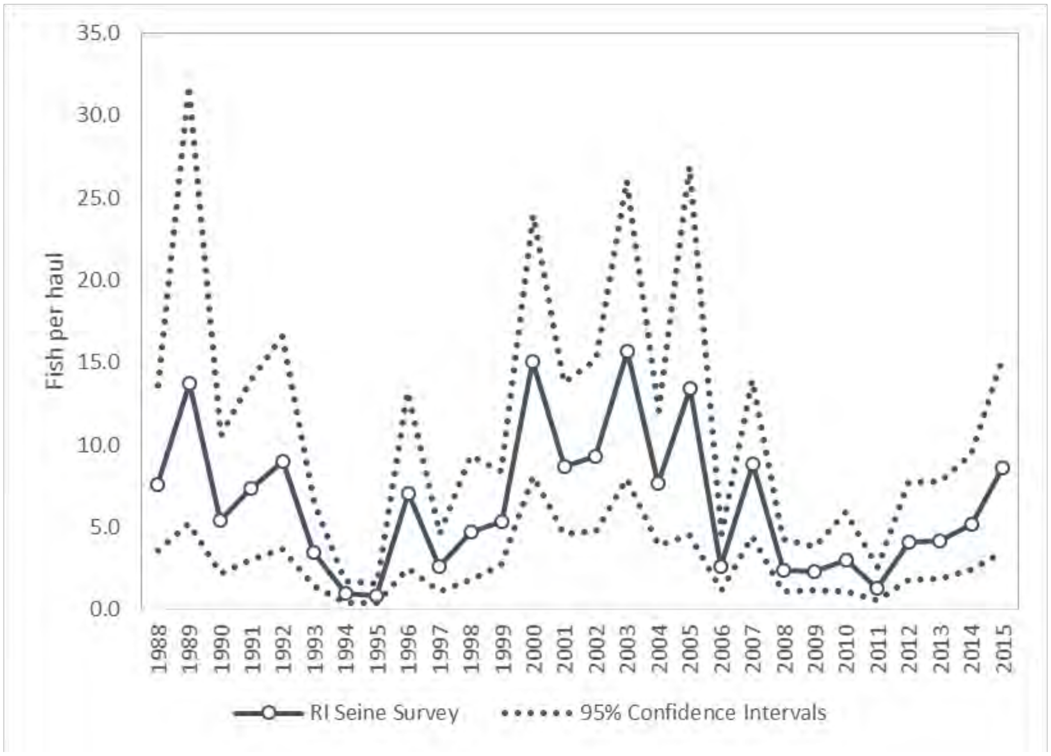


Figure 3.1.4. RI Seine Survey young-of-year index of abundance.

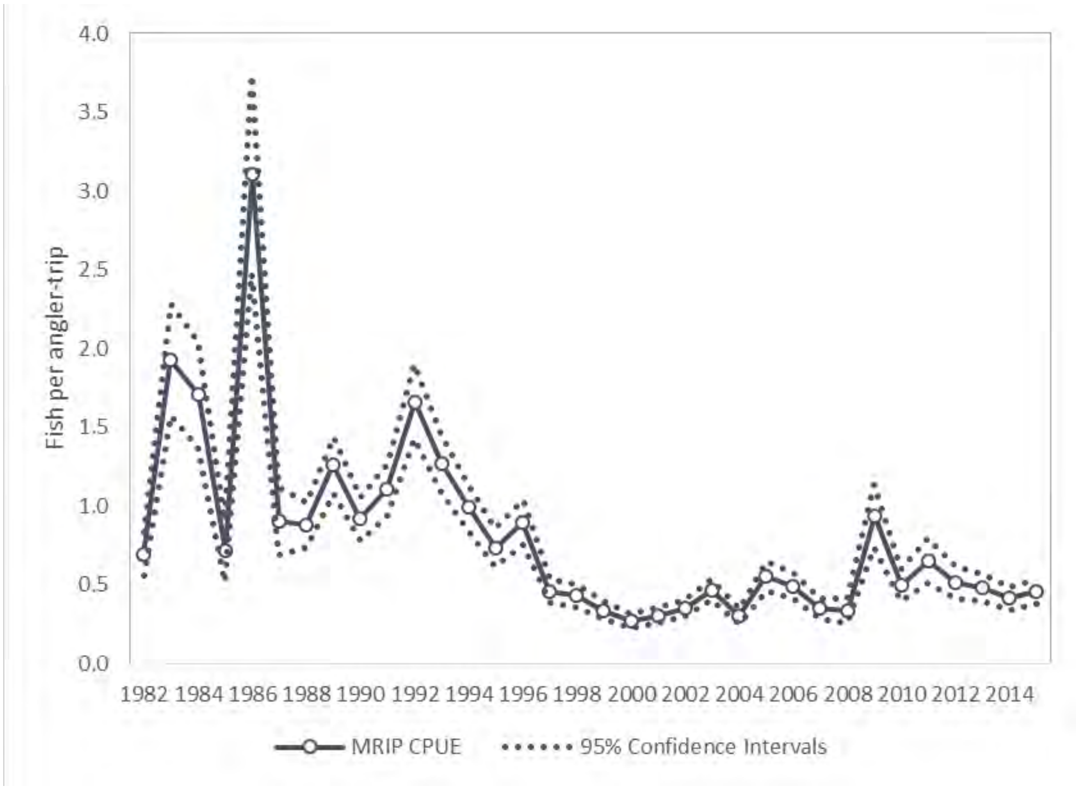
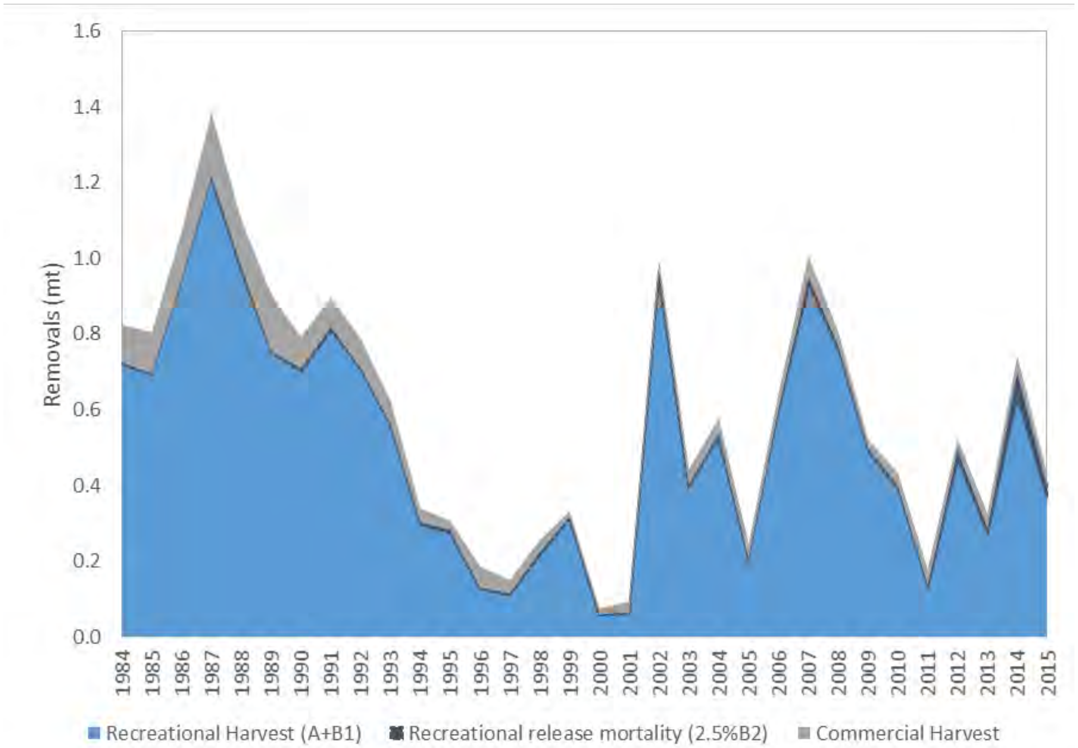


Figure 3.1.5. MRIP CPUE for the MARI region.



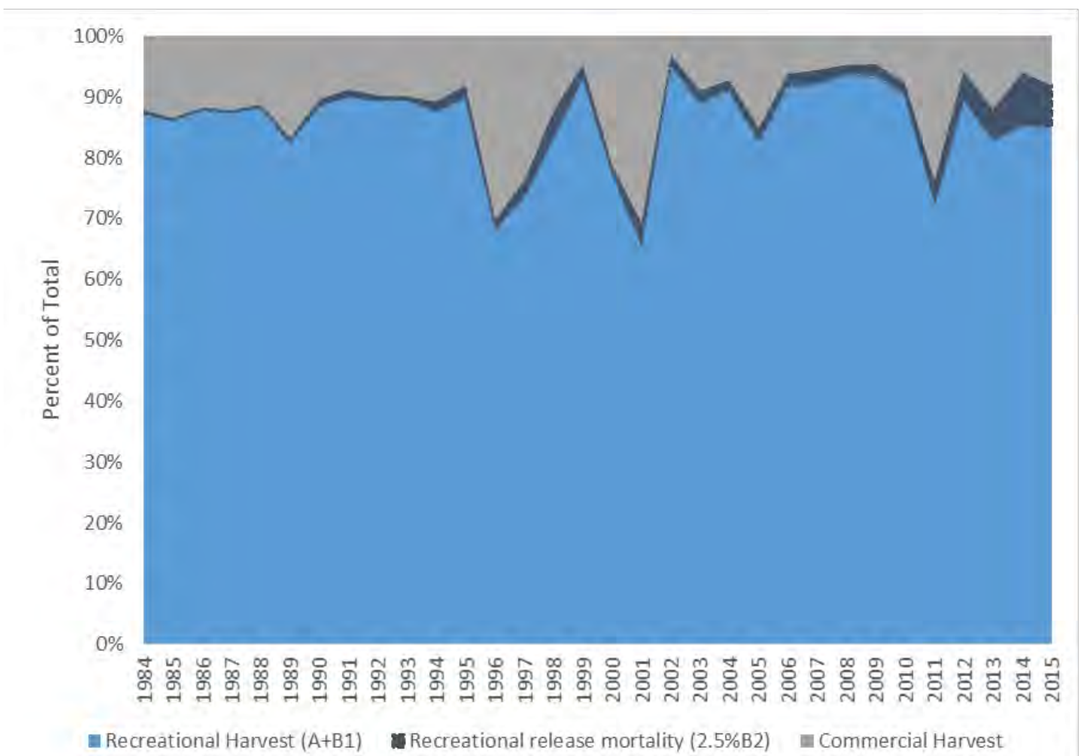


Figure 3.2.1 Removals by sector in metric tons (top) and percent of total (bottom) for the LIS region.

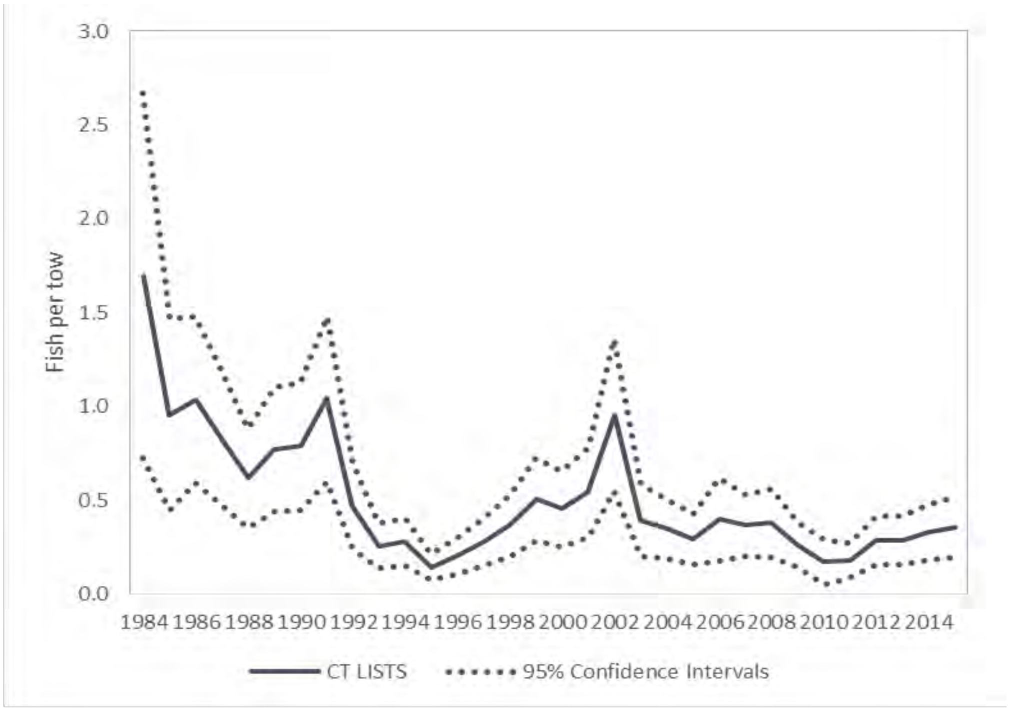


Figure 3.2.2. CT Long Island Sound Trawl Survey index of abundance.

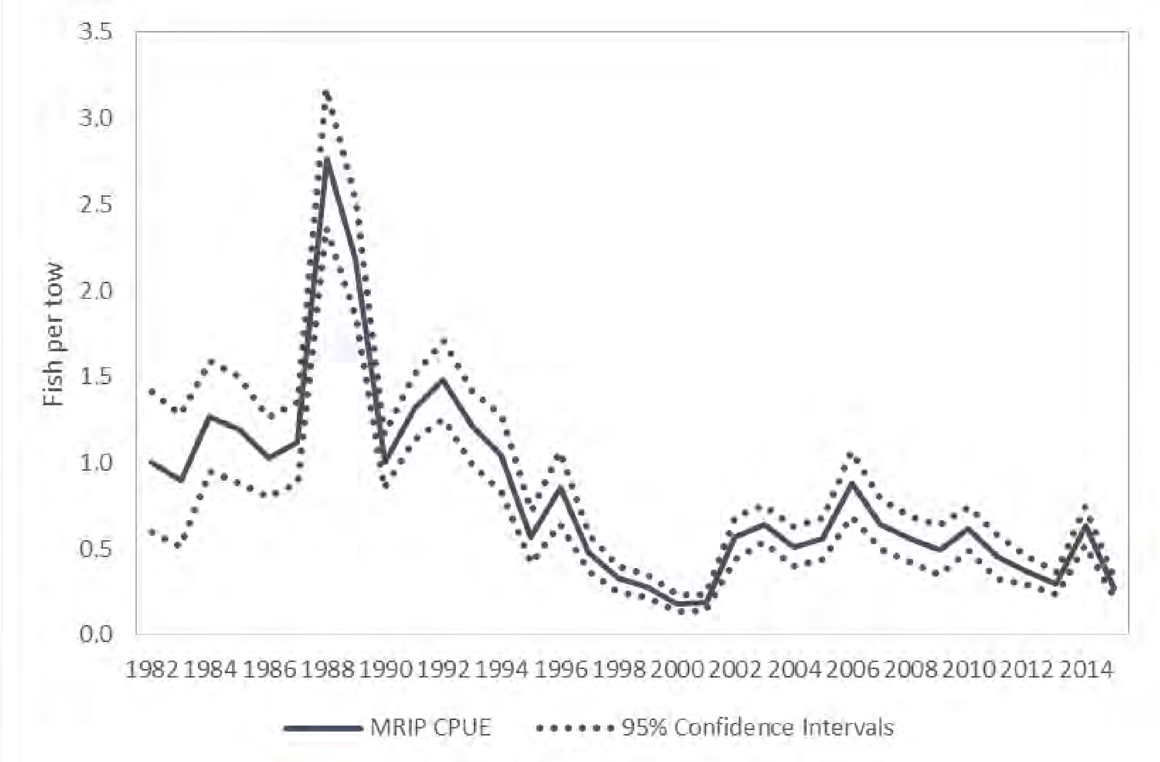


Figure 3.2.3. MRIP CPUE for the LIS region.

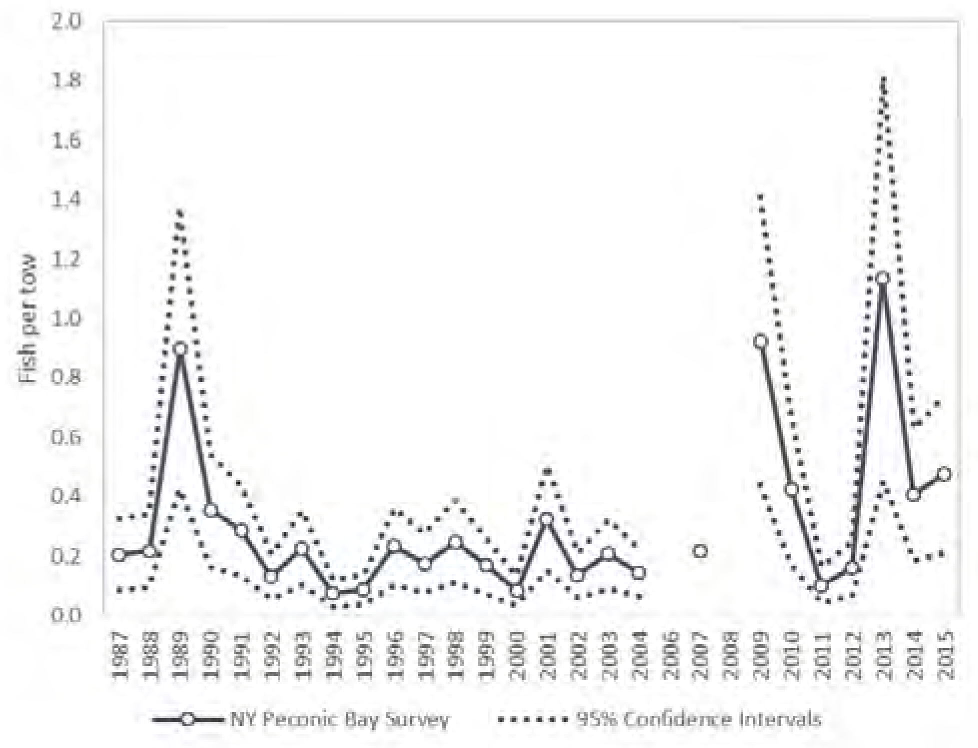


Figure 3.2.4. NY Peconic Bay Trawl Survey YOY index.

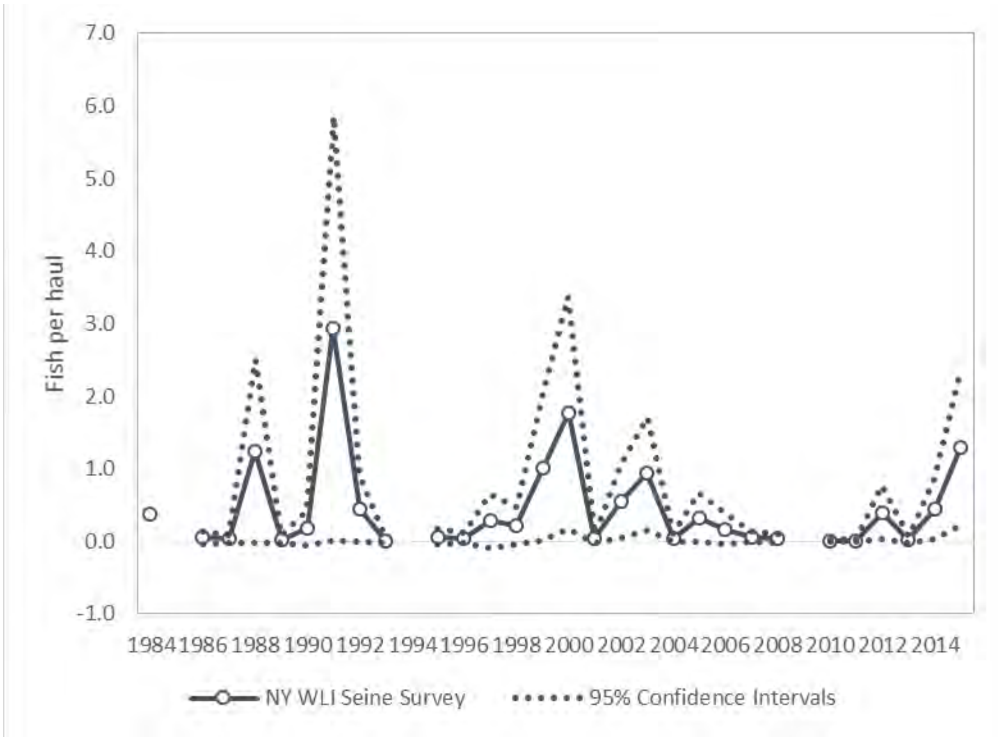


Figure 3.2.5. NY Western Long Island Seine Survey YOY index for the LIS region.

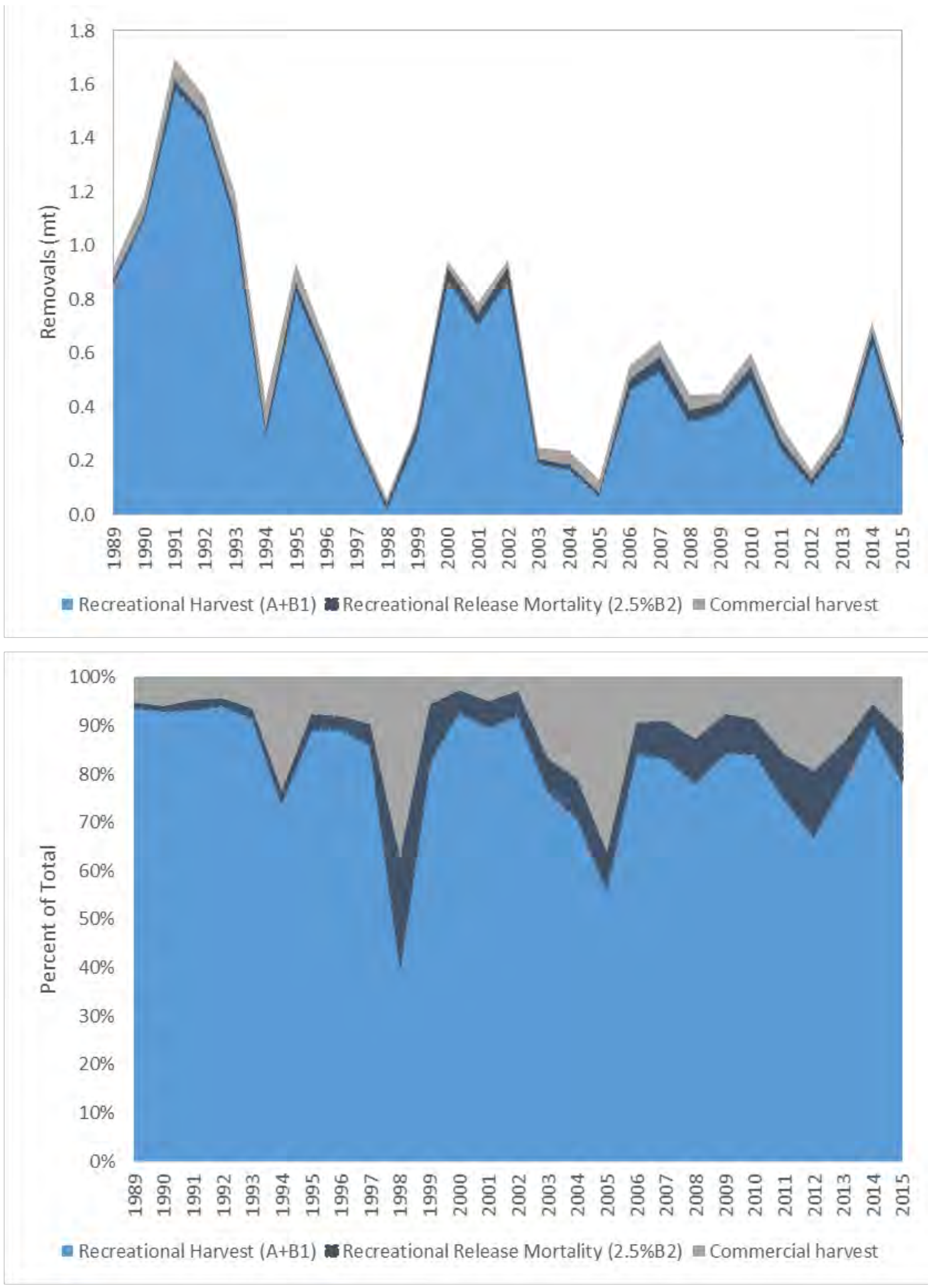


Figure 3.3.1. Total removals by sector for the NJ-NYB region.

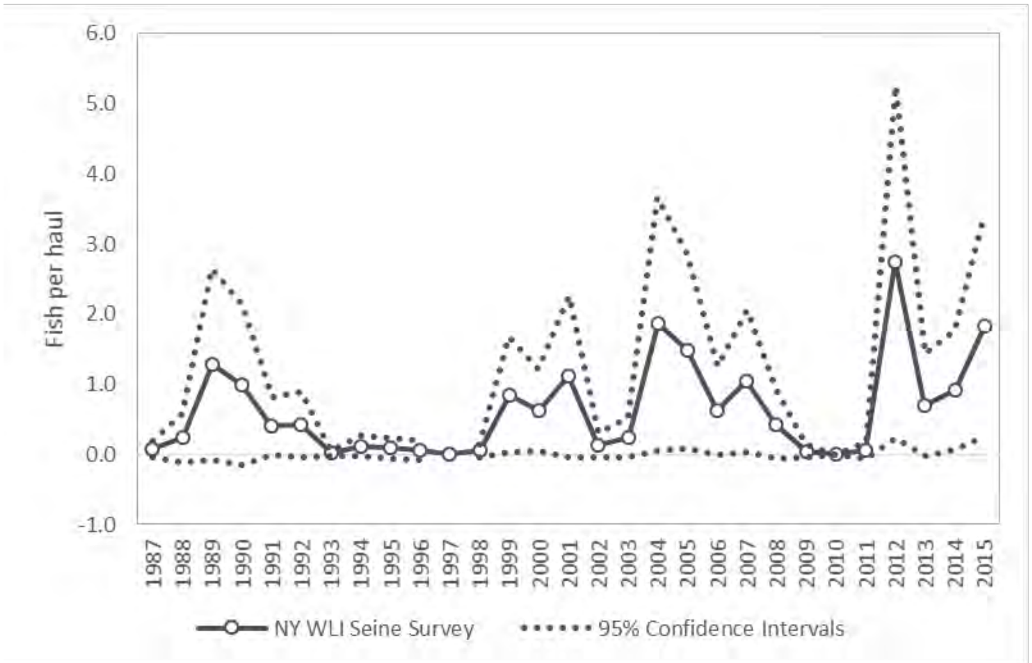


Figure 3.3.2. NY Western Long Island Seine Survey YOY index for the NJ-NYB region.

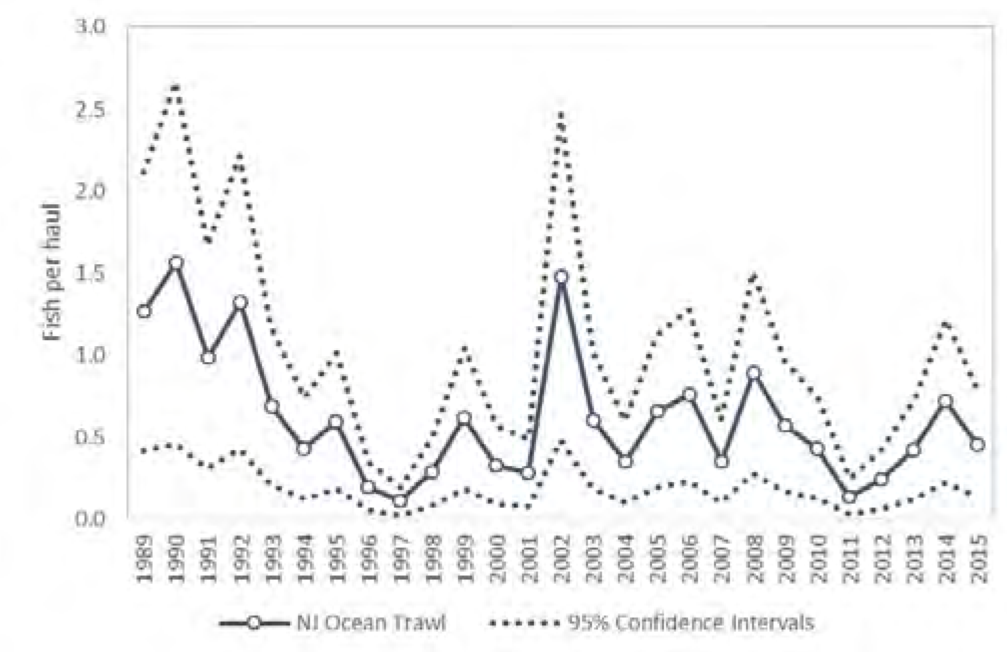


Figure 3.3.3. NJ Ocean Trawl index of abundance.

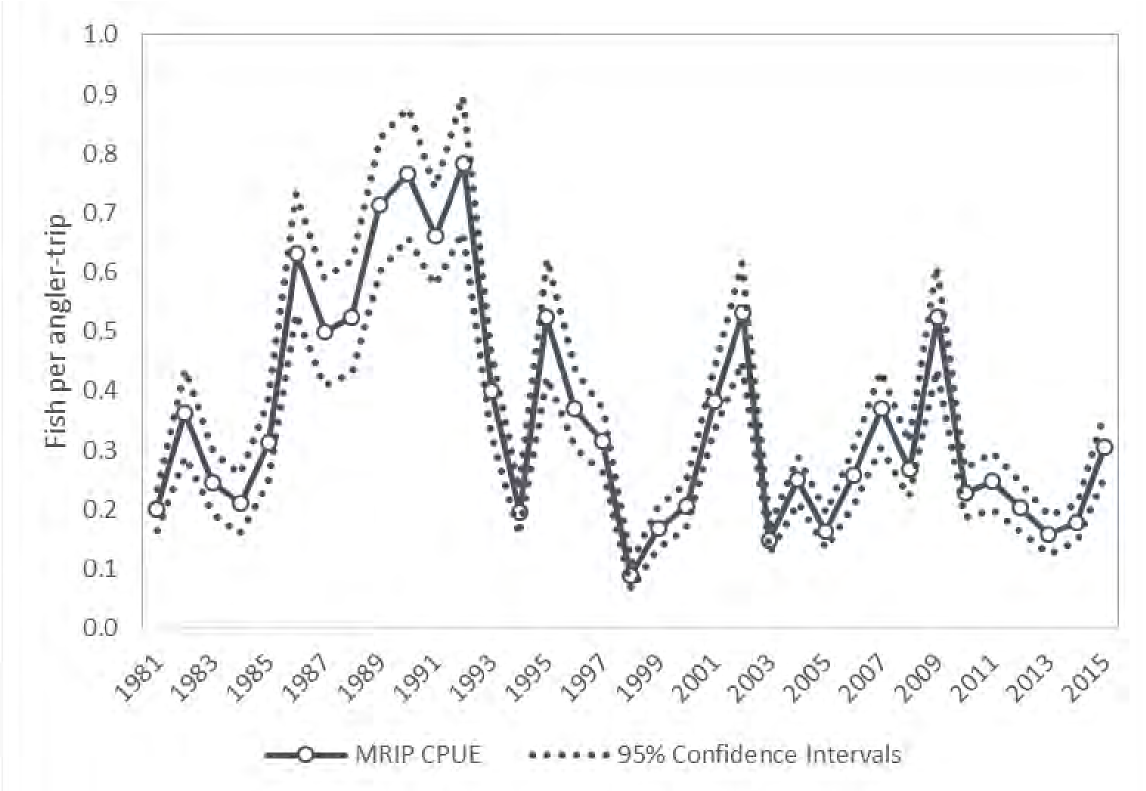
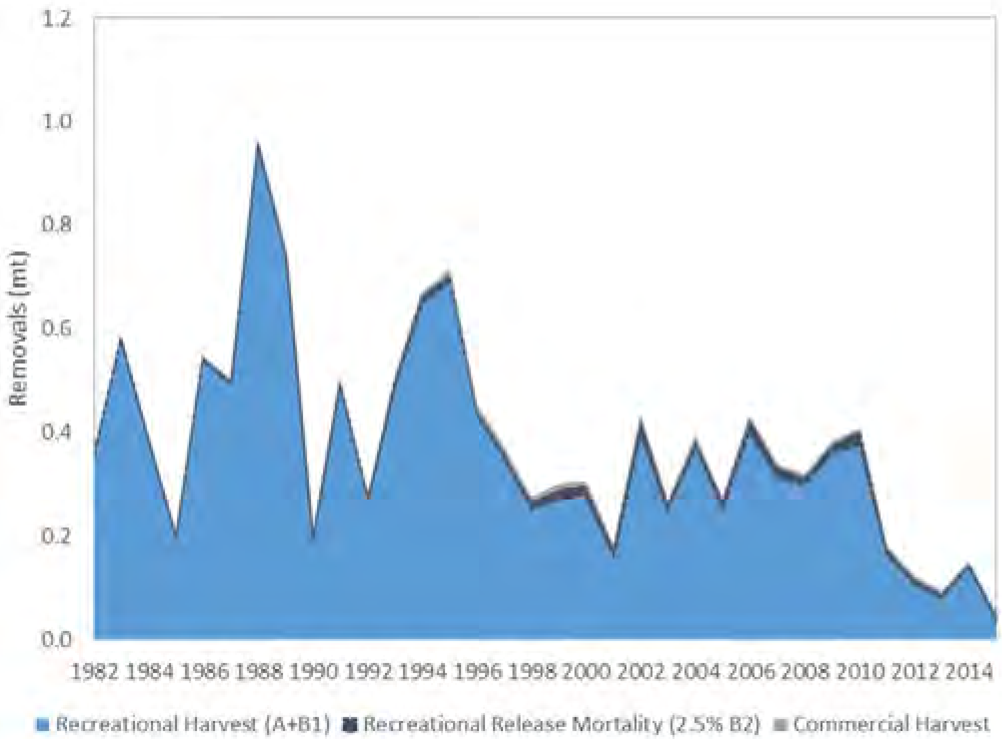


Figure 3.3.4. MRIP CPUE for the NJ-NYB region.



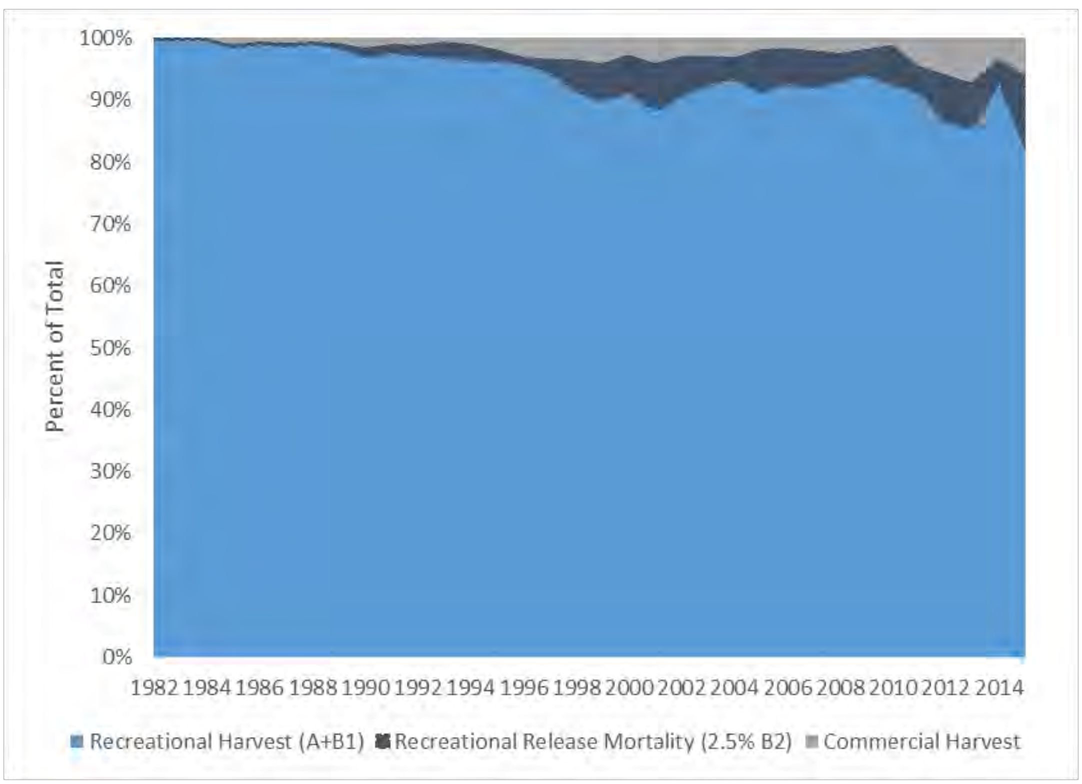


Figure 3.4.1. Removals by sector in metric tons (top) and percent of total (bottom) for the DMV region.

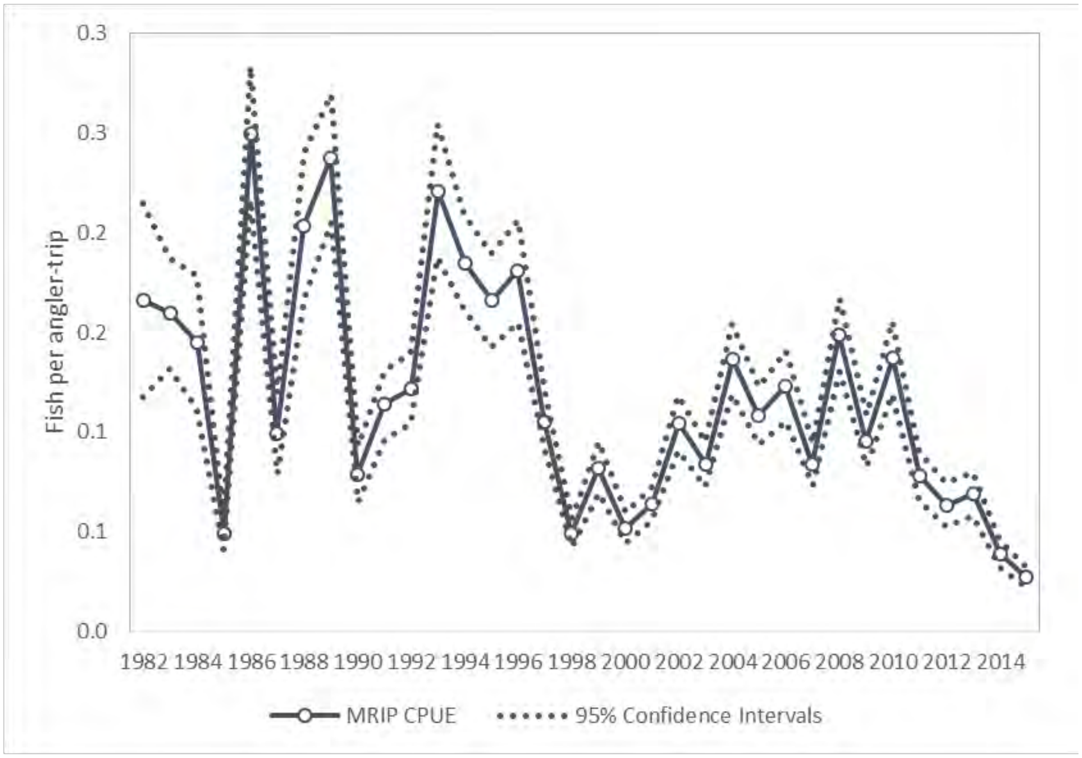


Figure 3.4.2. MRIP CPUE for the DMV region.

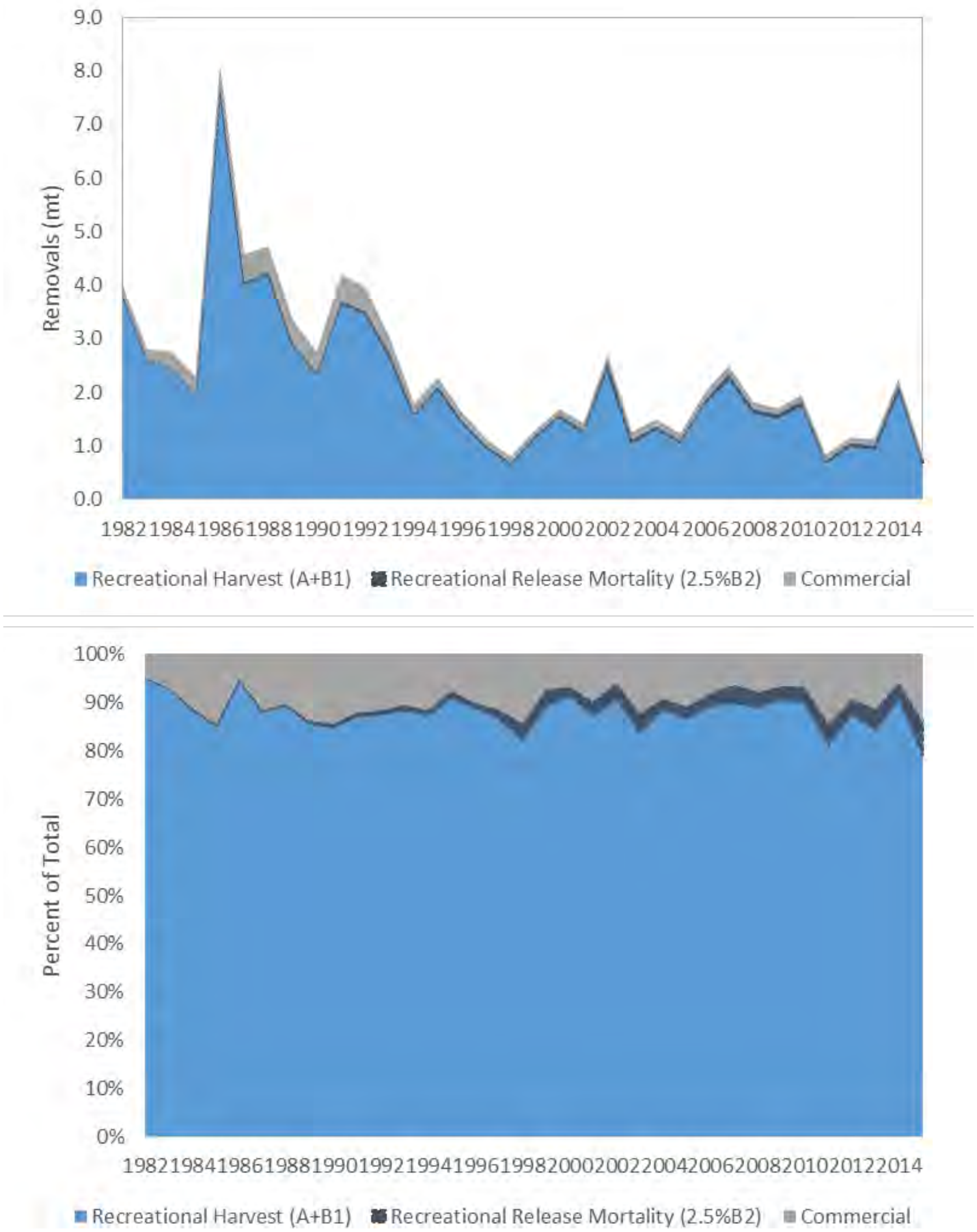
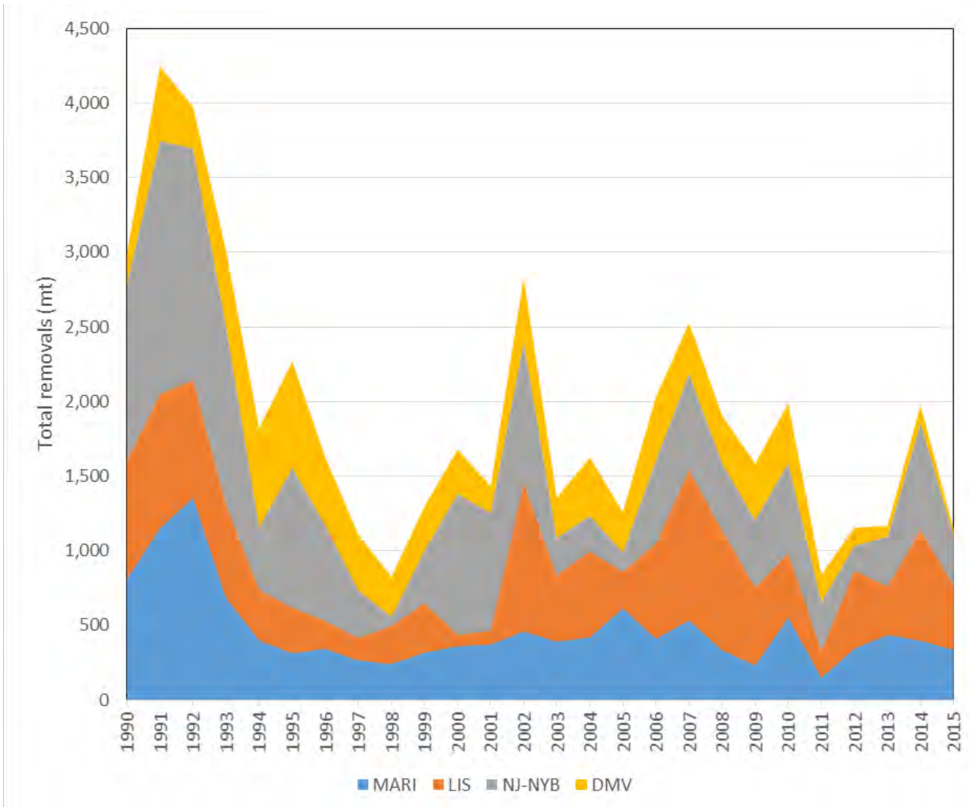


Figure 3.5.1. Total removals by sector for the coast.



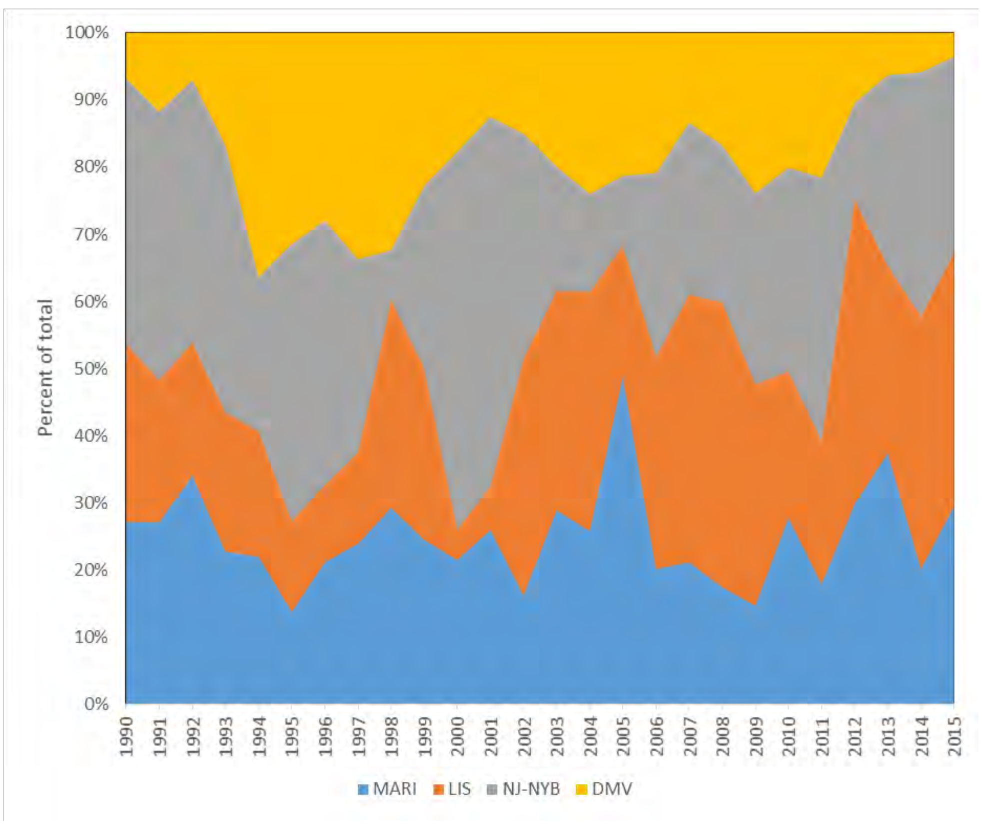


Figure 3.5.2. Coastwide removals by region in metric tons (top) and percent of total (bottom)

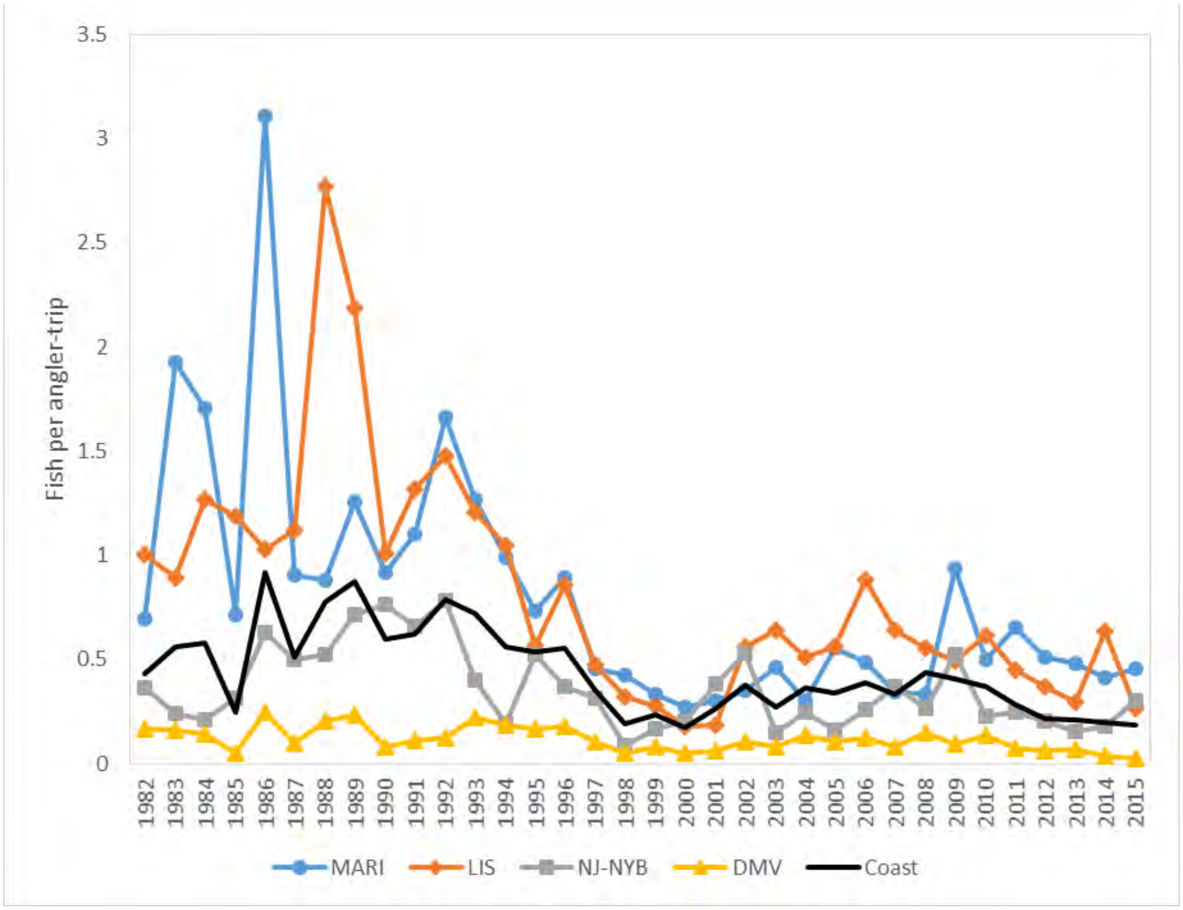


Figure 3.5.3. Comparison of regional and coastwide MRIP CPUE trends.

Coast

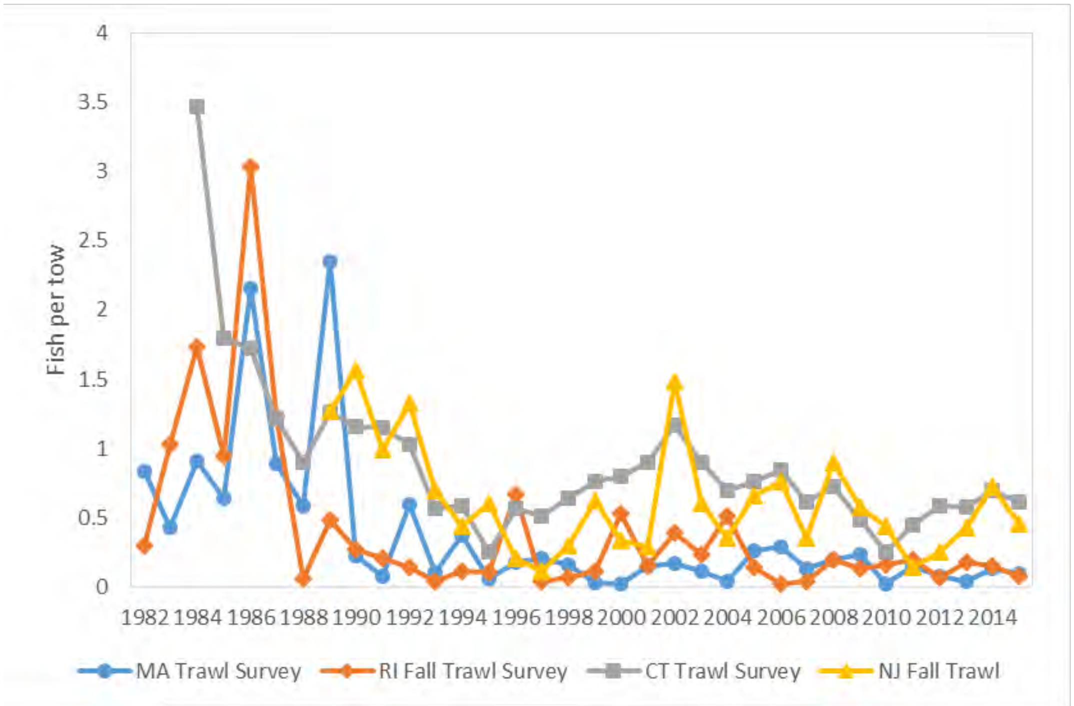


Figure 3.5.4. Comparison of fishery independent age-1+ index trends for the coast.

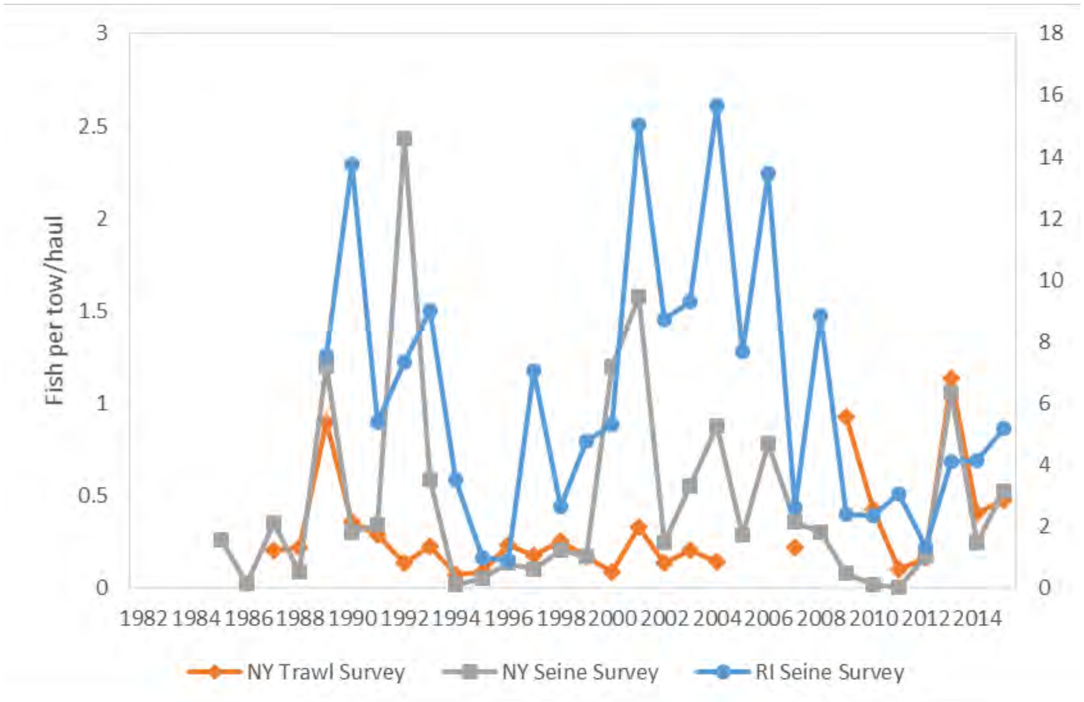


Figure 3.5.5. Comparison of fishery independent recruitment index trends for the coast.

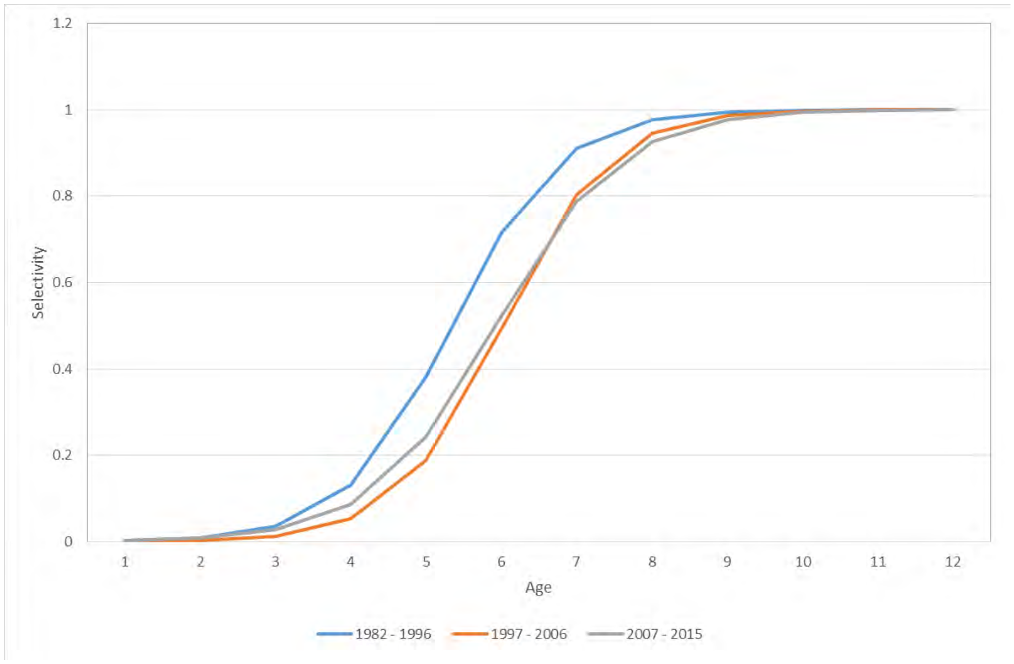


Figure 5.1.1. Estimated selectivity patterns for the fishery in the MARI region.

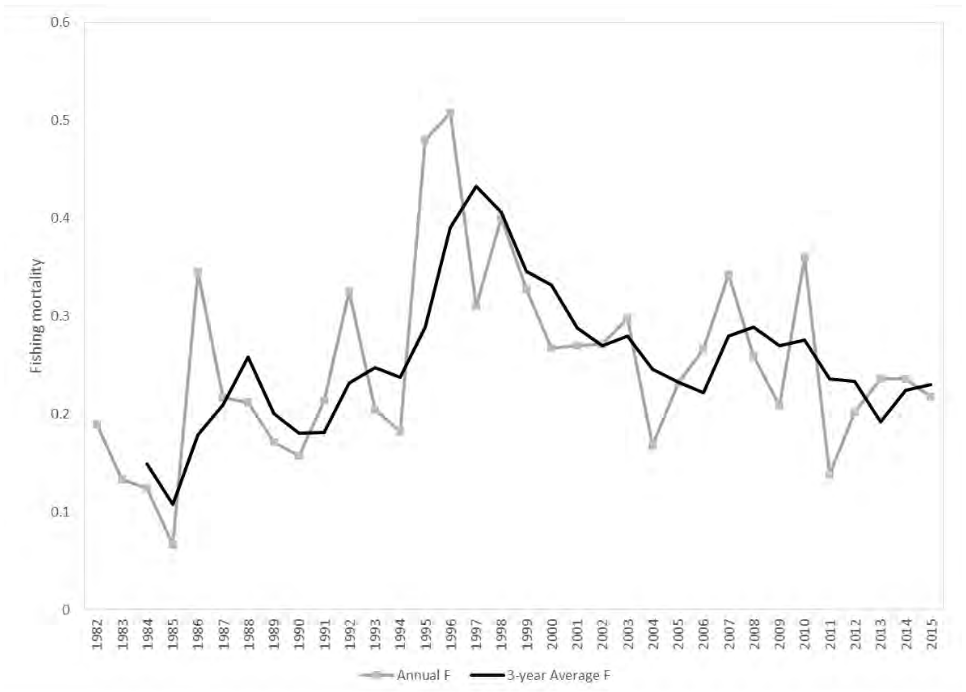


Figure 5.1.2. Fishing mortality estimates for the MARI region.

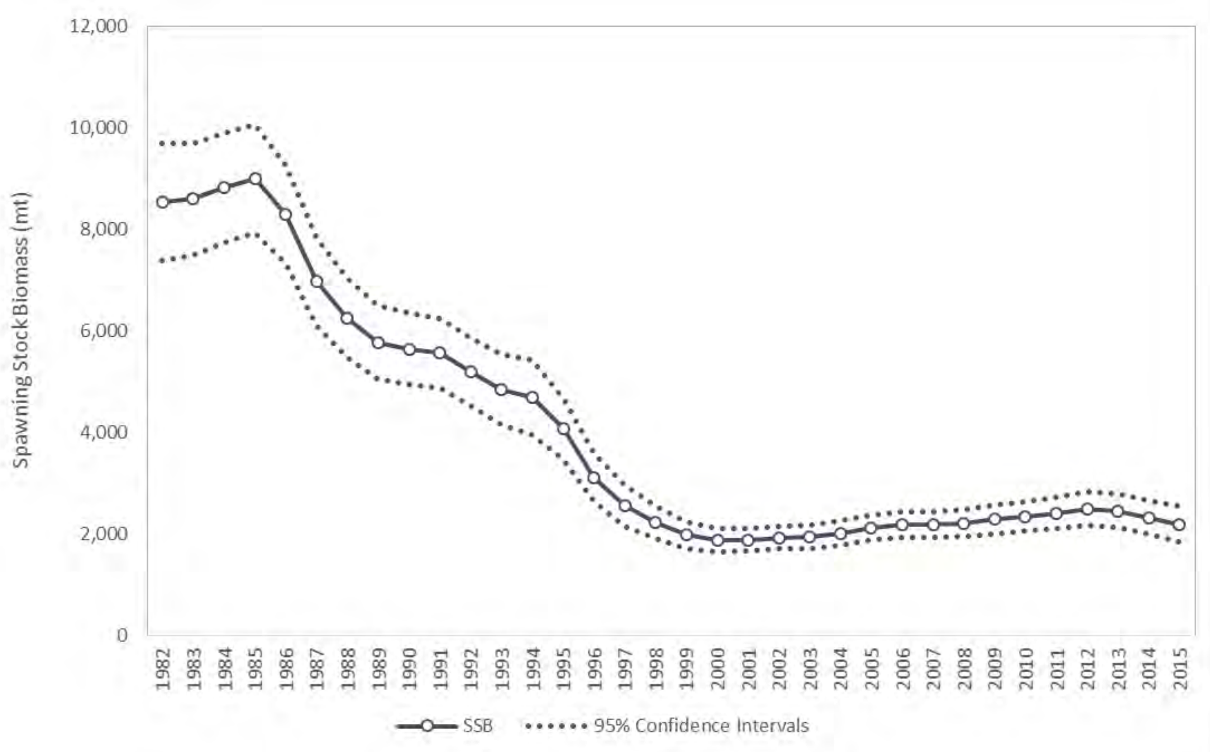
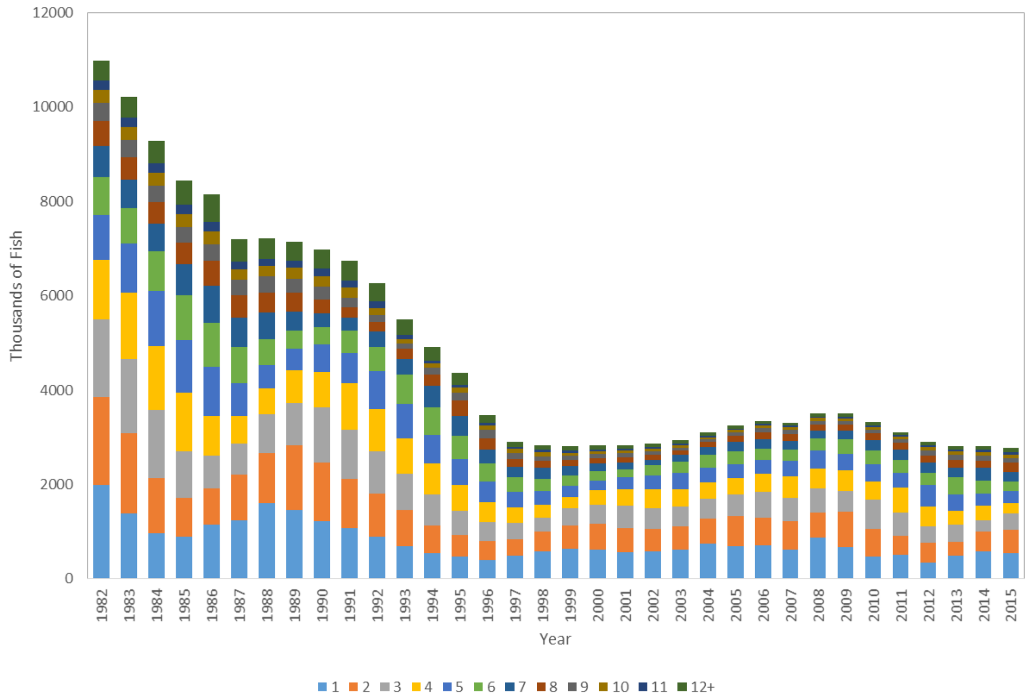


Figure 5.1.3. Spawning stock biomass estimates for the MARI region.



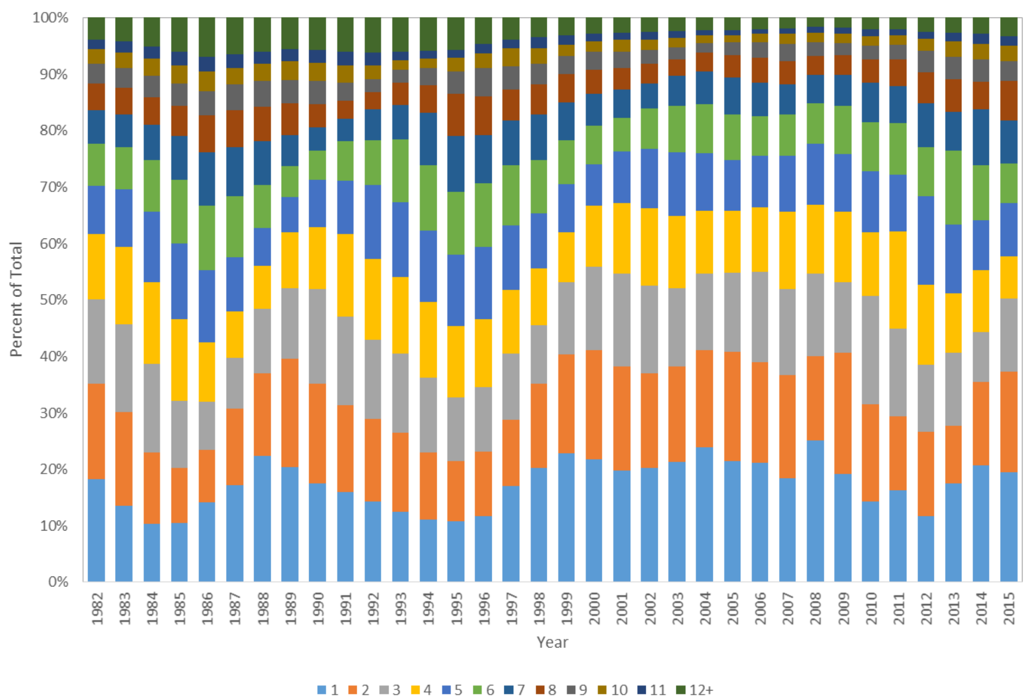


Figure 5.1.4. Abundance at age for the MARI region in total numbers of fish (top) and percent of population (bottom).

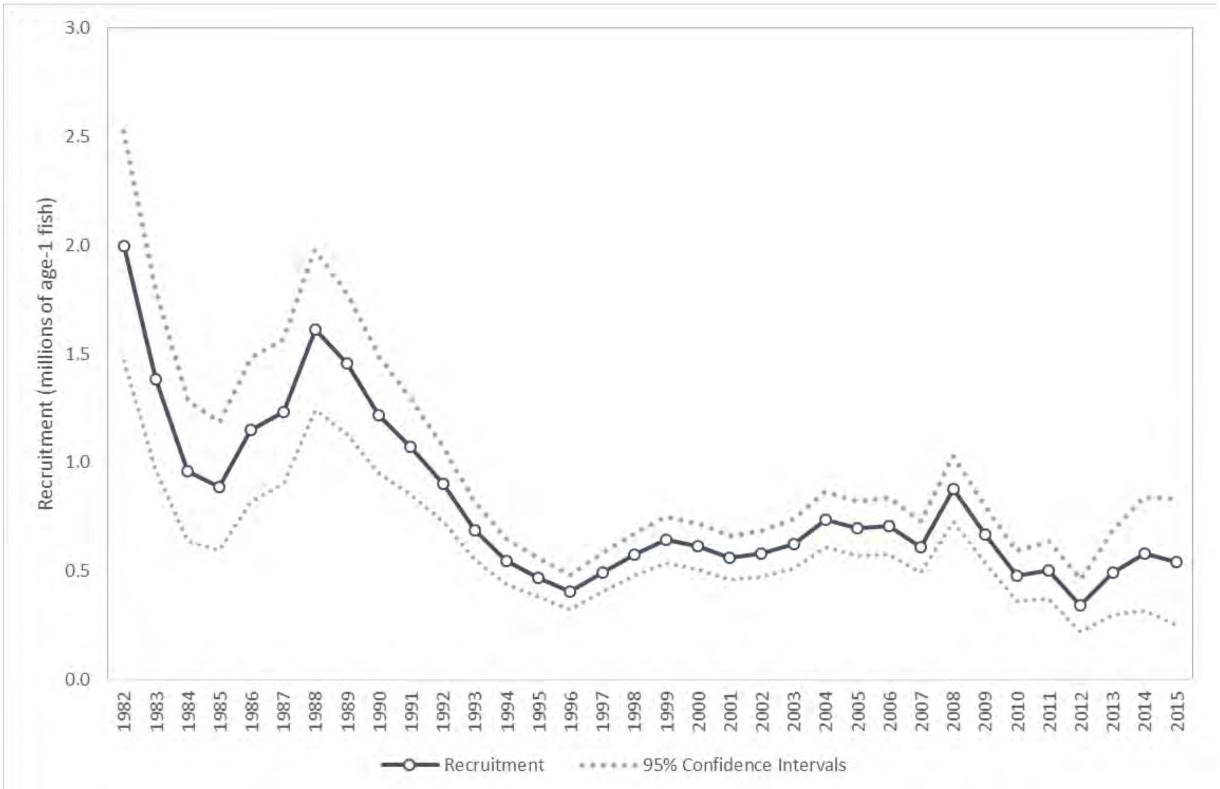


Figure 5.1.5. Recruitment estimates for the MARI region.

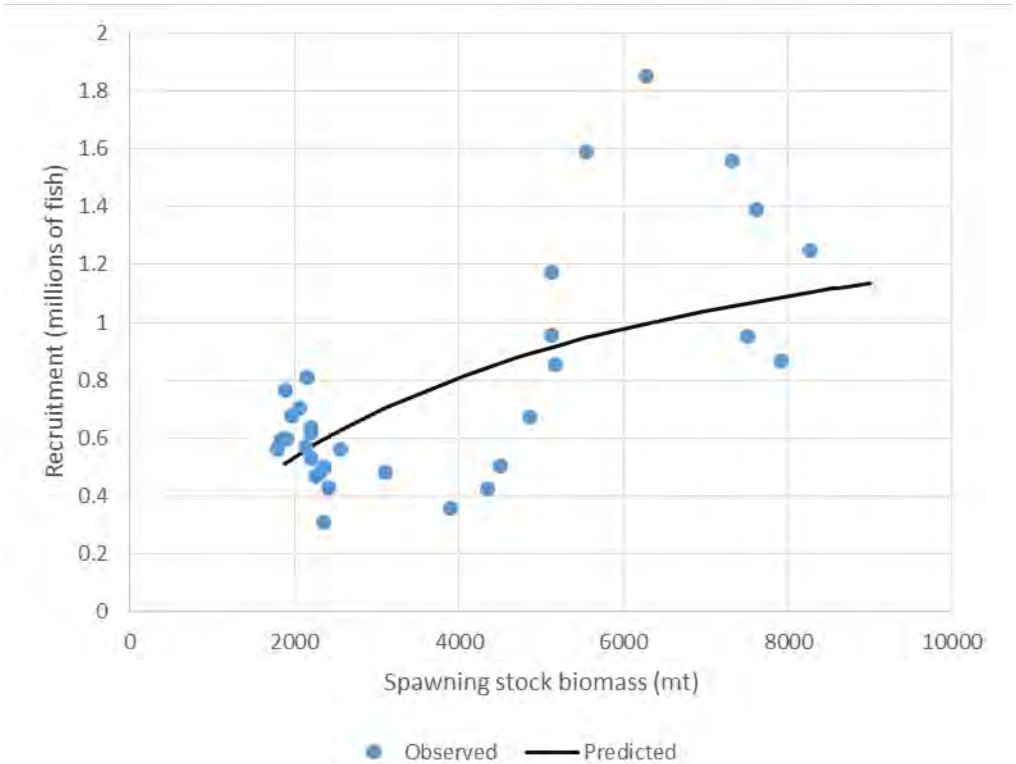
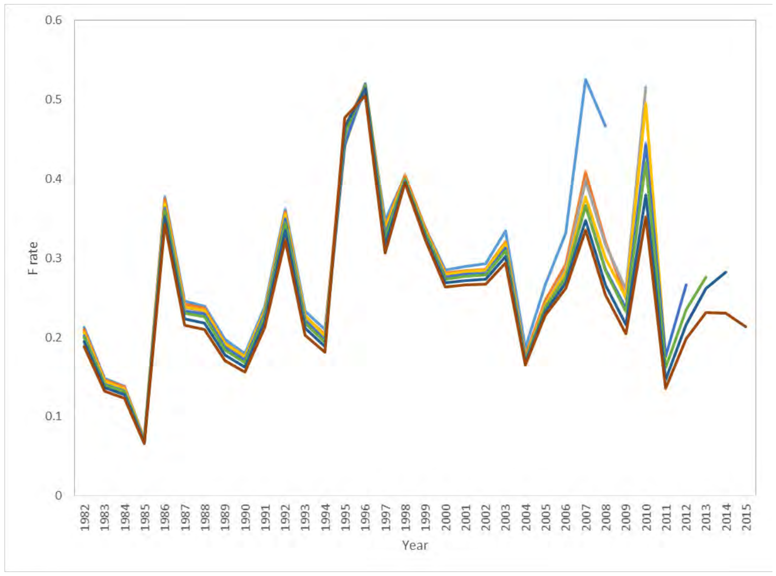
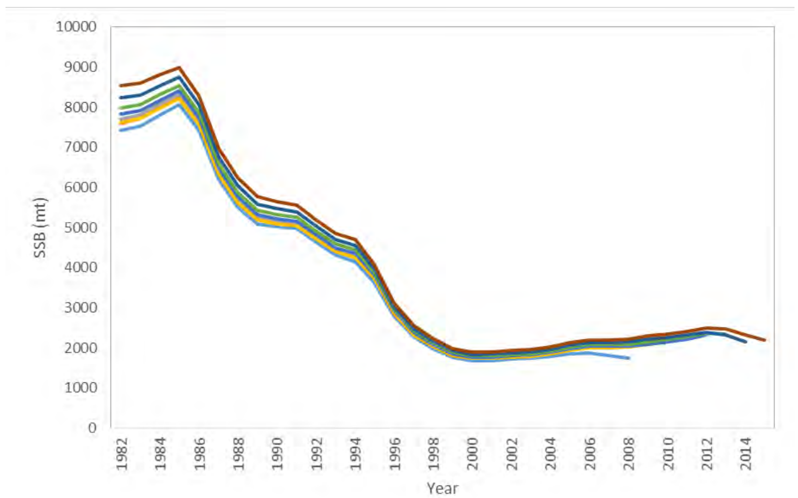


Figure 5.1.6. Stock-recruitment relationship for the MARI region.

A.



B.



C.

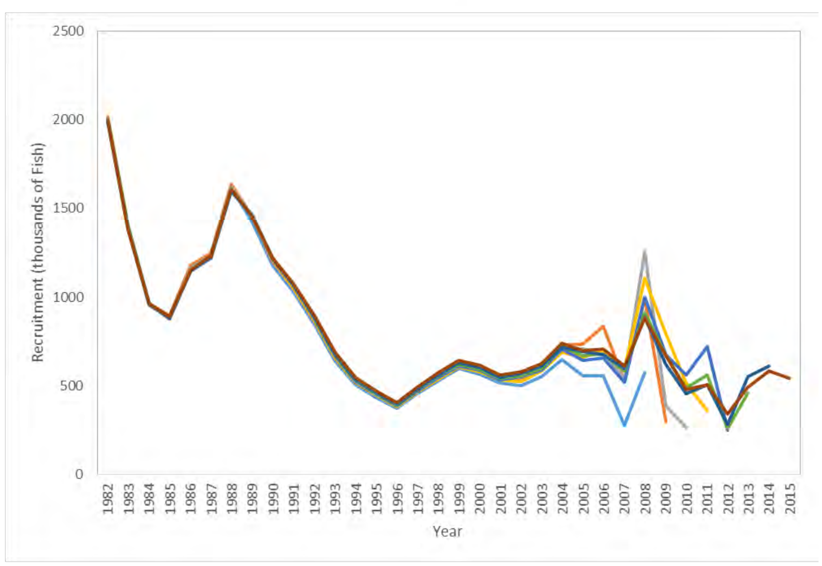


Figure 5.1.7. Retrospective analysis for the MARI region for F (A), SSB (B), and recruitment (C)

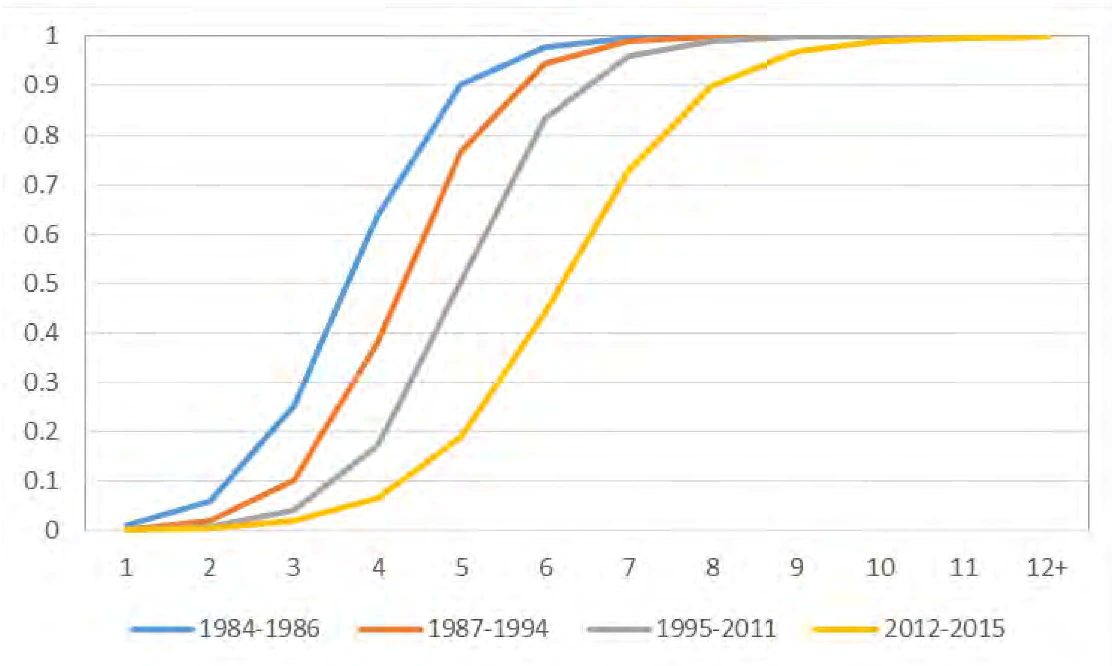


Figure 5.2.1 Estimated selectivity patterns for the fishery in the LIS region.

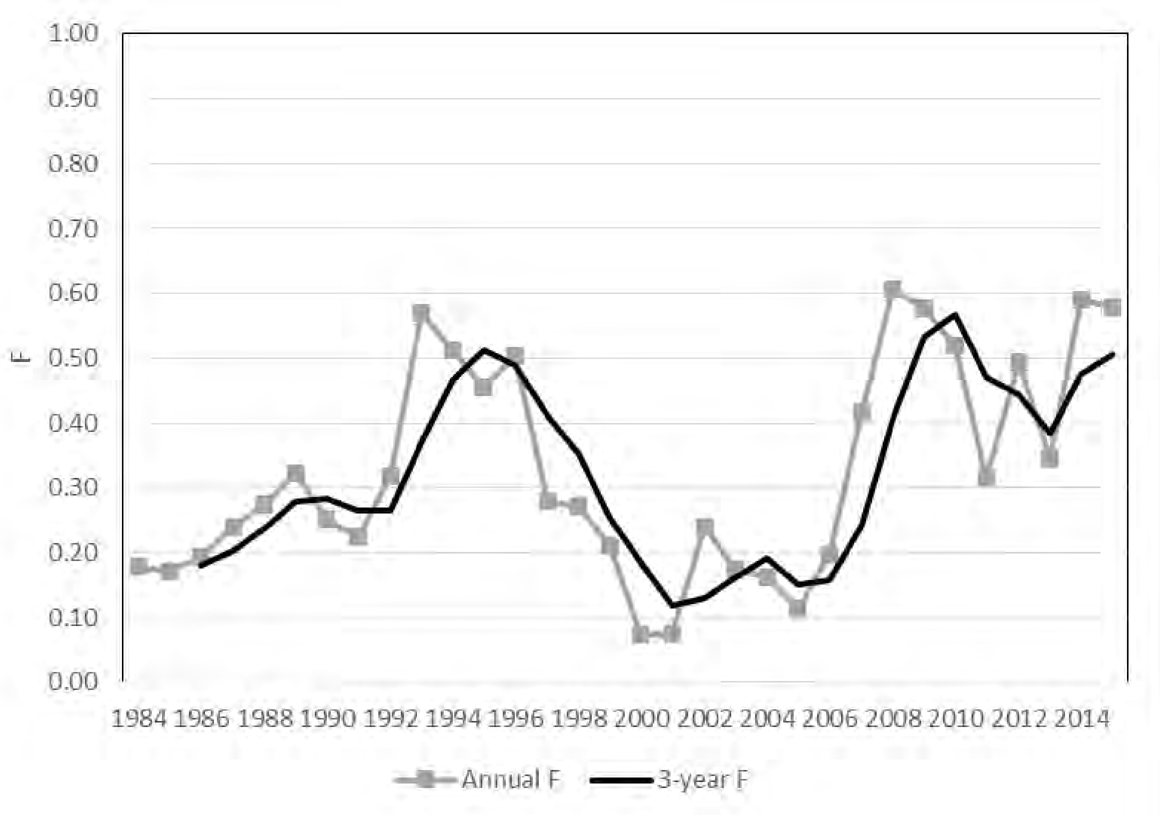


Figure 5.2.2 Annual fishing mortality (F) and 3-year average for LIS.

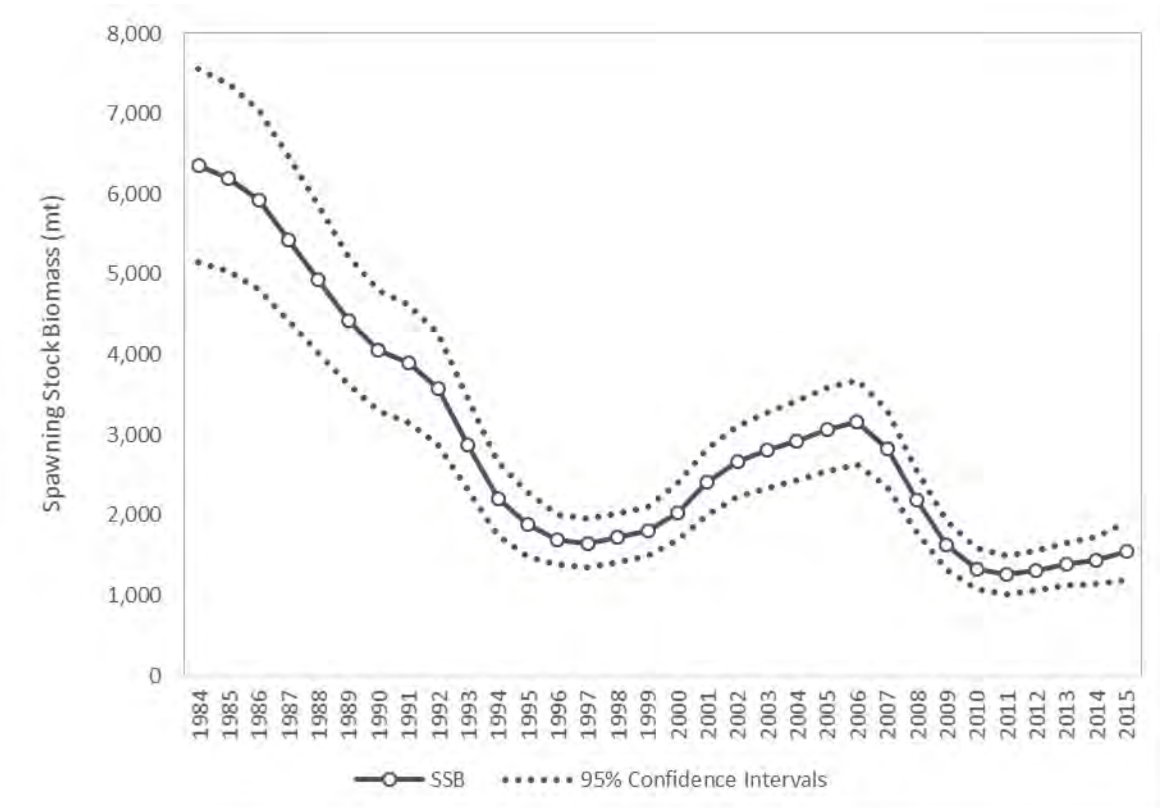


Figure 5.2.3. Estimates of spawning stock biomass for the LIS region.

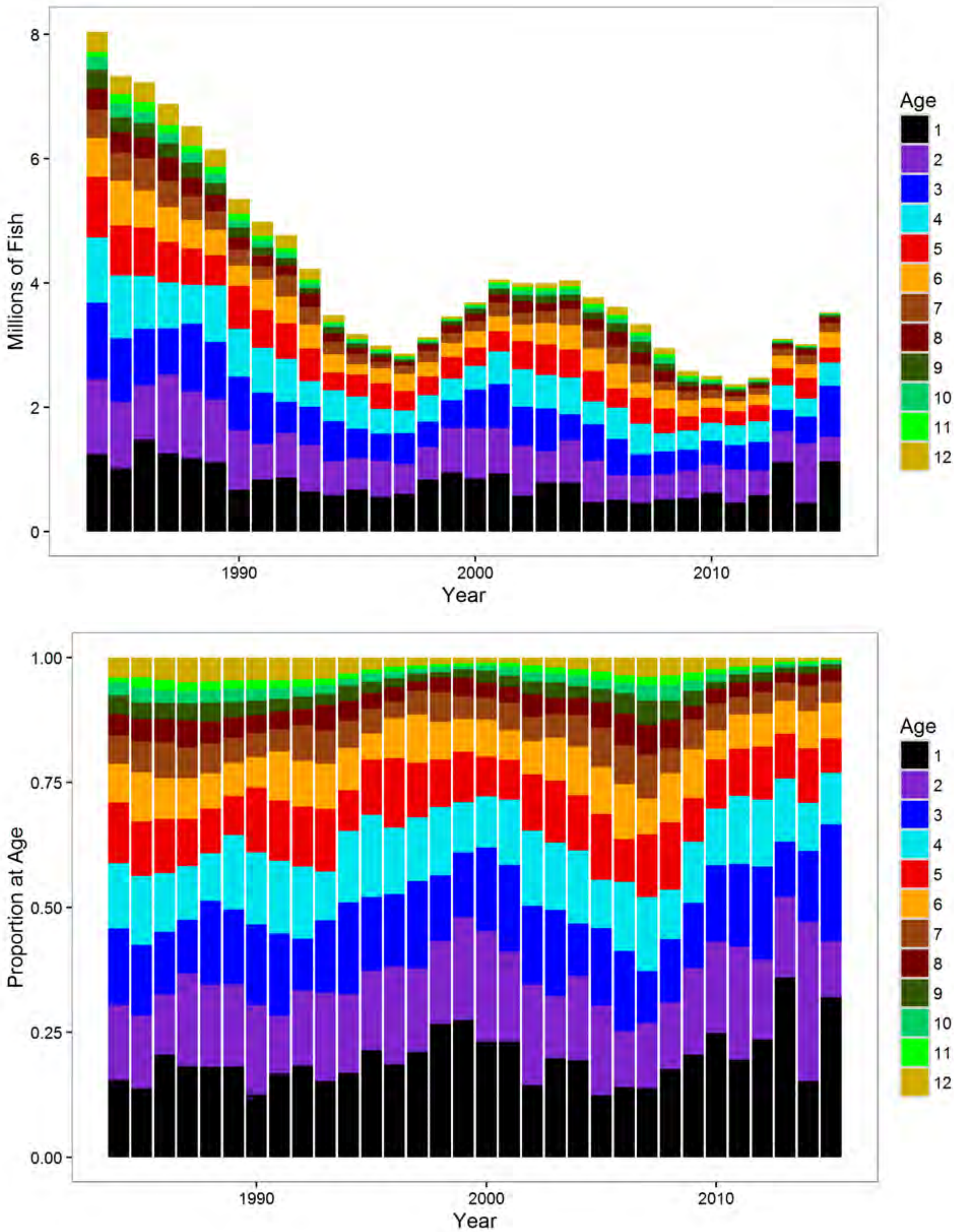


Figure 5.2.4. Abundance at age for the LIS region in total numbers of fish (top) and percent of population (bottom).

LIS

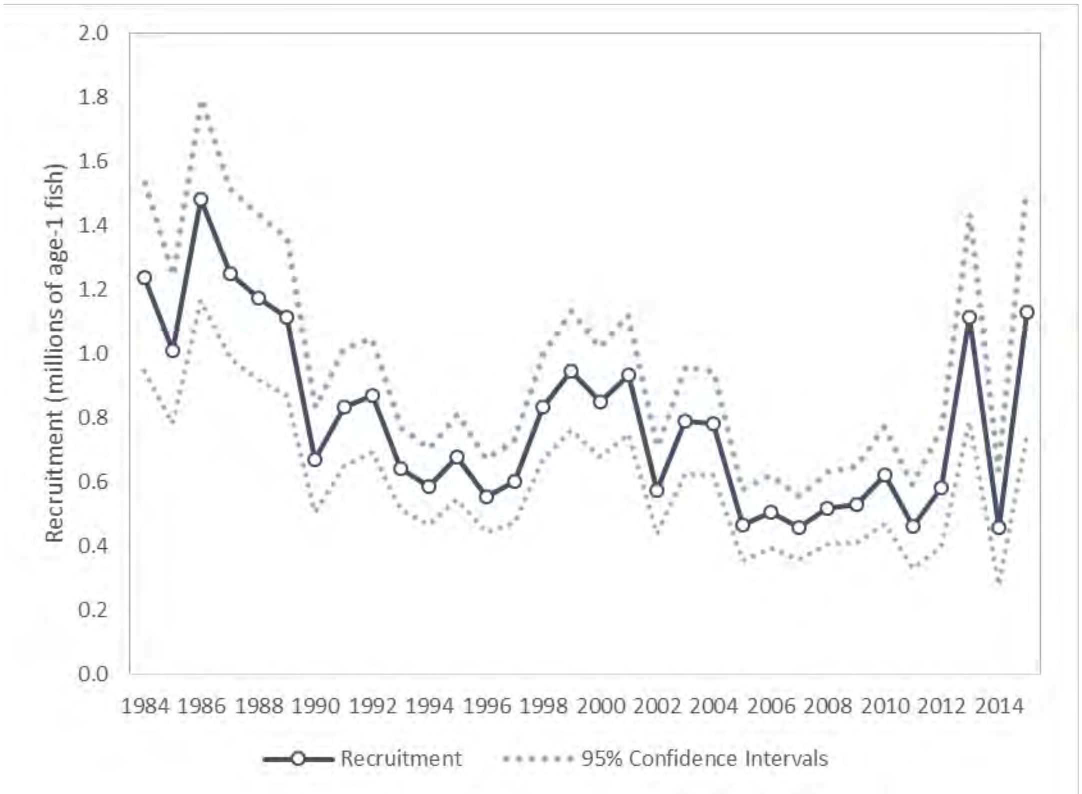
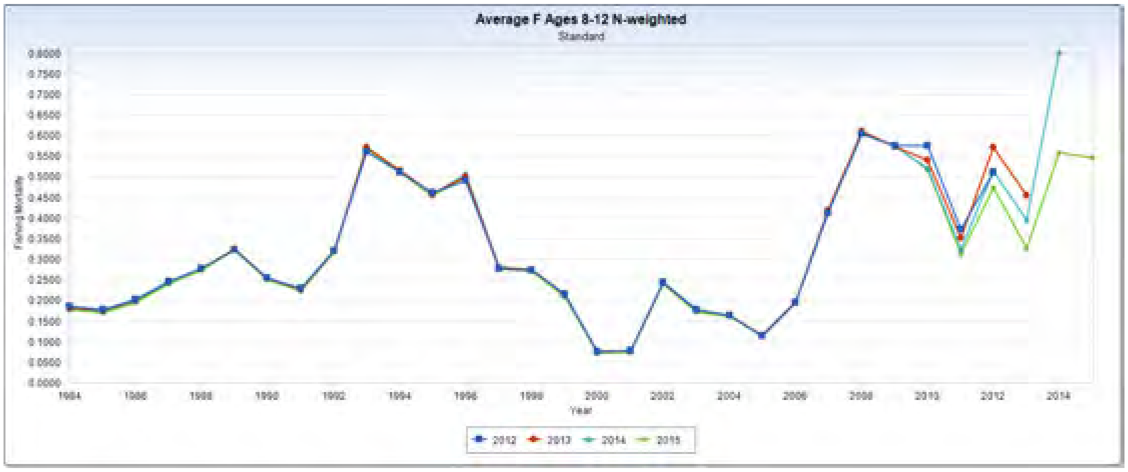


Figure 5.2.5. Recruitment estimates for LIS region.

A.



B.

C.

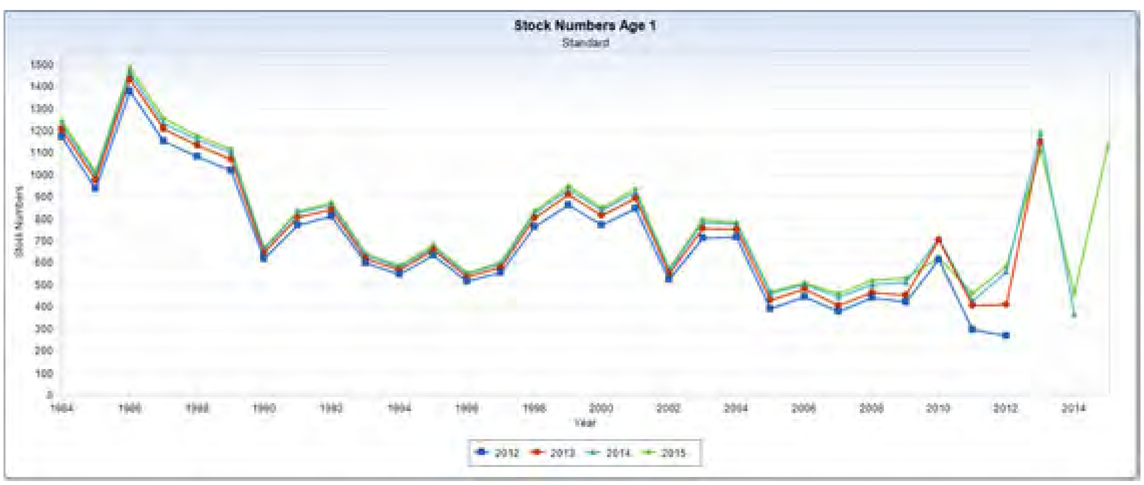


Figure 5.2.6. Retrospective analysis for LIS region for F (A), SSB (B), and Recruits (C).

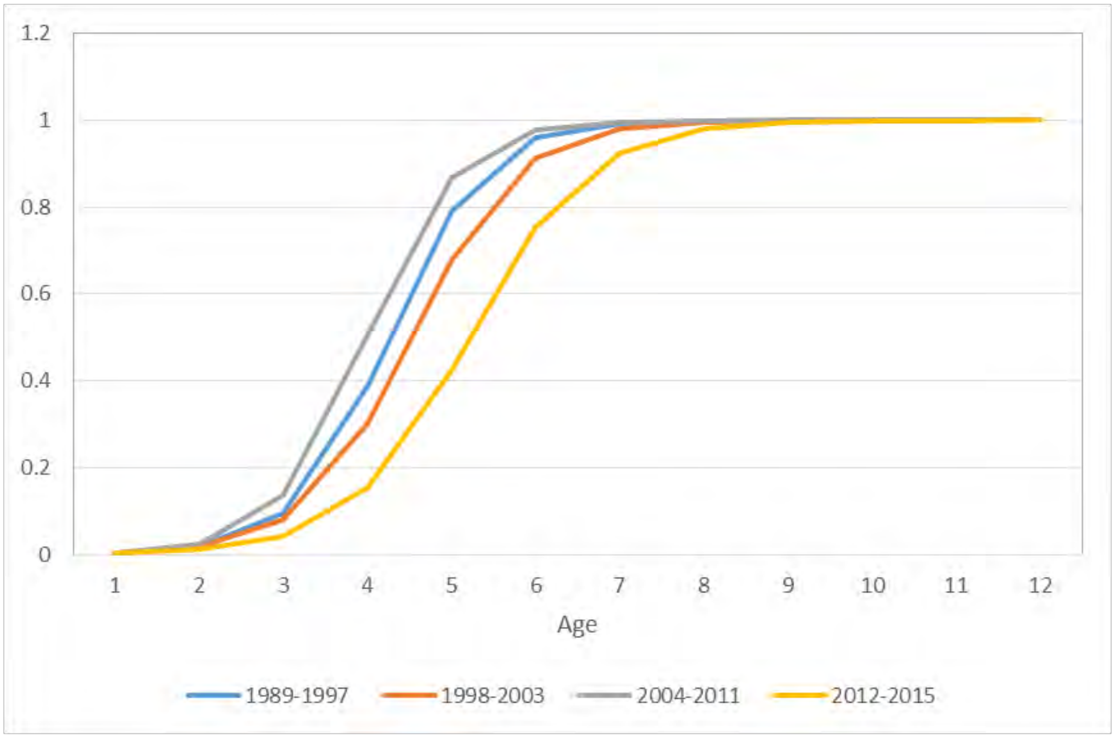


Figure 5.3.1. Estimated selectivity patterns for the NJ-NYB region.

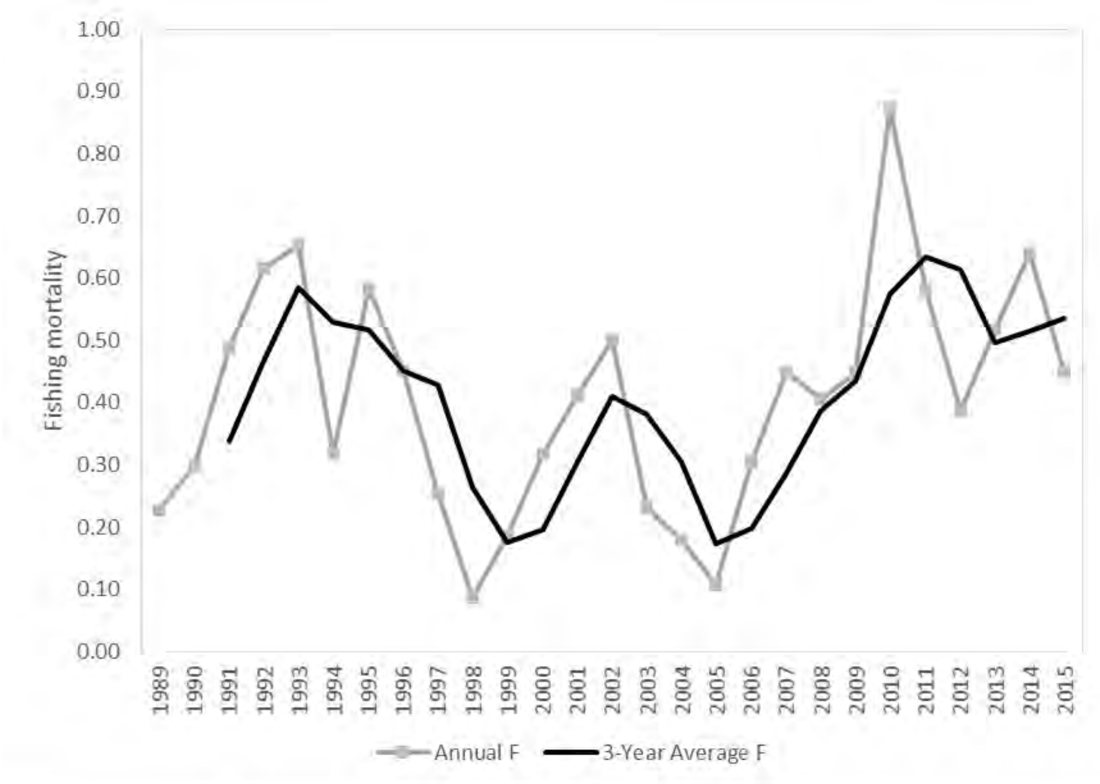


Figure 5.3.2. Fishing mortality estimates for the NJ-NYB region.

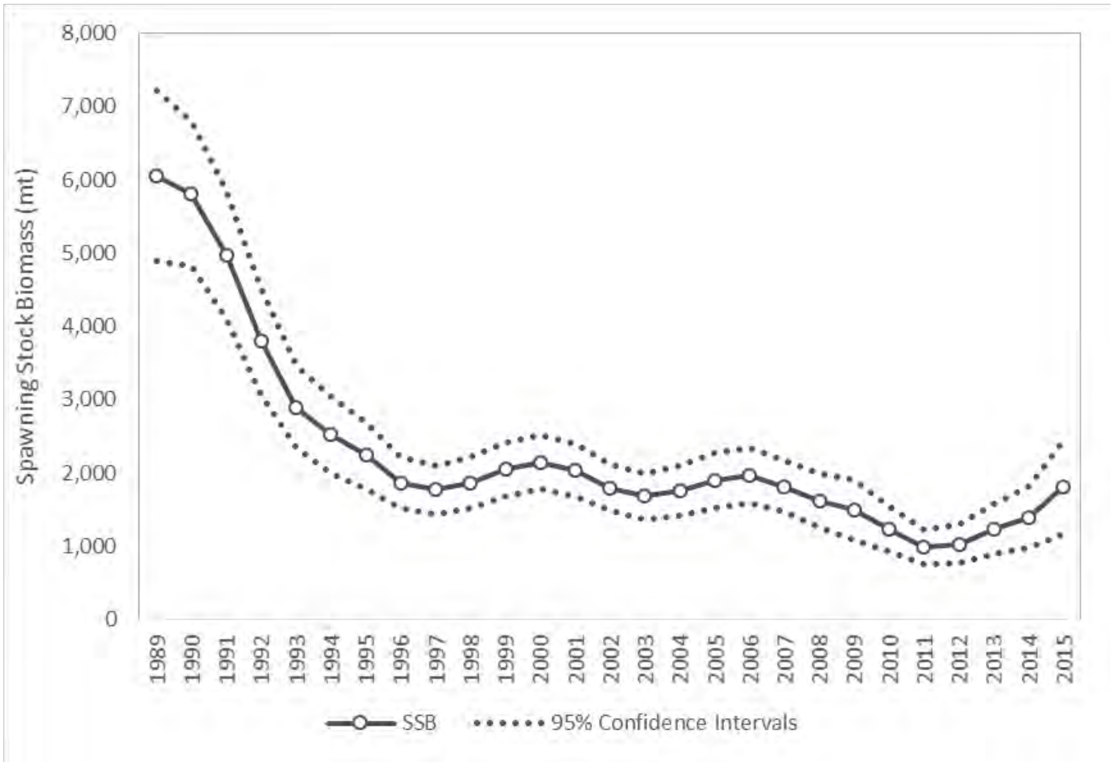


Figure 5.3.3. Spawning stock biomass estimates for the NJ-NYB region.

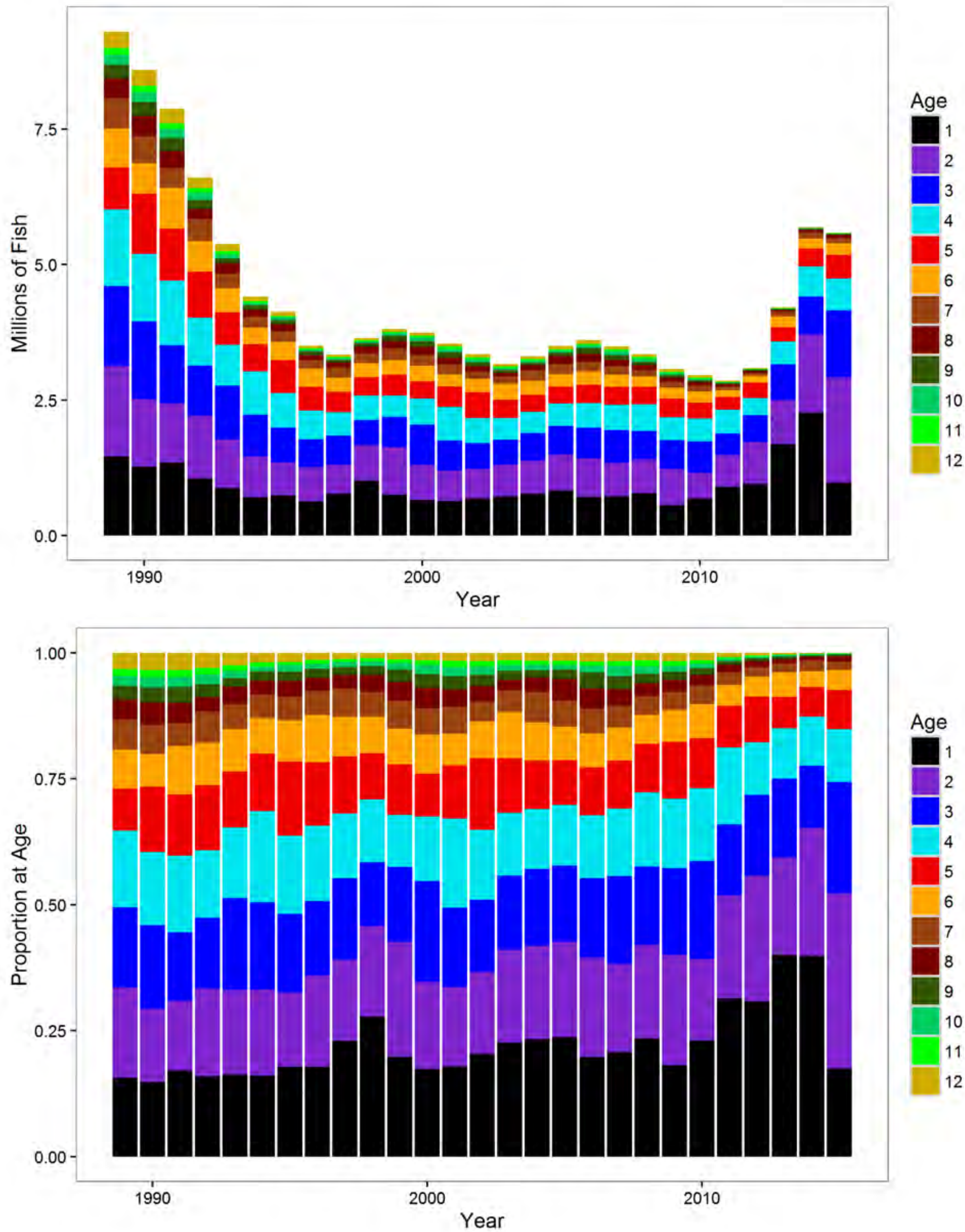


Figure 5.3.4. Abundance at age for the NJ-NYB region in total numbers (top) and proportion of population (bottom).

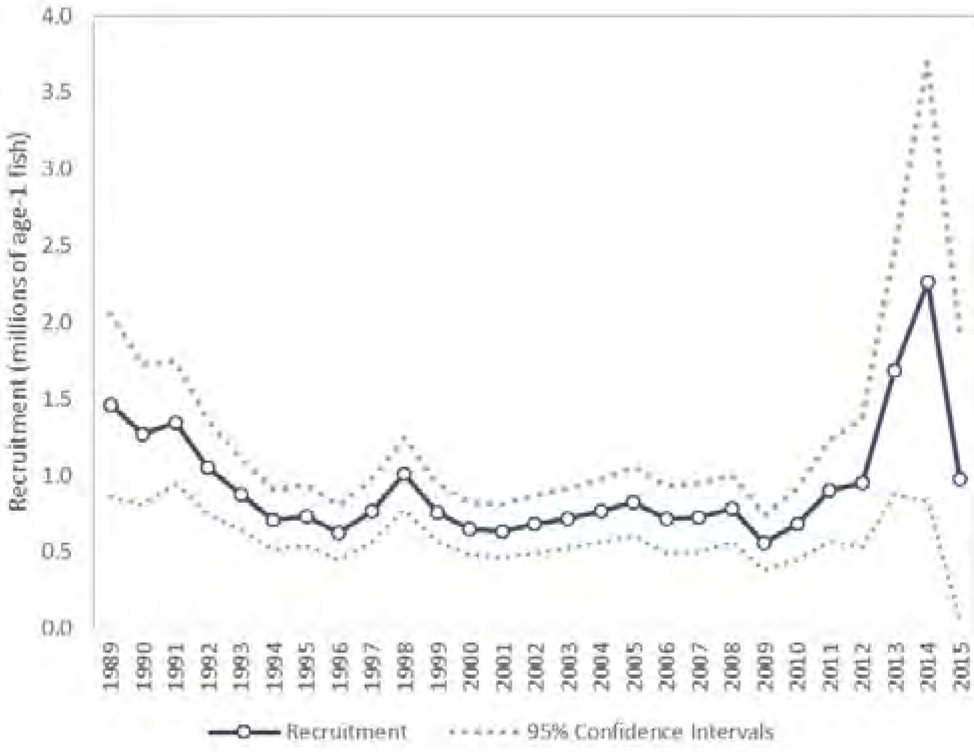


Figure 5.3.5. Recruitment estimates for the NJ-NYB region.

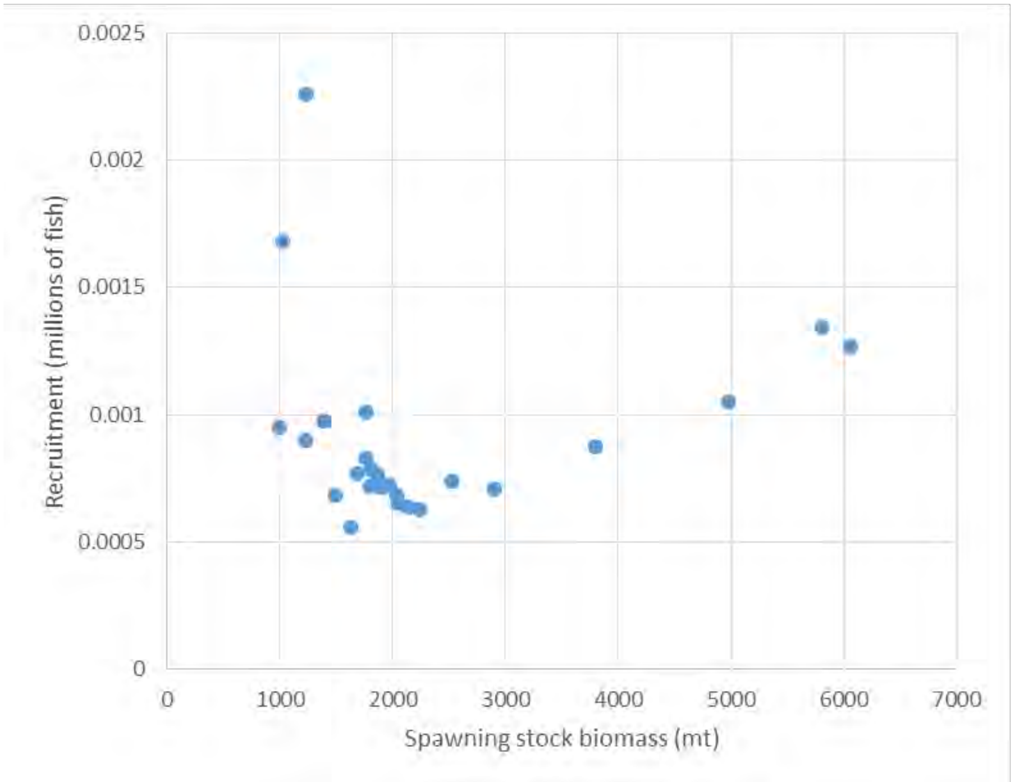


Figure 5.3.6. Stock-recruitment data for NJ-NYB region.

NJ-NYB

A.

B.

C.

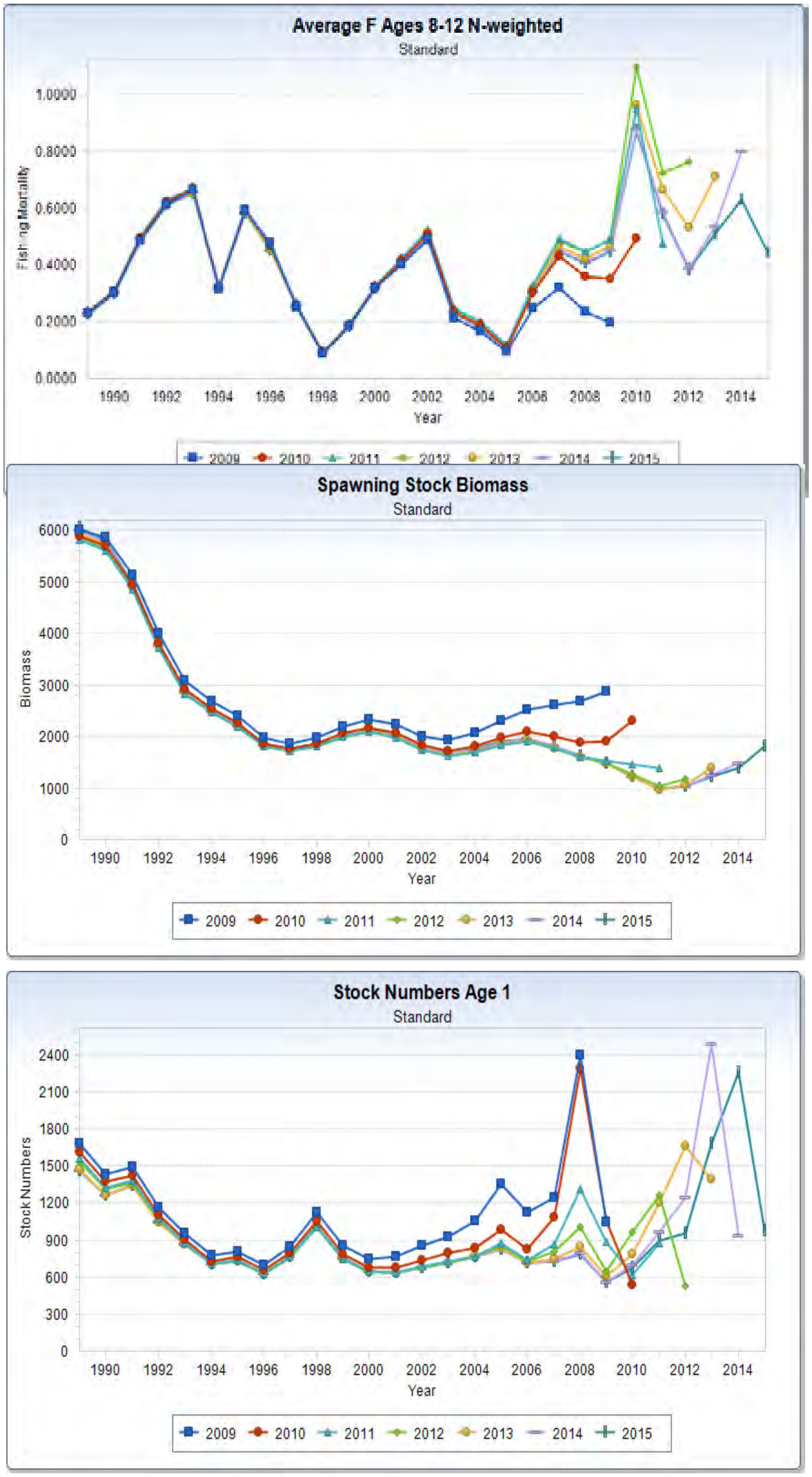


Figure 5.3.7. Retrospective analysis for the NJ-NYB region for F (A), SSB (B), and recruitment (C)

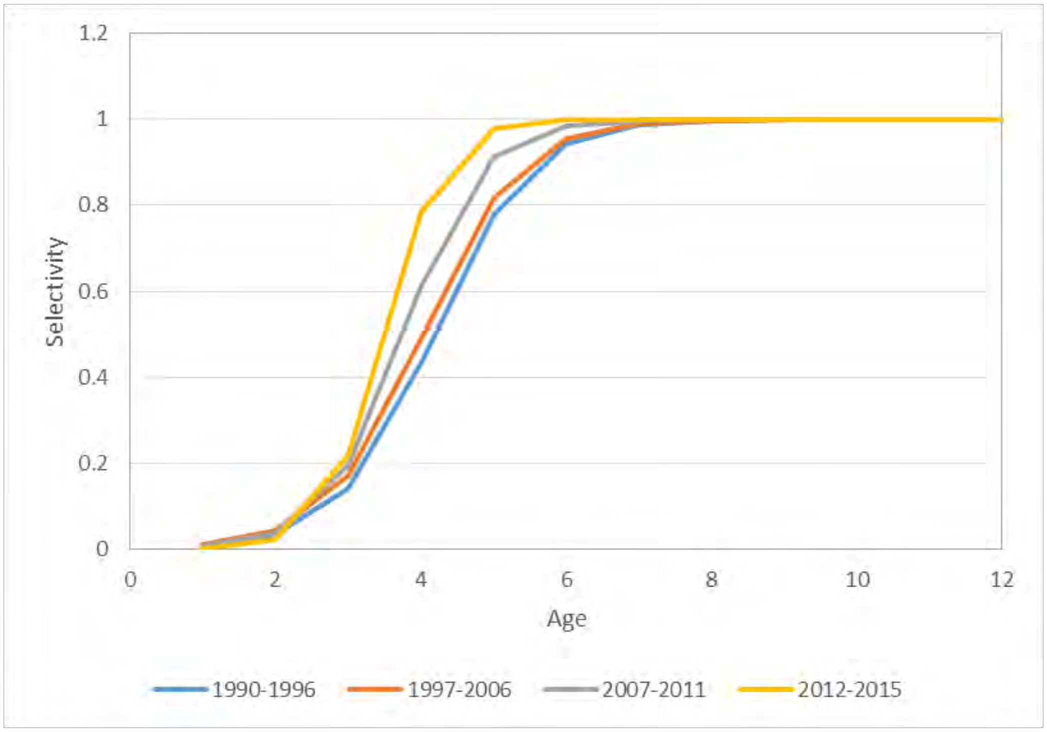


Figure 5.4.1. Estimated selectivity patterns for the DMV region.

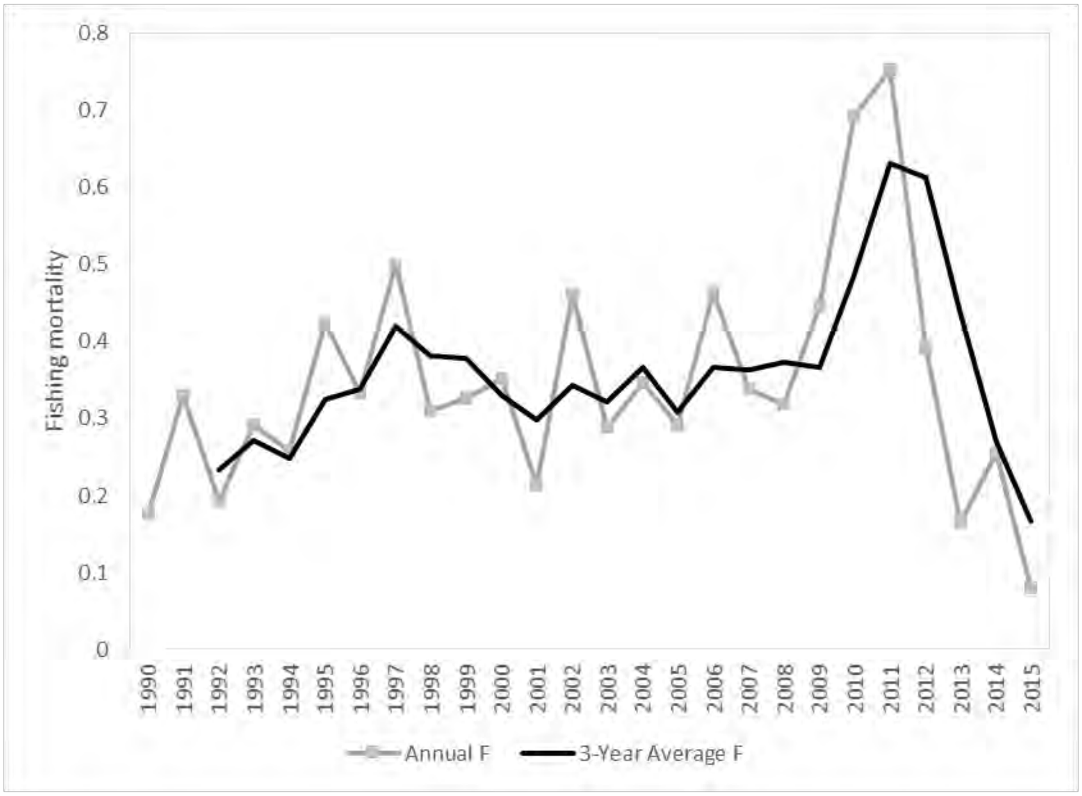


Figure 5.4.2. Fishing mortality estimates for the DMV region.

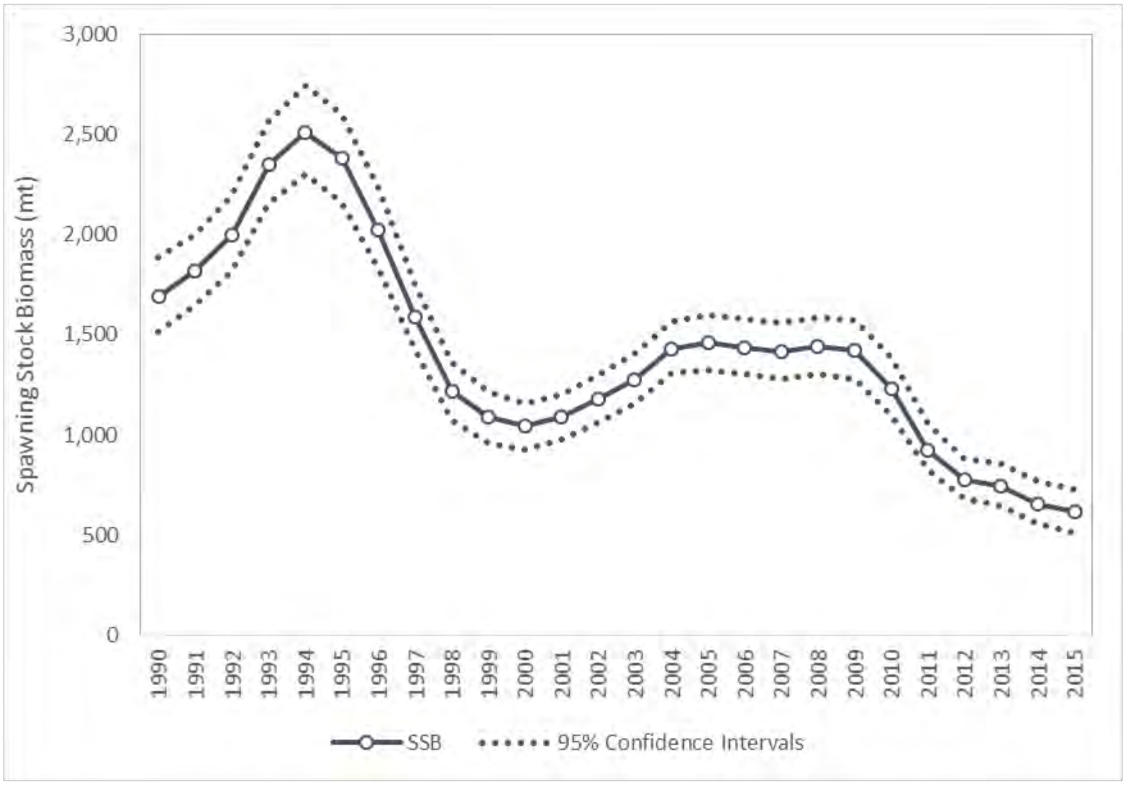
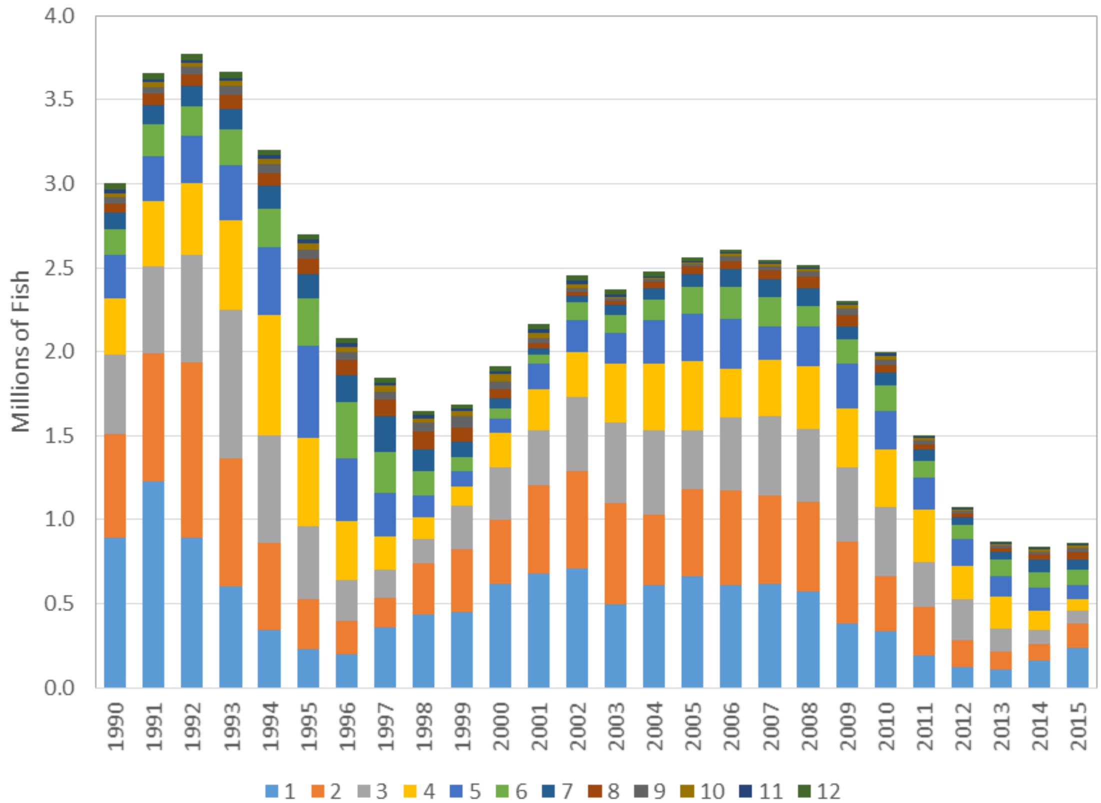


Figure 5.4.3. Spawning stock biomass estimates for the DMV region.



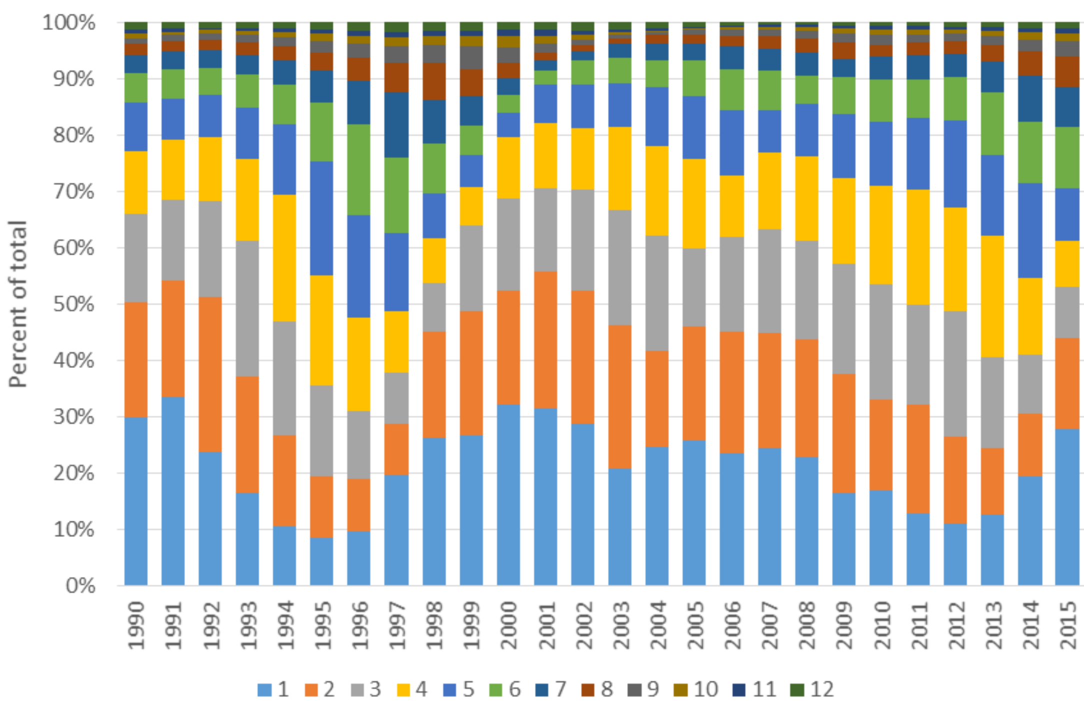


Figure 5.4.4. Abundance at age for the DMV region in total numbers (top) and proportion of population (bottom).

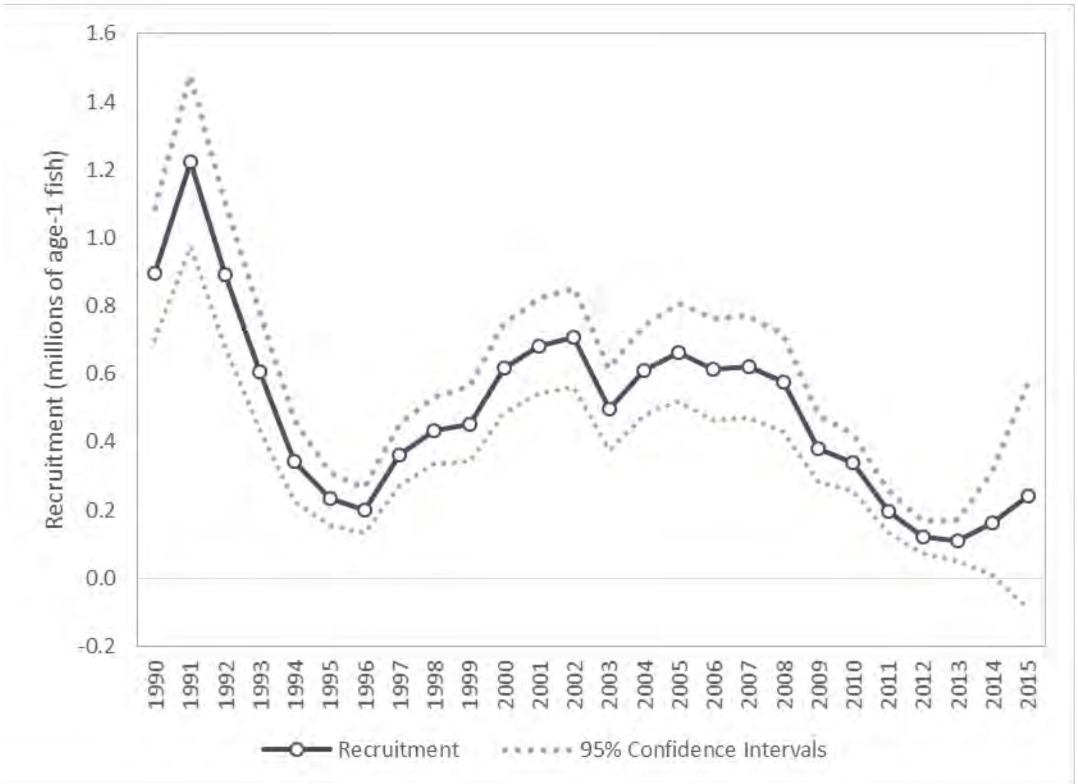


Figure 5.4.5. Recruitment estimates for the DMV region.

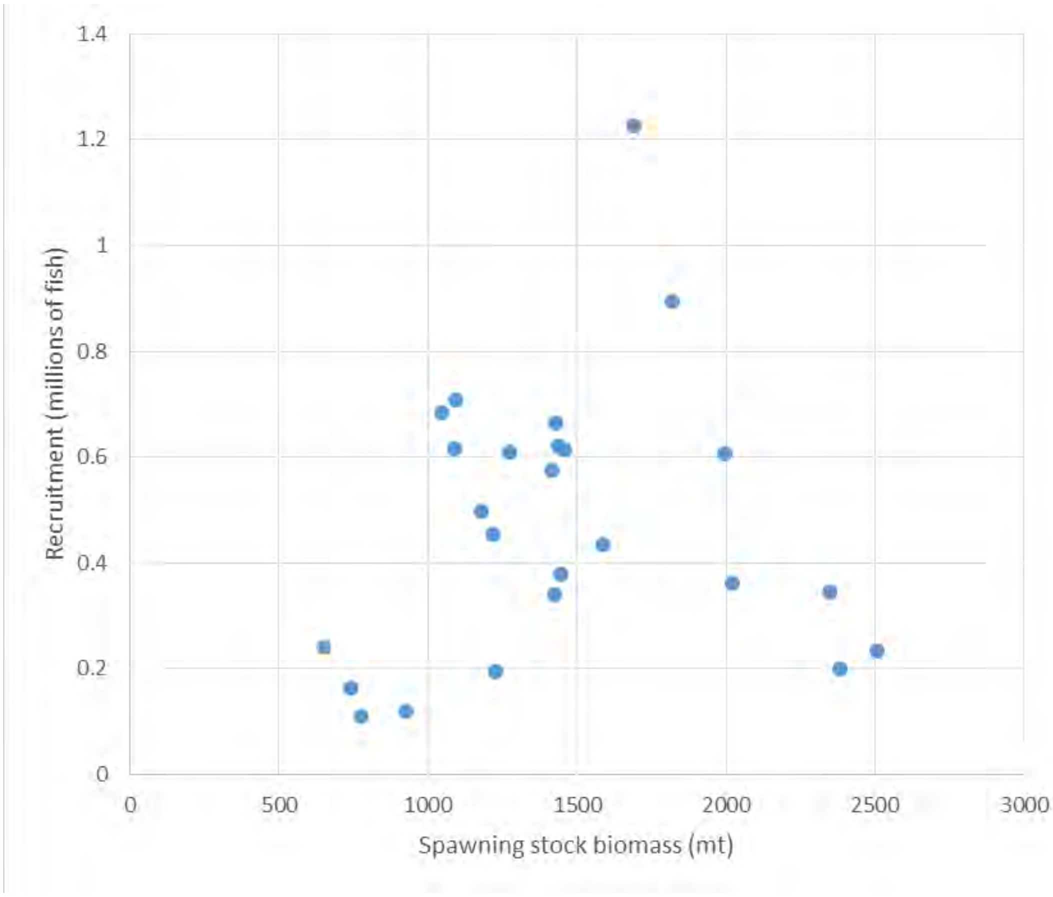


Figure 5.4.6. Stock-recruitment data for the DMV region.

A.

B.

C.

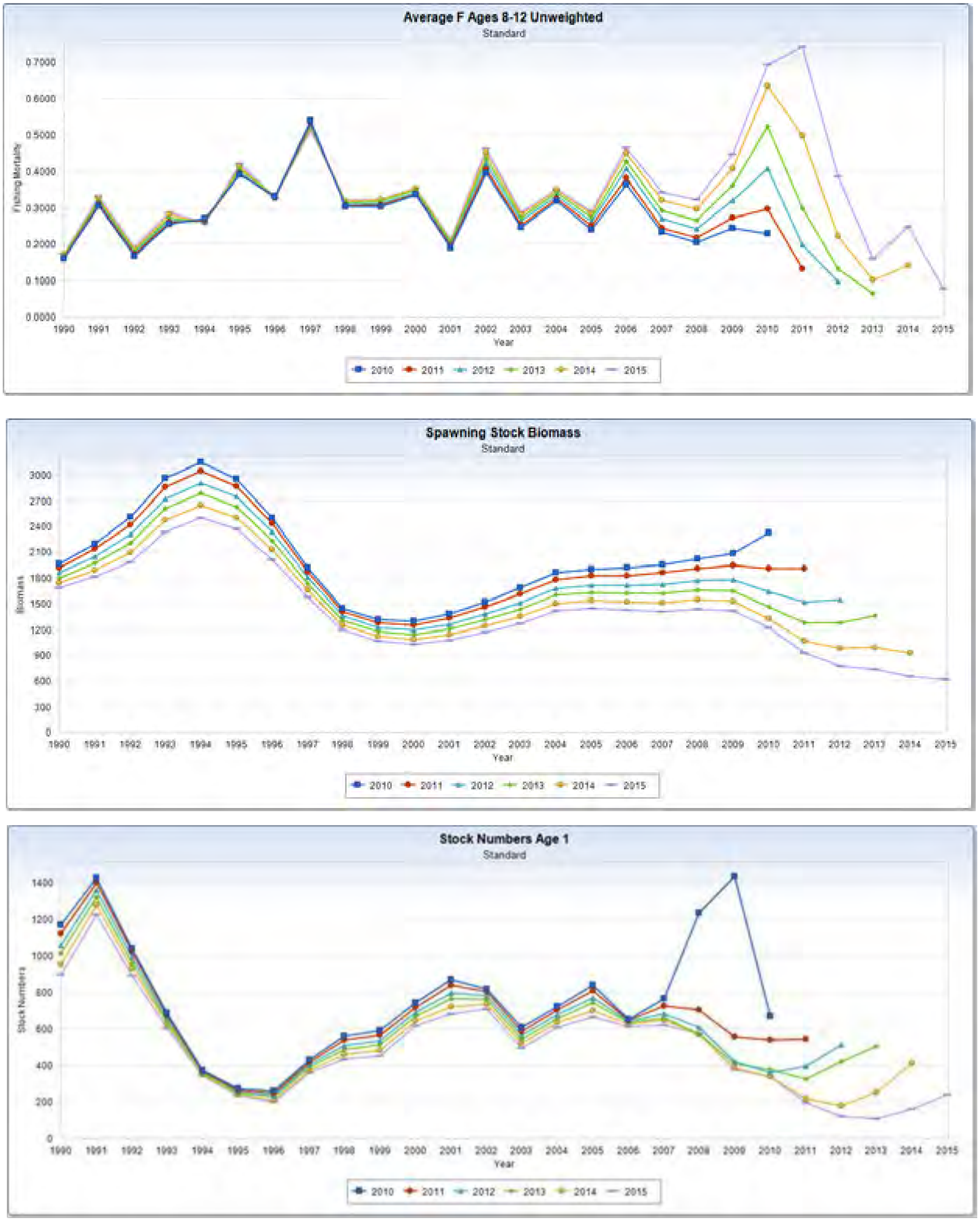


Figure 5.4.7. Retrospective analysis for the DMV region for F (A), SSB (B), and recruitment (C).

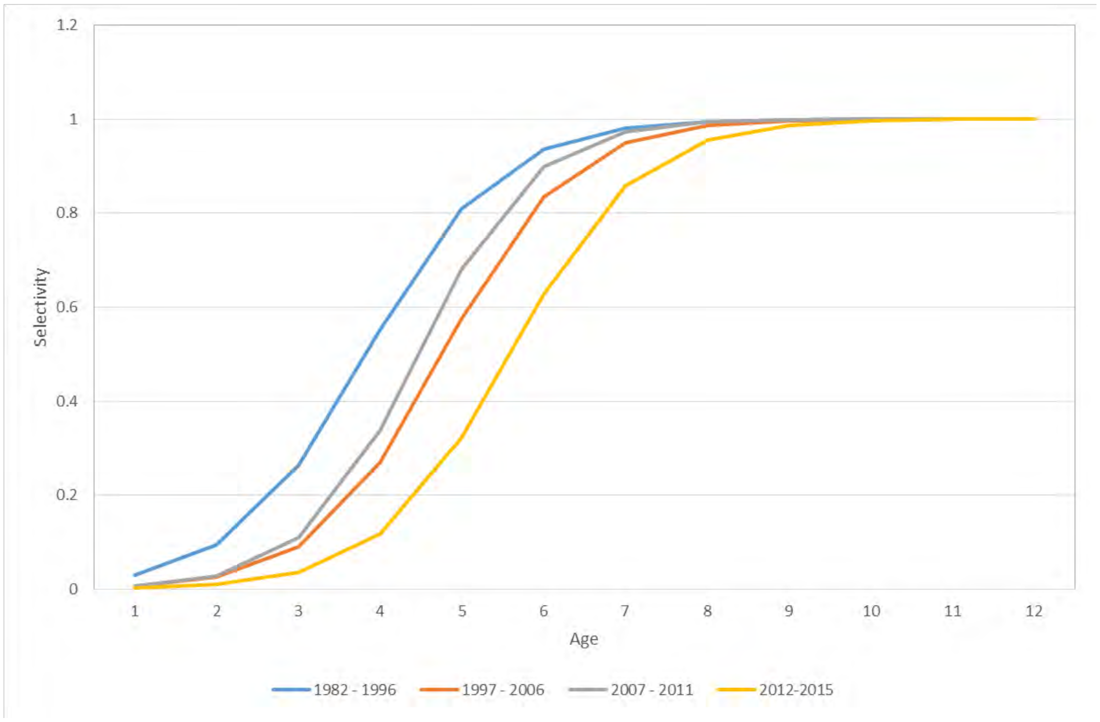


Figure 5.5.1. Estimated selectivity patterns for the coast.

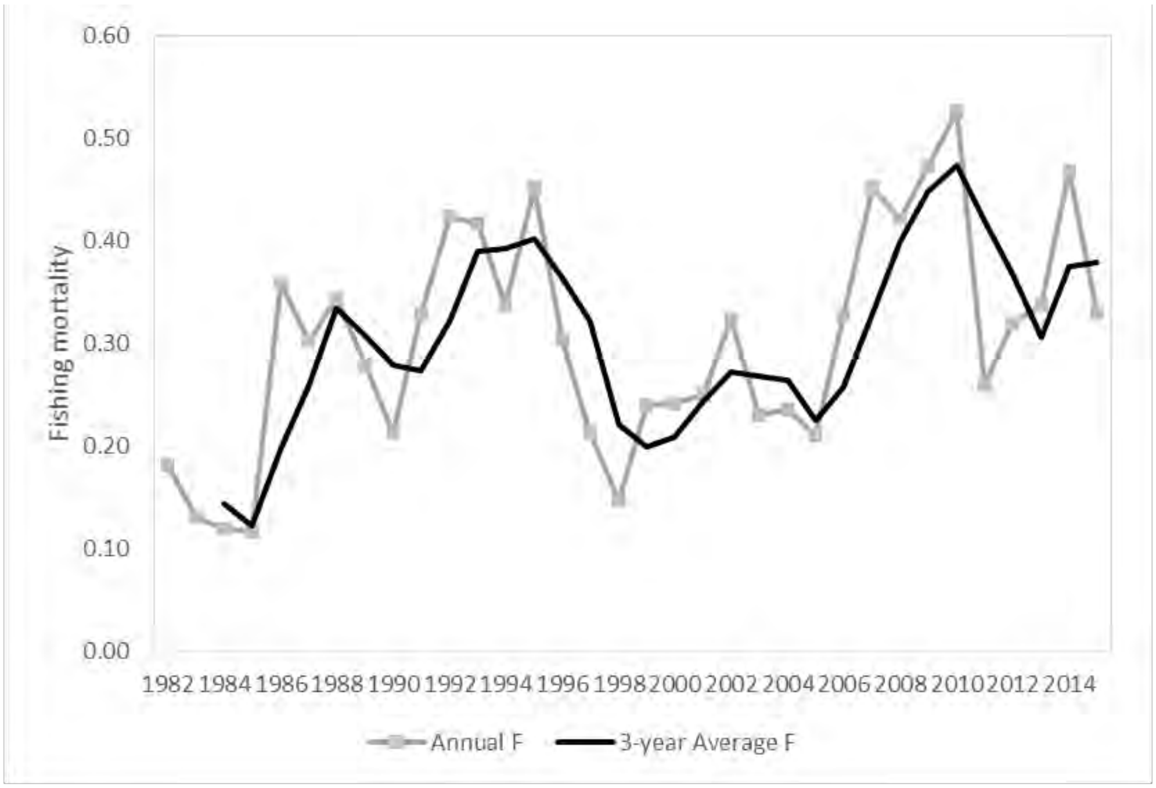


Figure 5.5.2. Fishing mortality estimates for the coast.

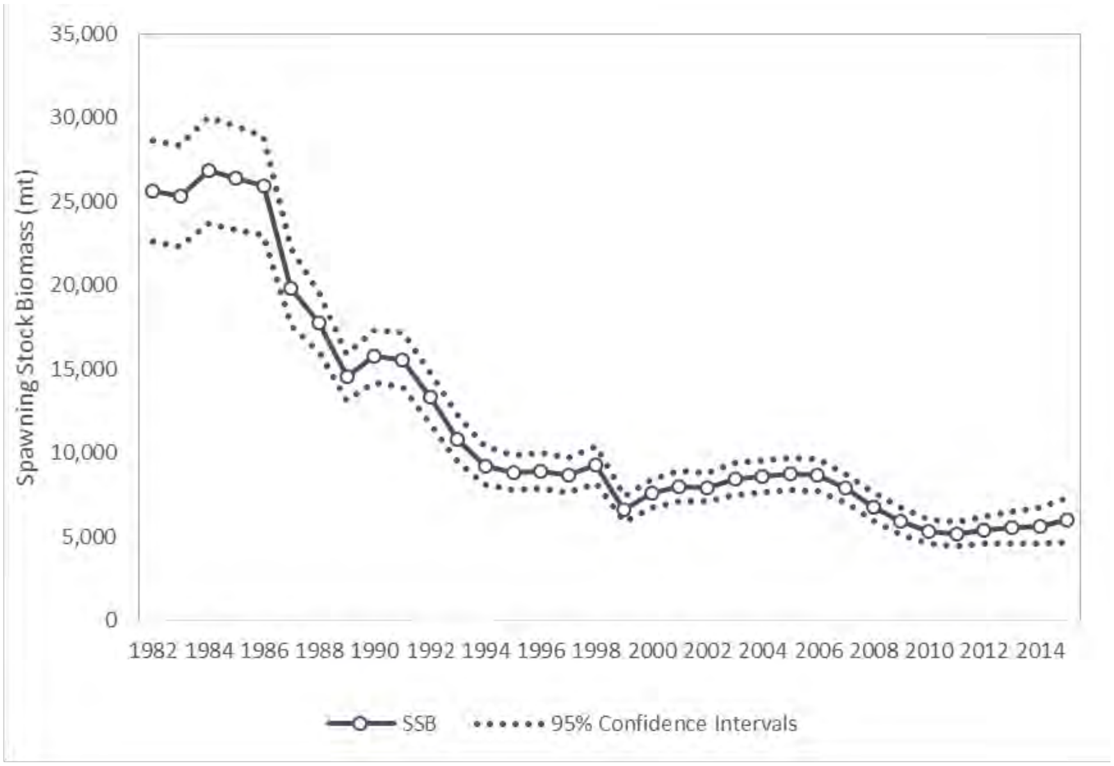


Figure 5.5.3. Spawning stock biomass estimates for the coast.

Coast

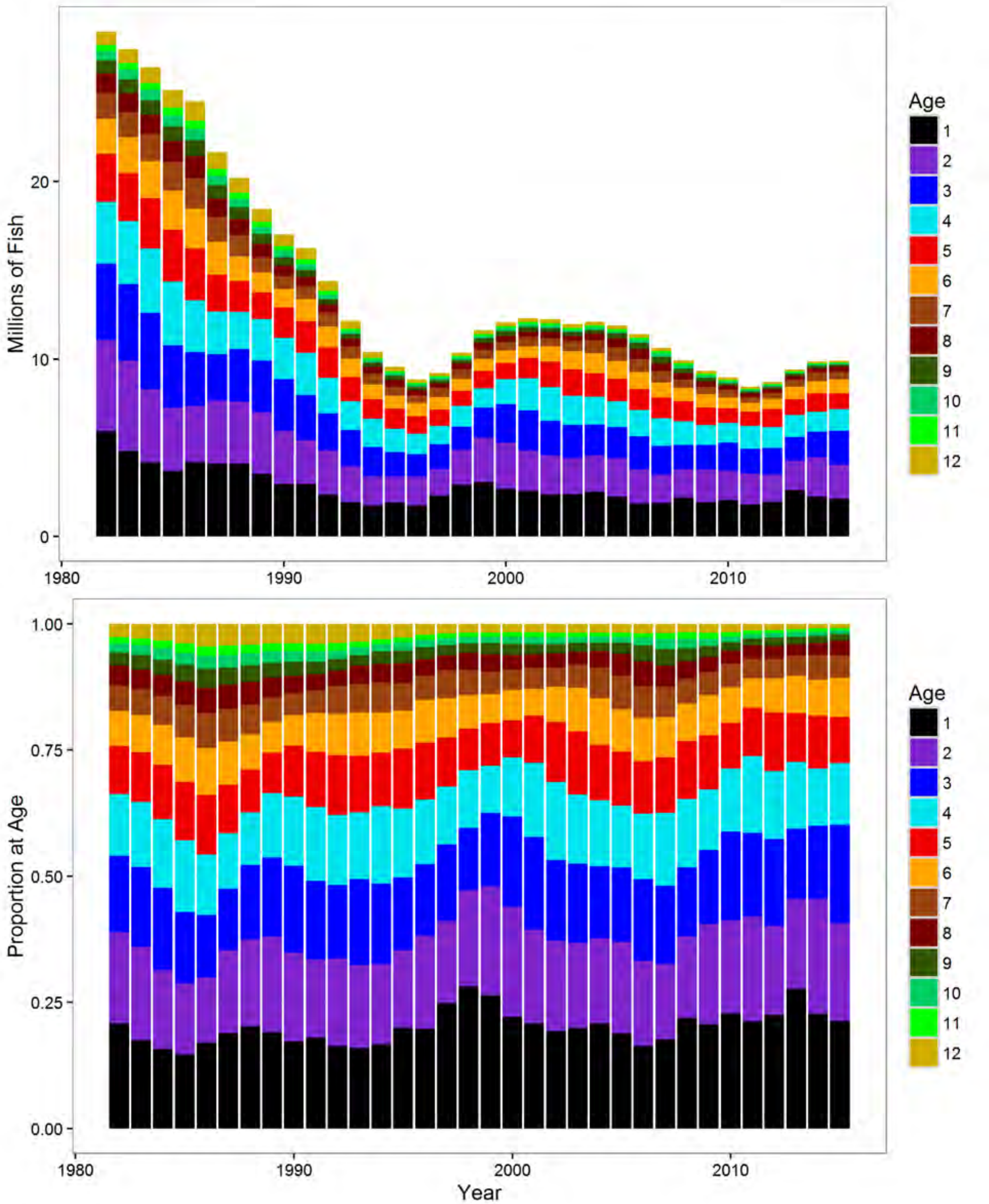


Figure 5.5.4. Abundance at age for the coast in total numbers (top) and proportion of the population (bottom).

Coast

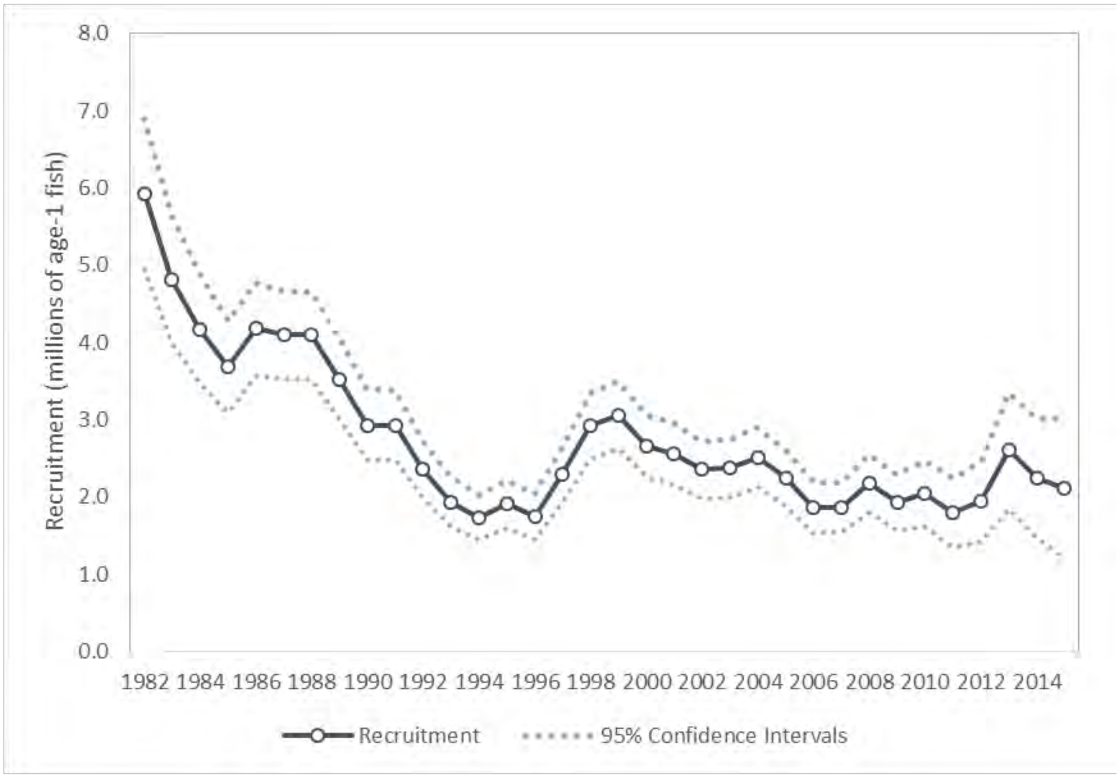


Figure 5.5.5. Recruitment estimates for the coast.

Coast

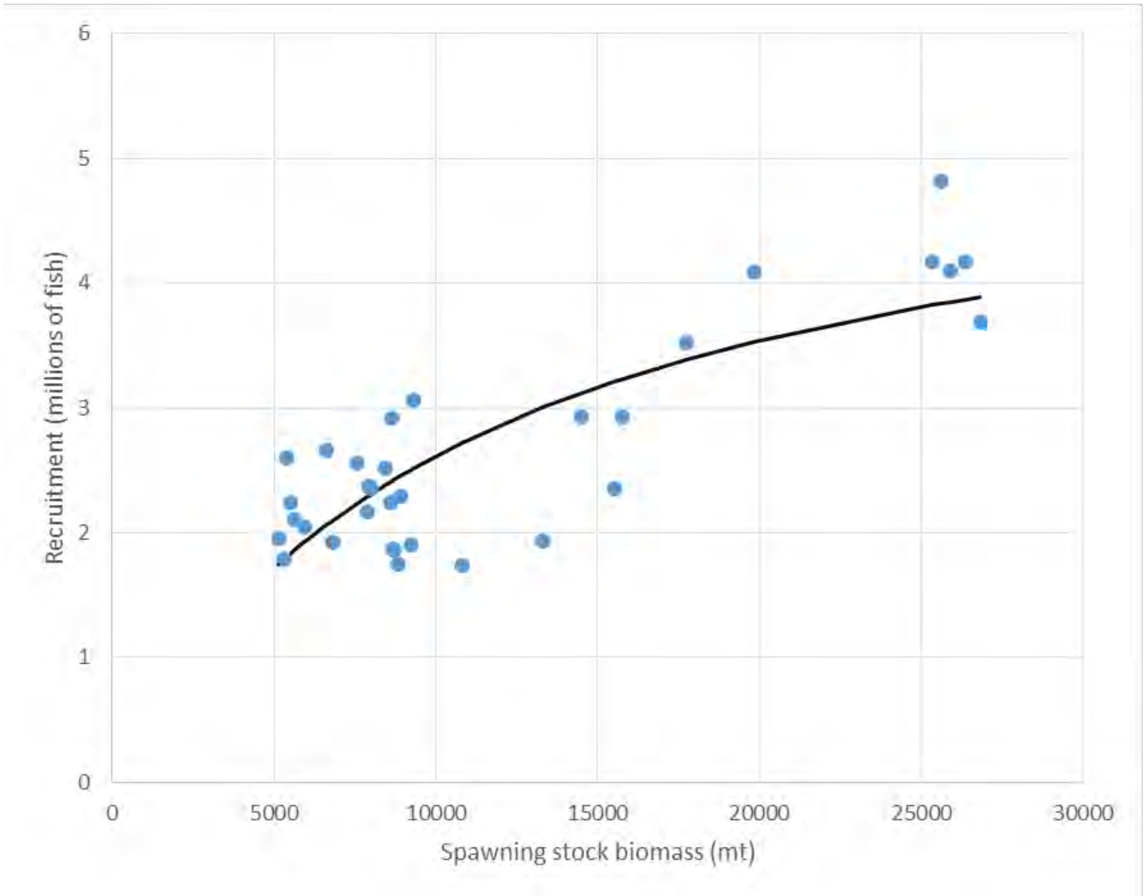
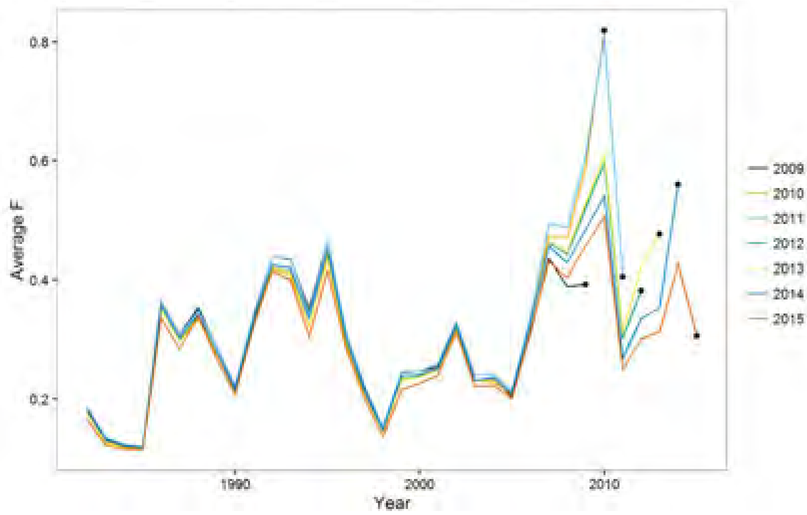


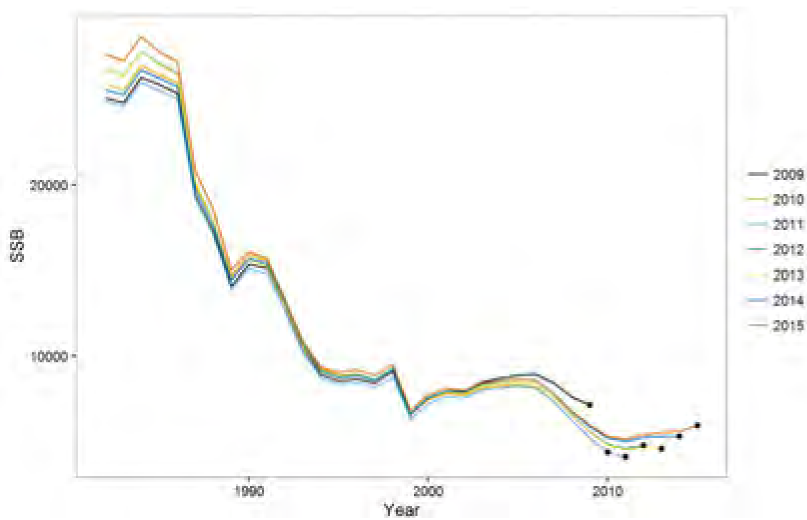
Figure 5.5.6. Stock-recruitment curve for the coast.

Coast

A.



B.



C.

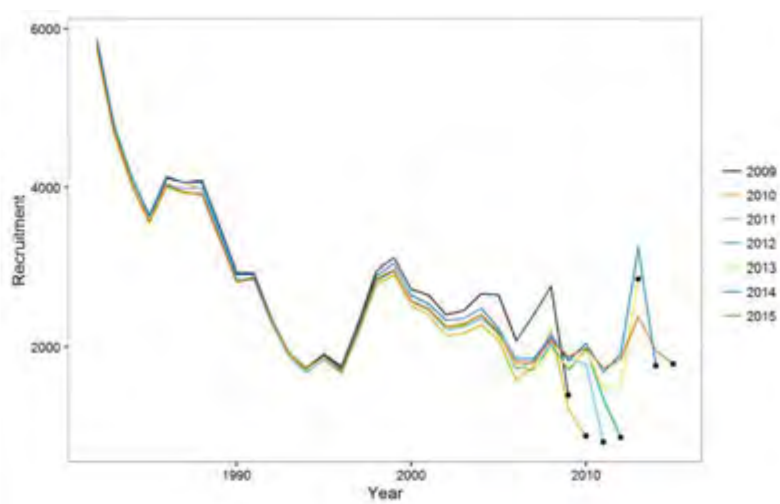
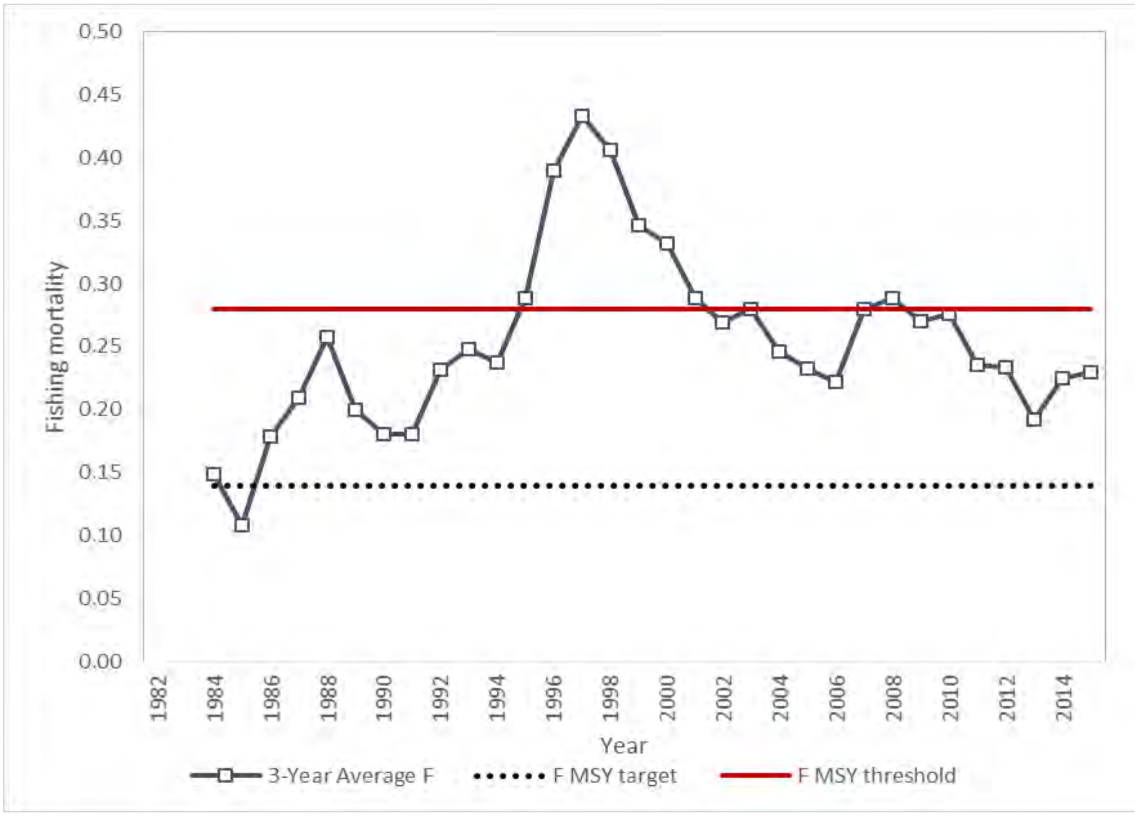


Figure 5.5.7. Retrospective analysis for the coast for F (A), SSB (B), and recruitment (C).



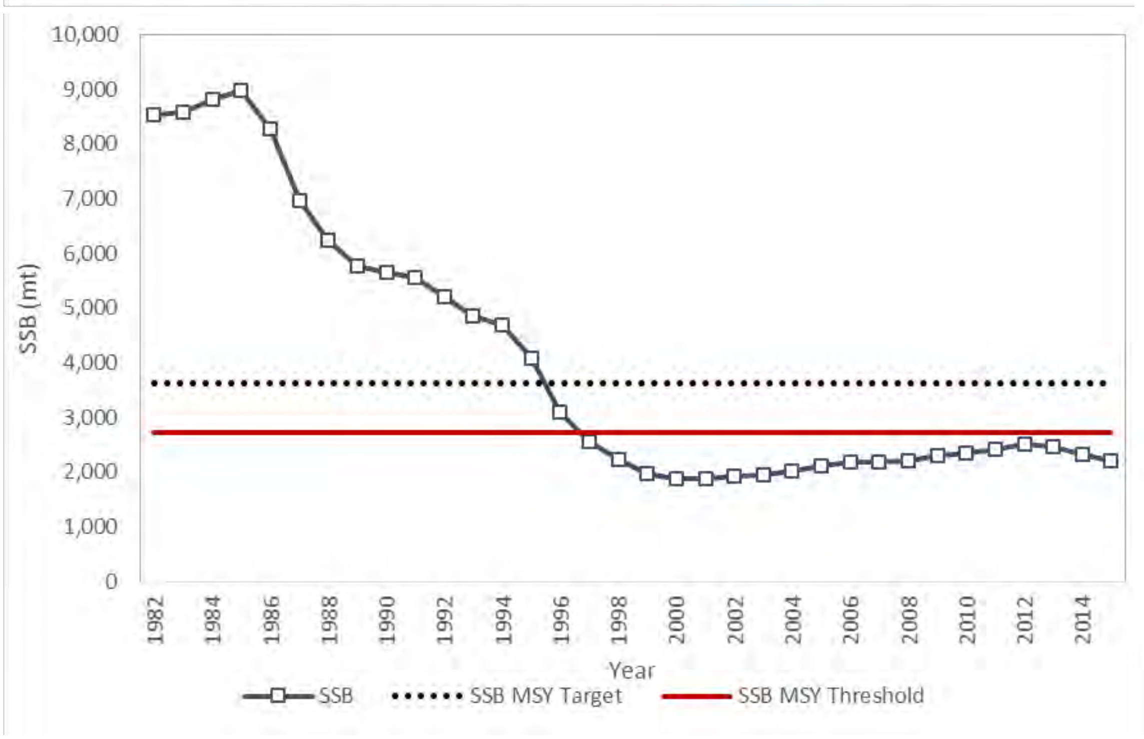
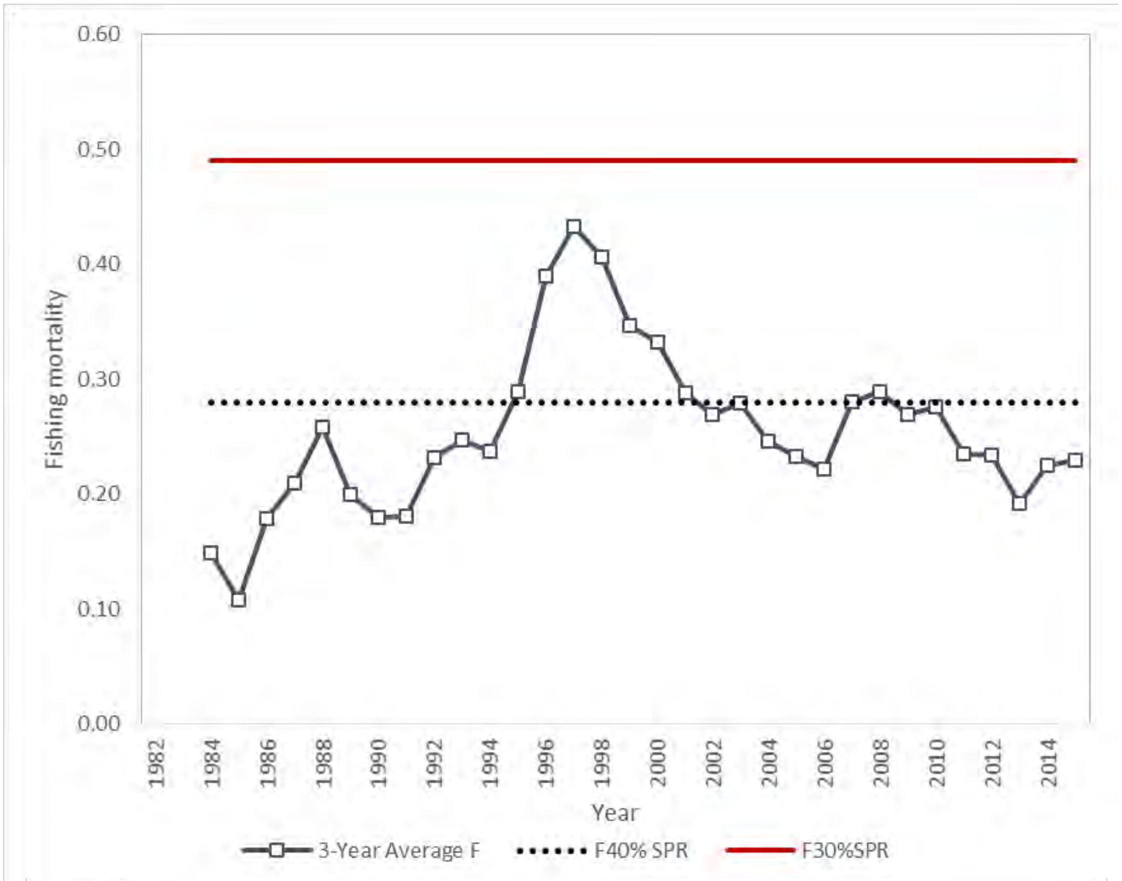


Figure 6.1.1. F (top) and SSB (bottom) plotted with their MSY-based targets and thresholds for the MARI region.



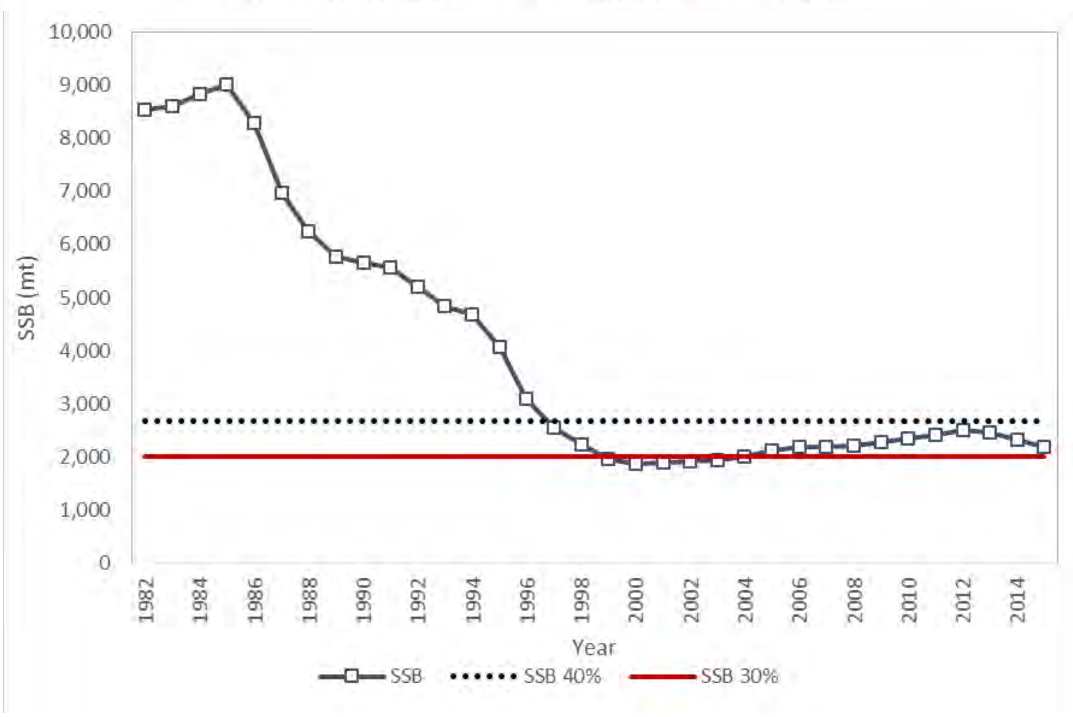


Figure 6.1.2. F (top) and SSB (bottom) plotted with their SPR-based targets and thresholds for the MARI region

.

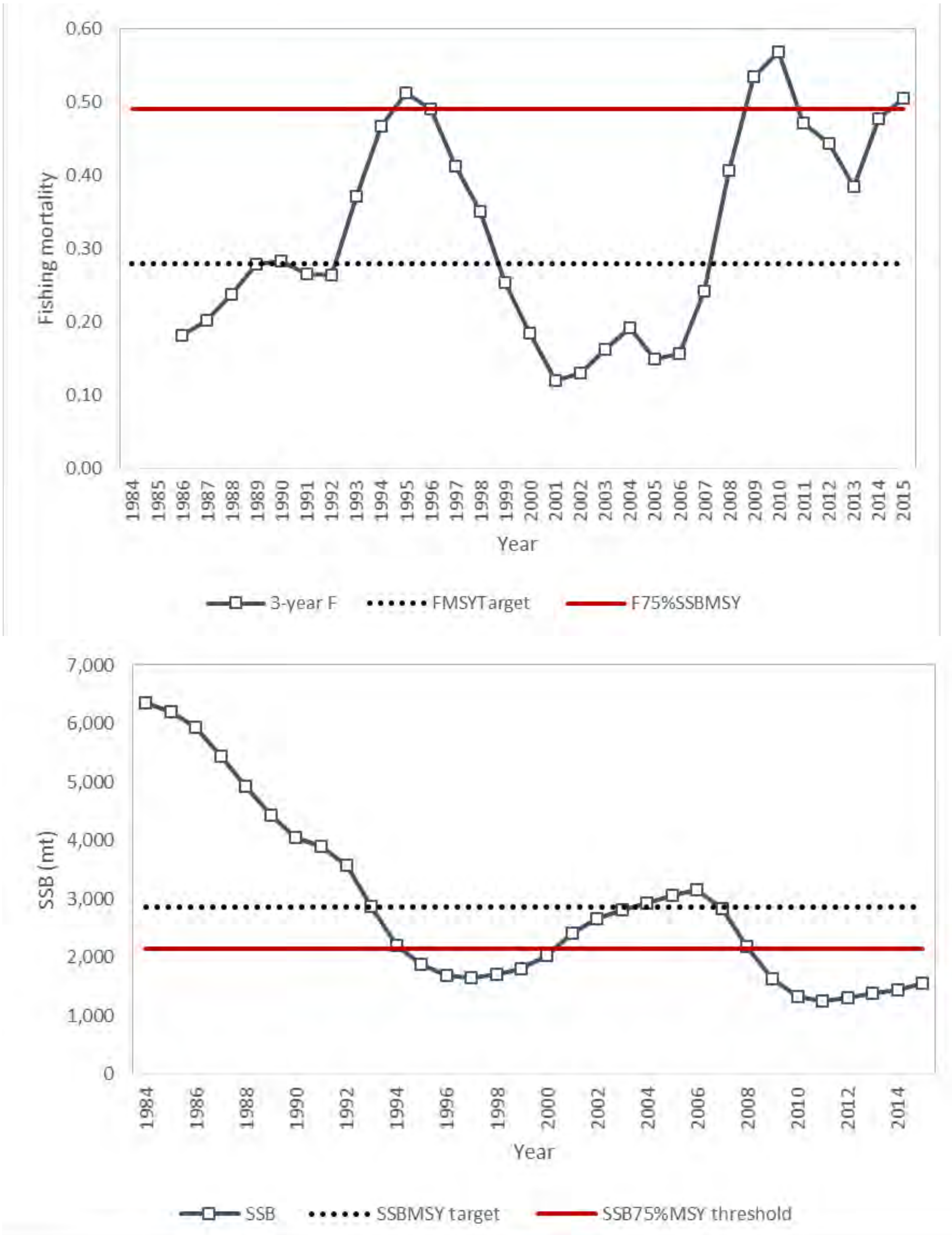


Figure 6.2.1. F (top) and SSB (bottom) plotted with their MSY-based targets and thresholds for the LIS region.

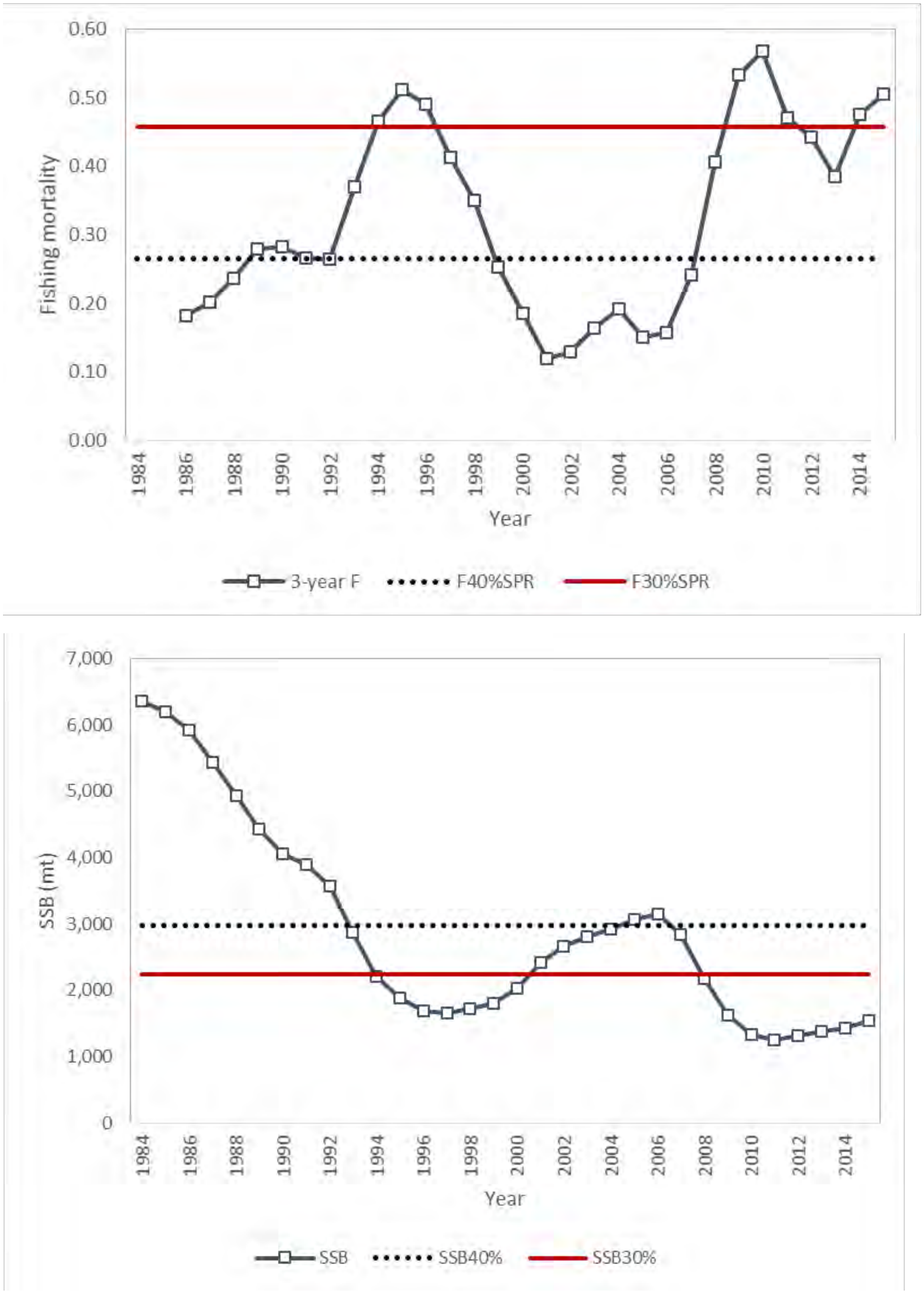
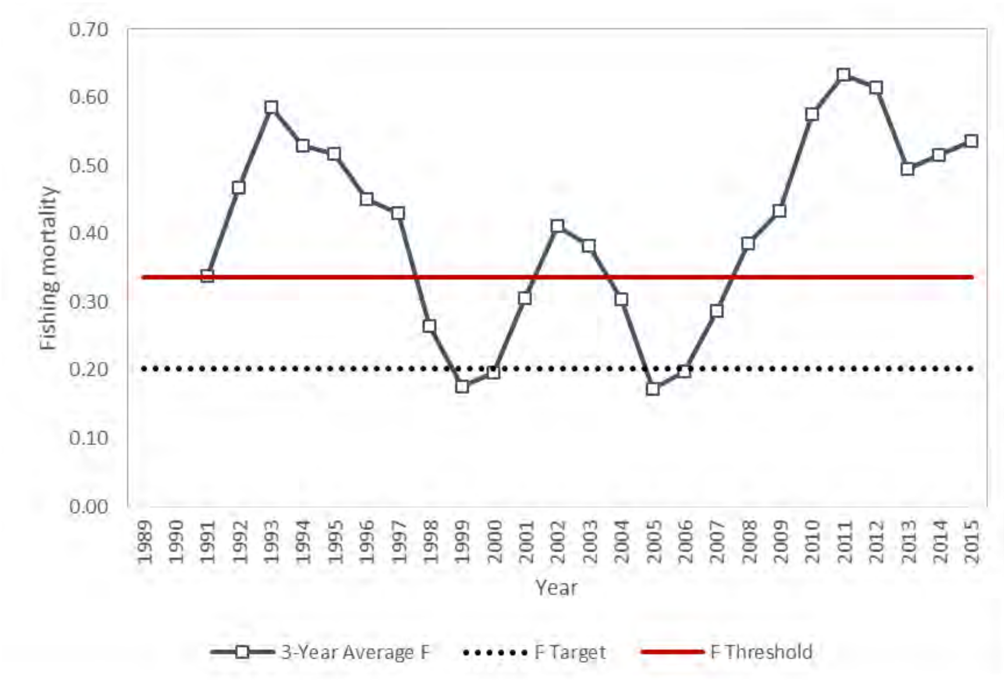


Figure 6.2.2. F (top) and SSB (bottom) plotted with their SPR-based targets and thresholds for the LIS region.



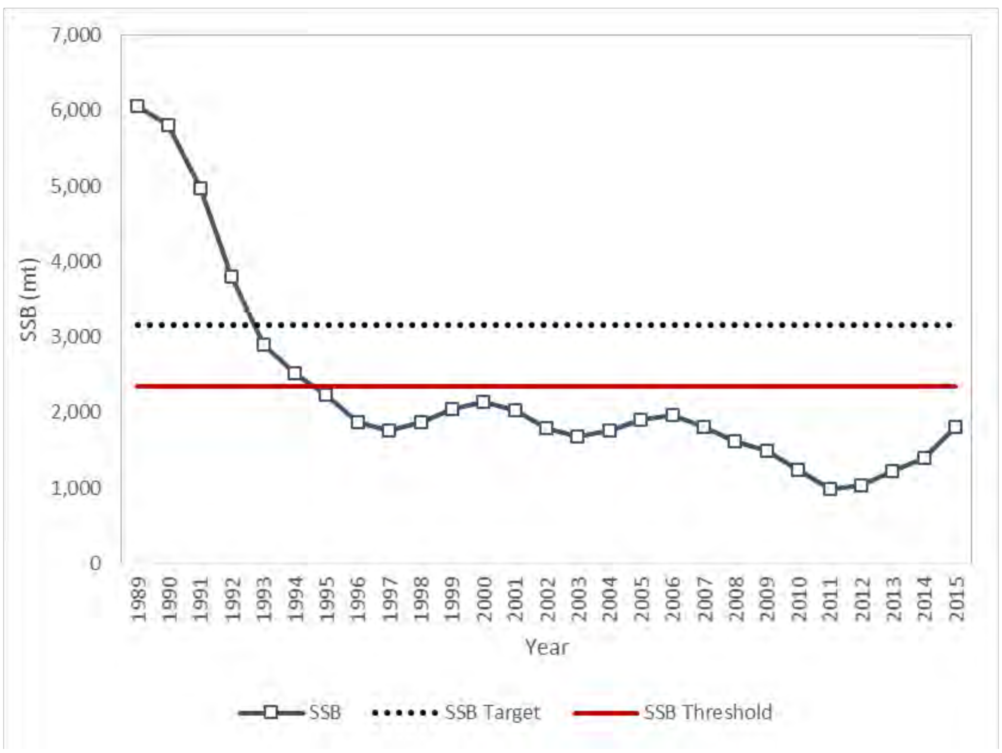
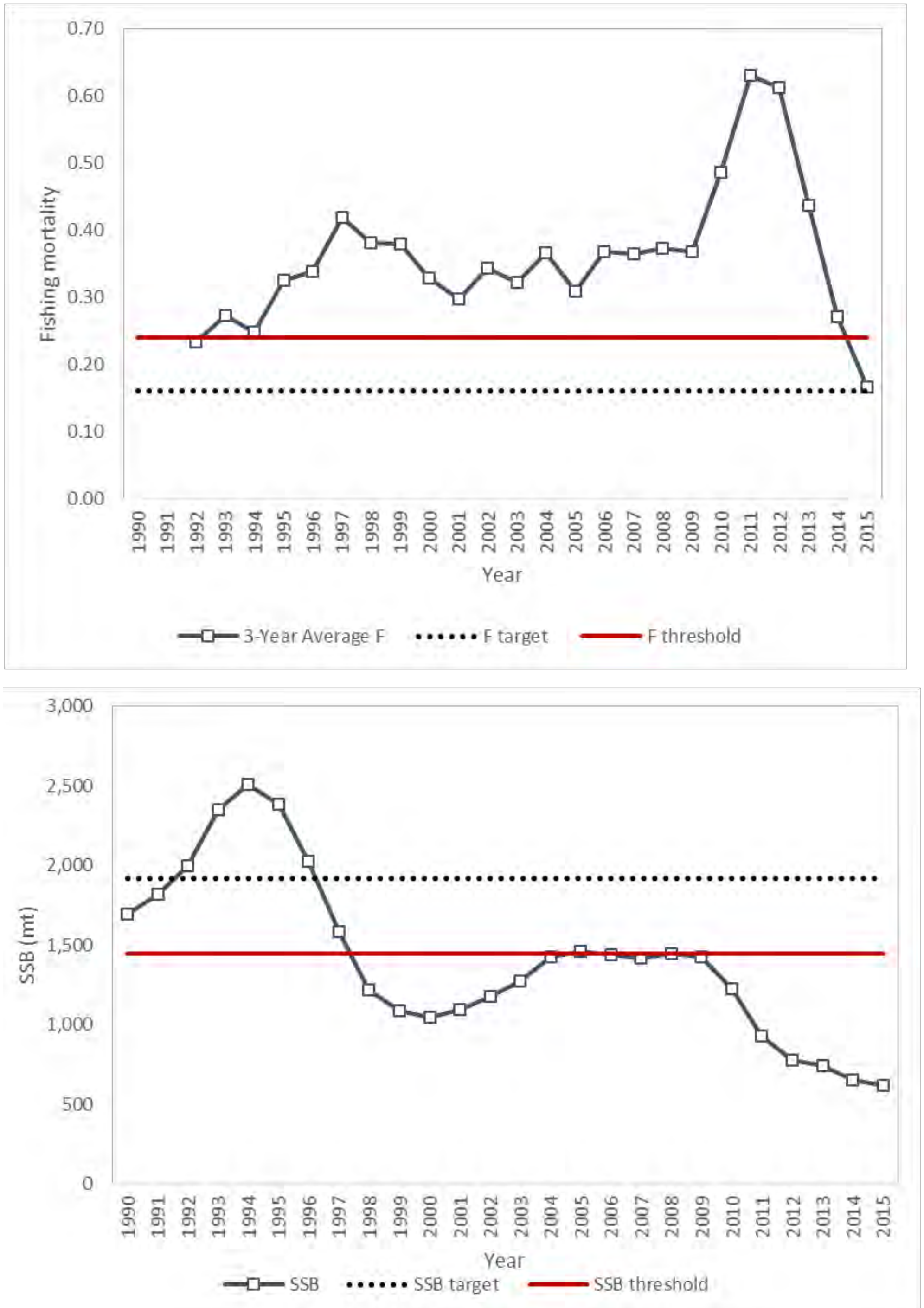


Figure 6.3.1. F (top) and SSB (bottom) plotted with their SPR-based targets and thresholds for the NJ-NYB region.

Figure 6.4.1. F (top) and SSB (bottom) plotted with their SPR-based targets and thresholds for



the DMV region.

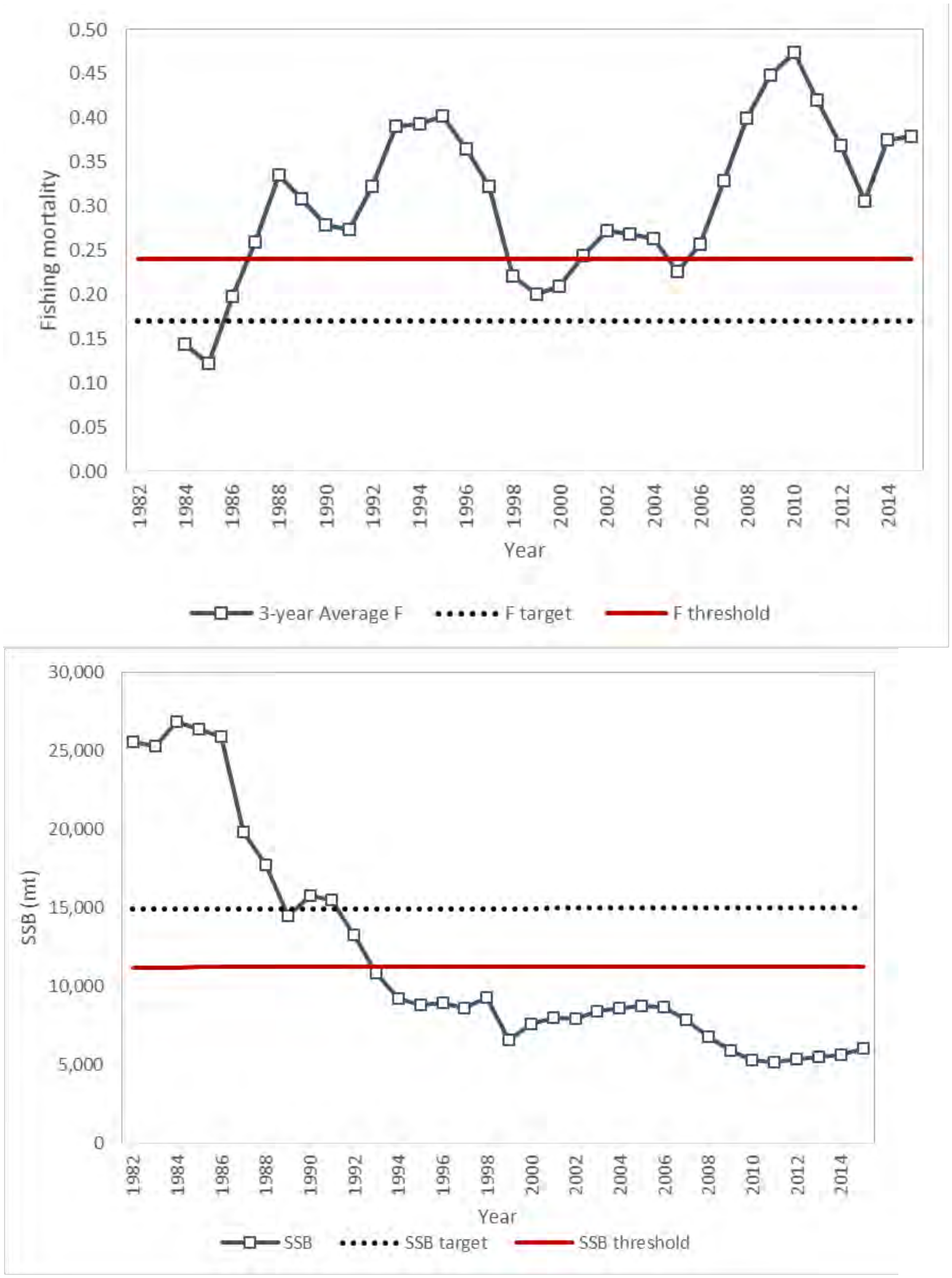


Figure 6.5.1. F (top) and SSB (bottom) plotted with their MSY-based targets and thresholds for the coast.

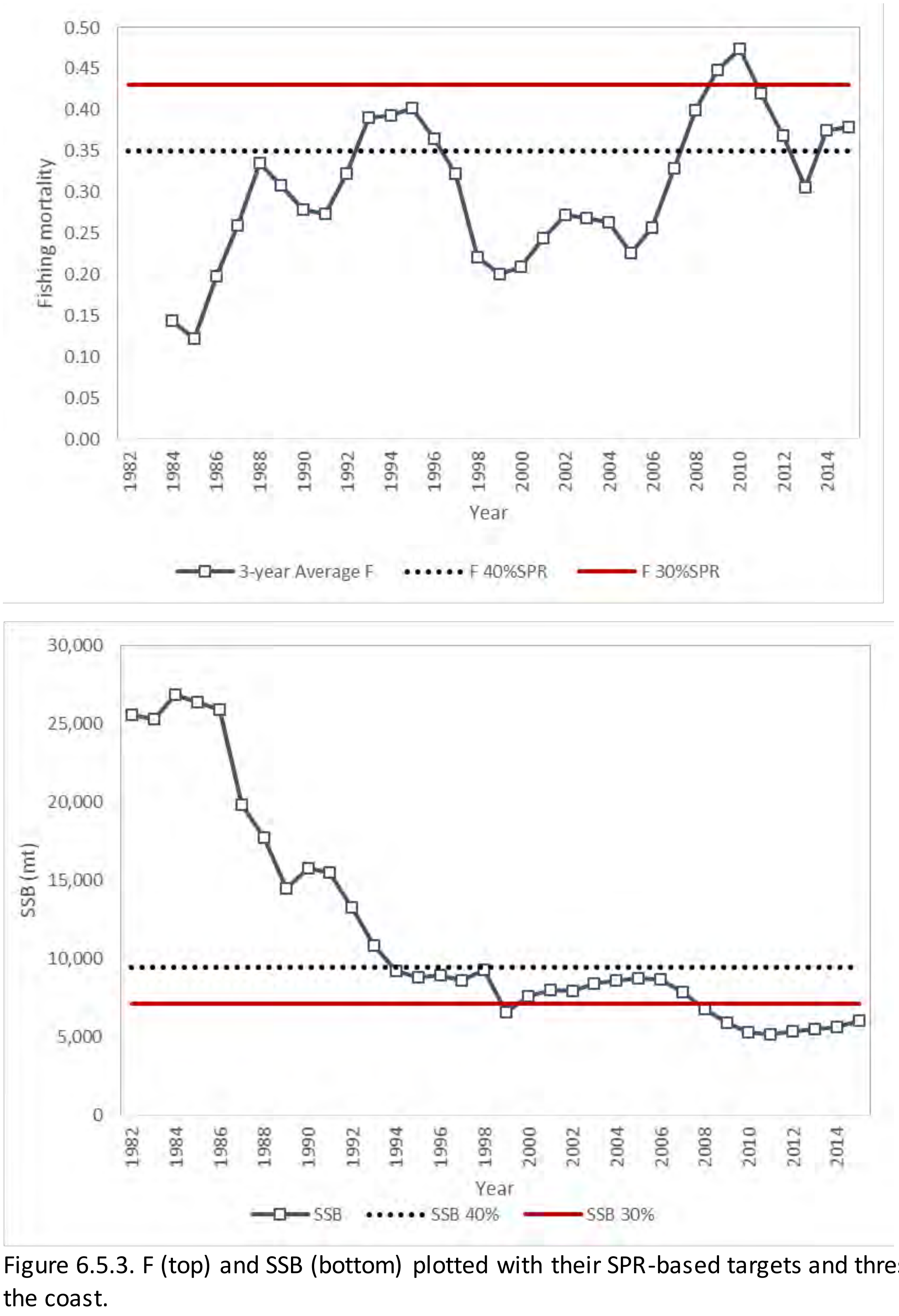


Figure 6.5.3. F (top) and SSB (bottom) plotted with their SPR-based targets and thresholds for the coast.

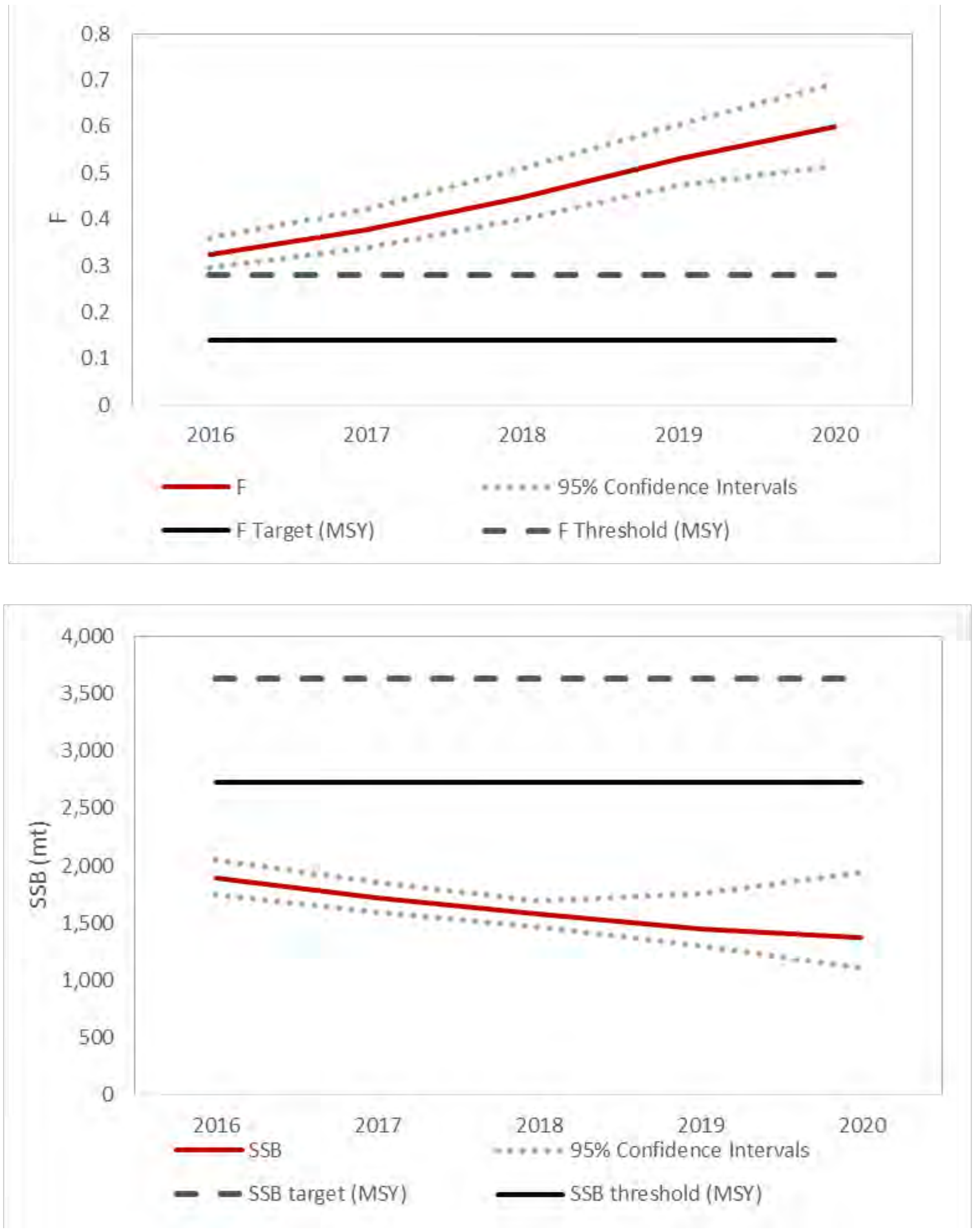
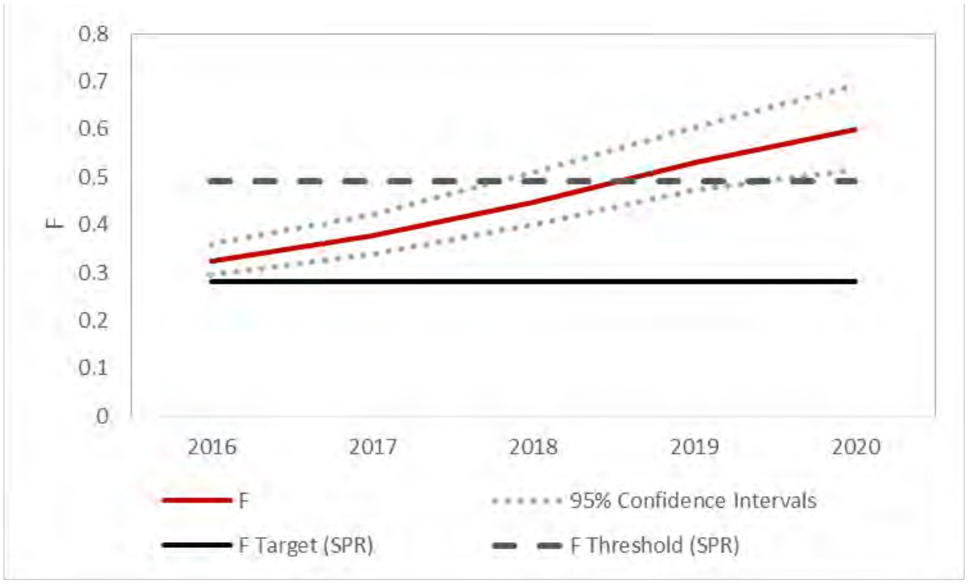


Figure 7.1.1. Short-term projection results for F (top) and SSB (bottom) under status quo landings for the MARI region relative to MSY reference points.



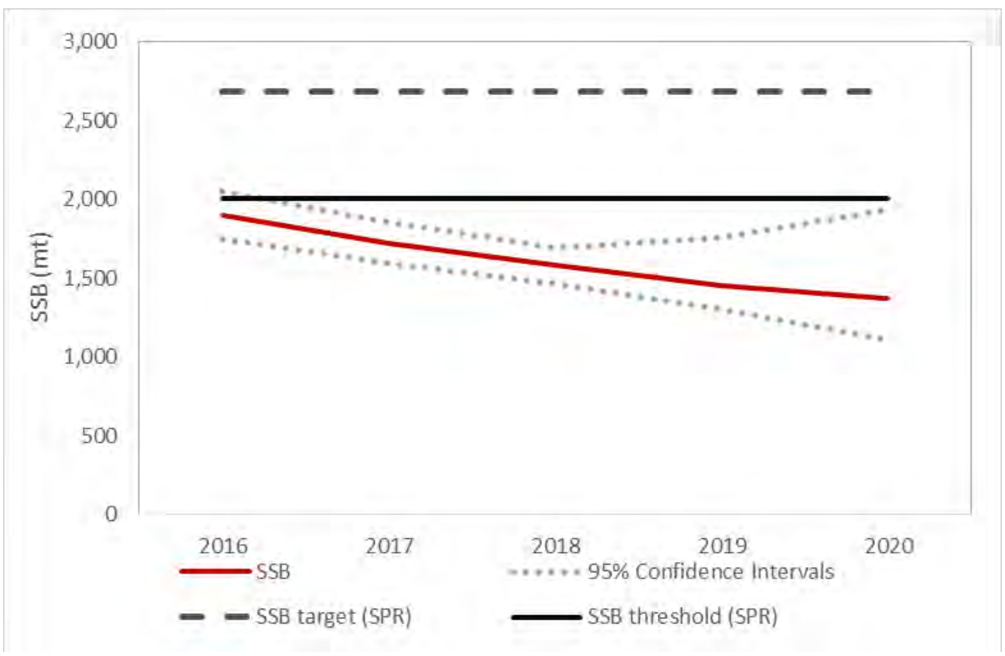
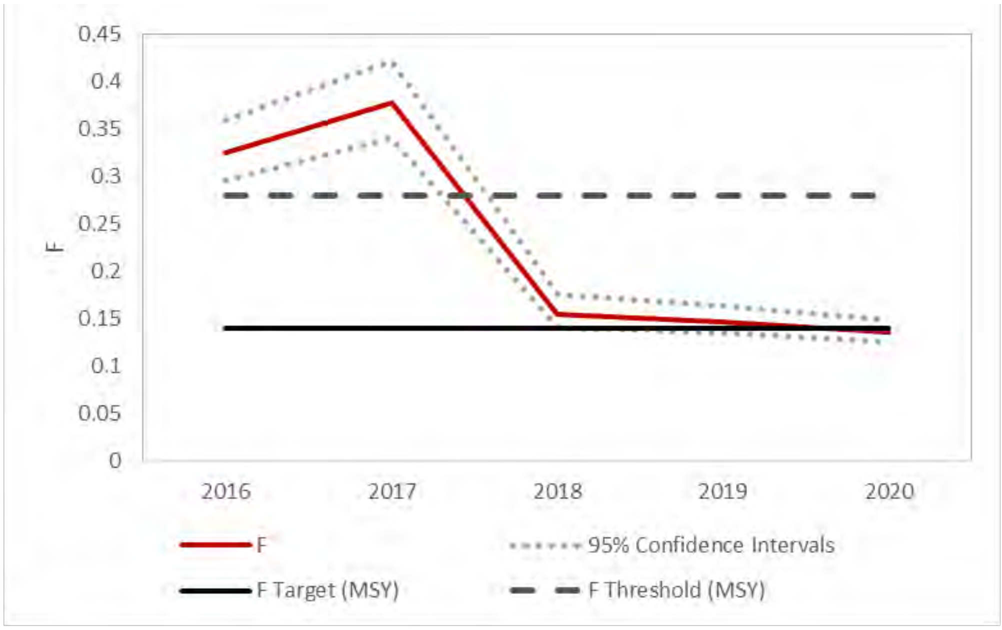


Figure 7.1.2. Short-term projection results for F (top) and SSB (bottom) under status quo landings for the MARI region relative to SPR reference points.



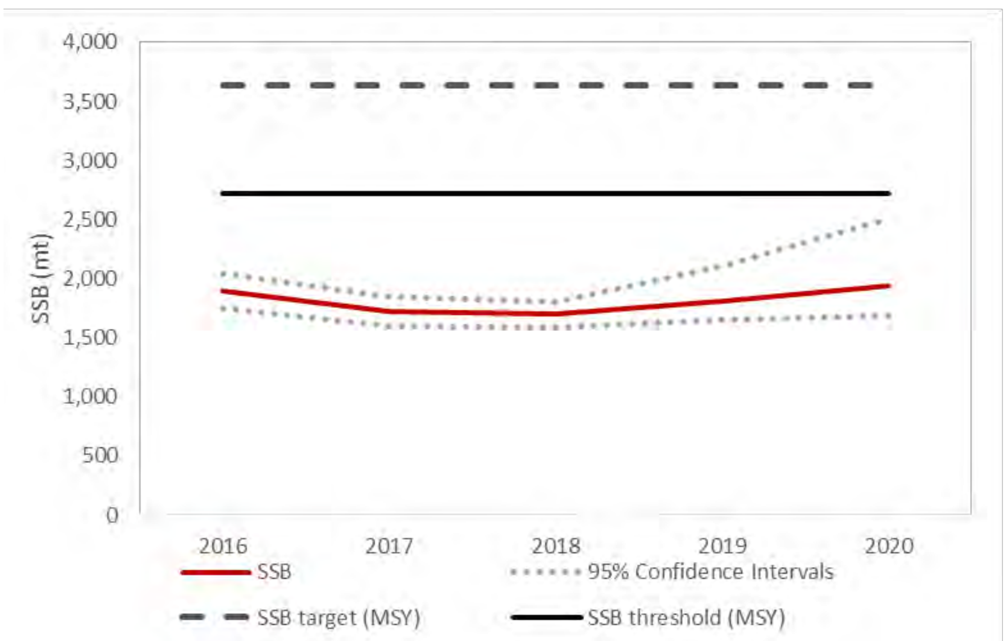
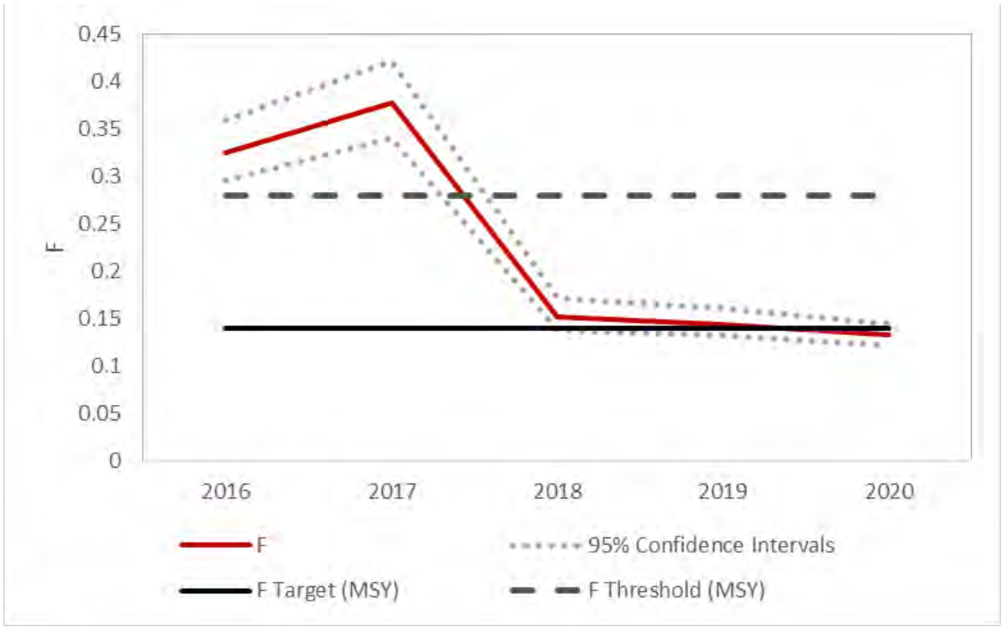
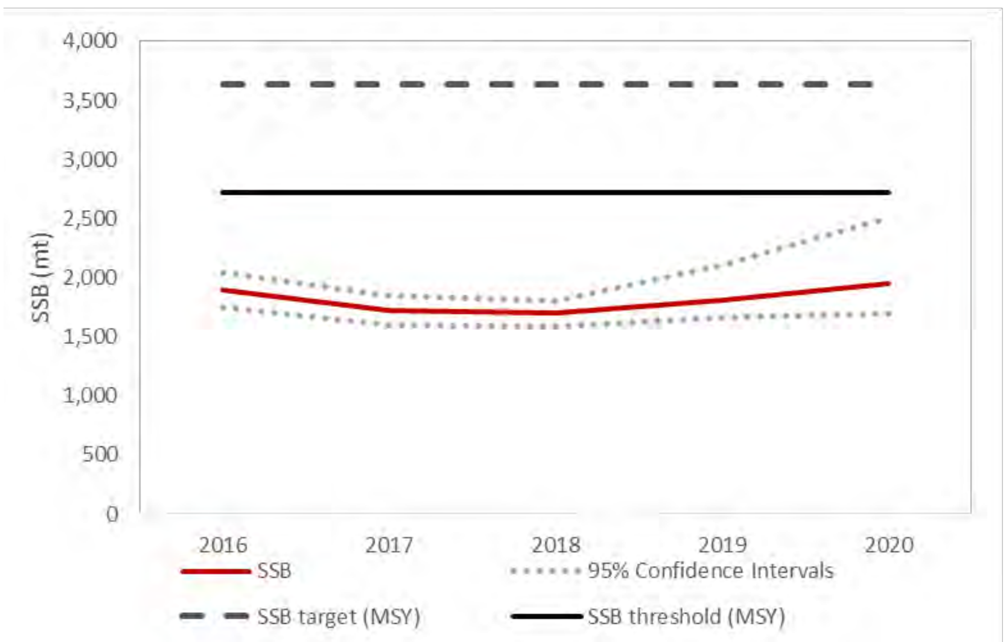


Figure 7.1.3. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the MARI region using MSY reference points.

Figure 7.1.4. Short-term projection results for F (top) and SSB (bottom) with a 70% probability





of achieving F target in 2020 for the MARI region using MSY reference points.

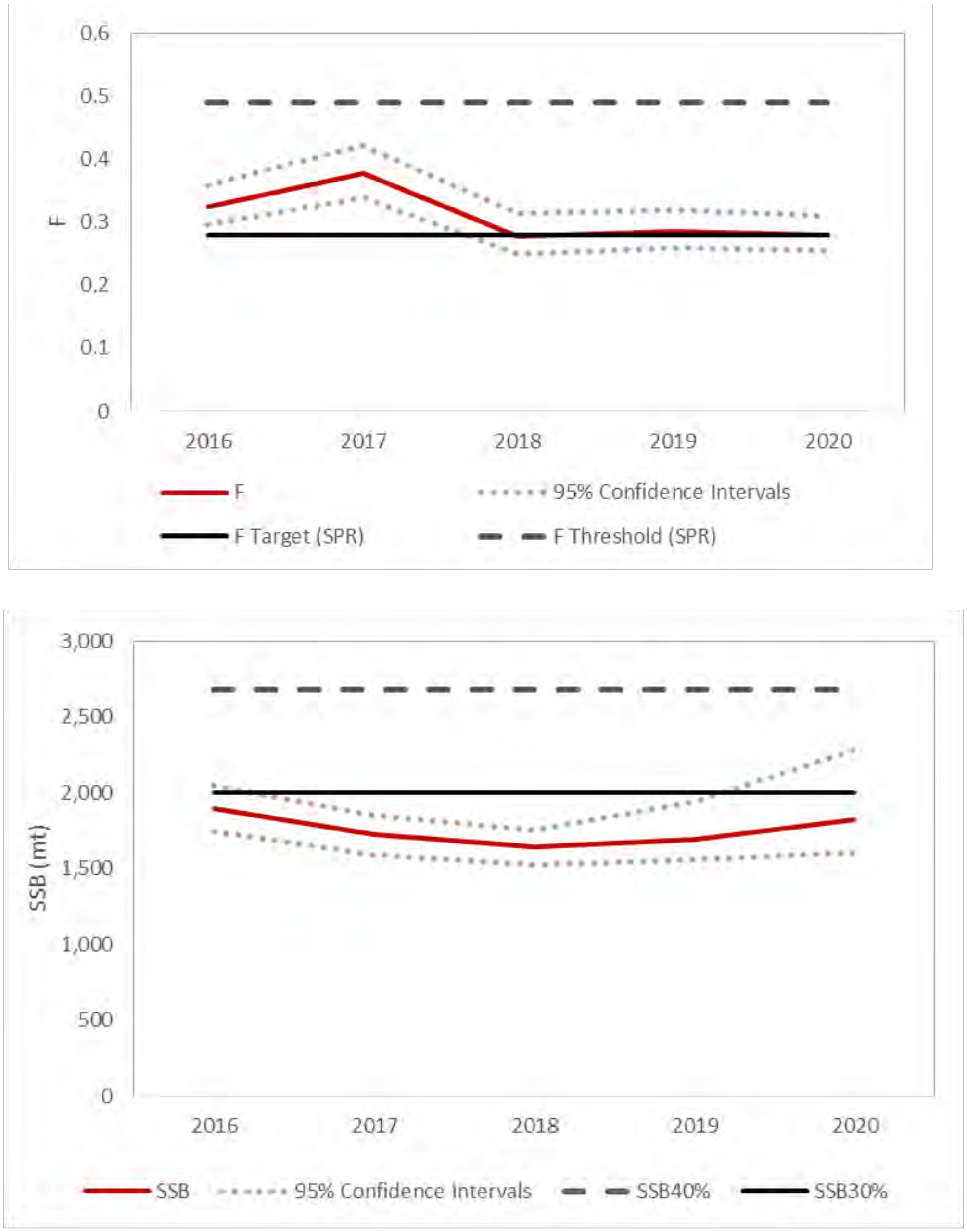
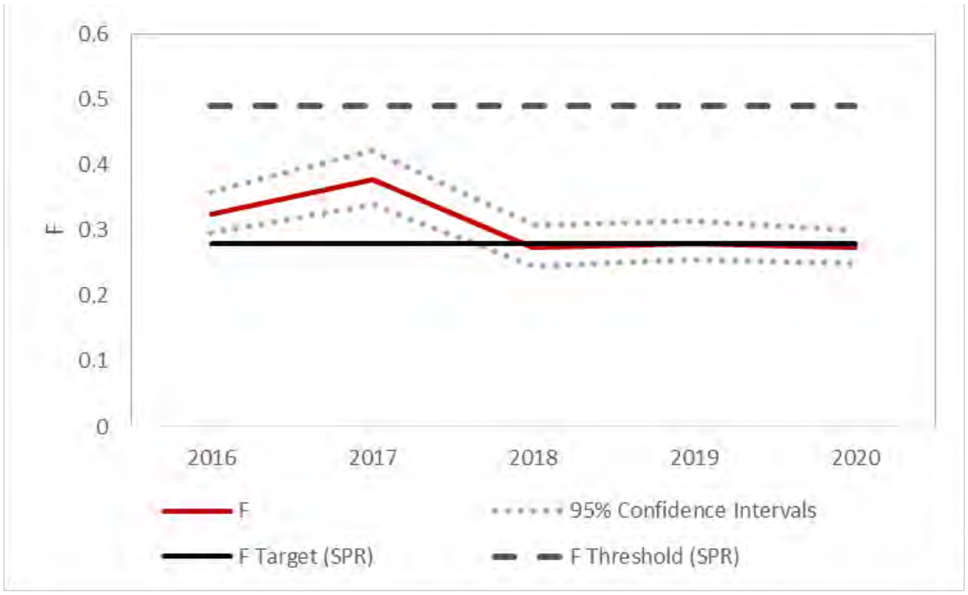


Figure 7.1.5. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the MARI region using SPR reference points.



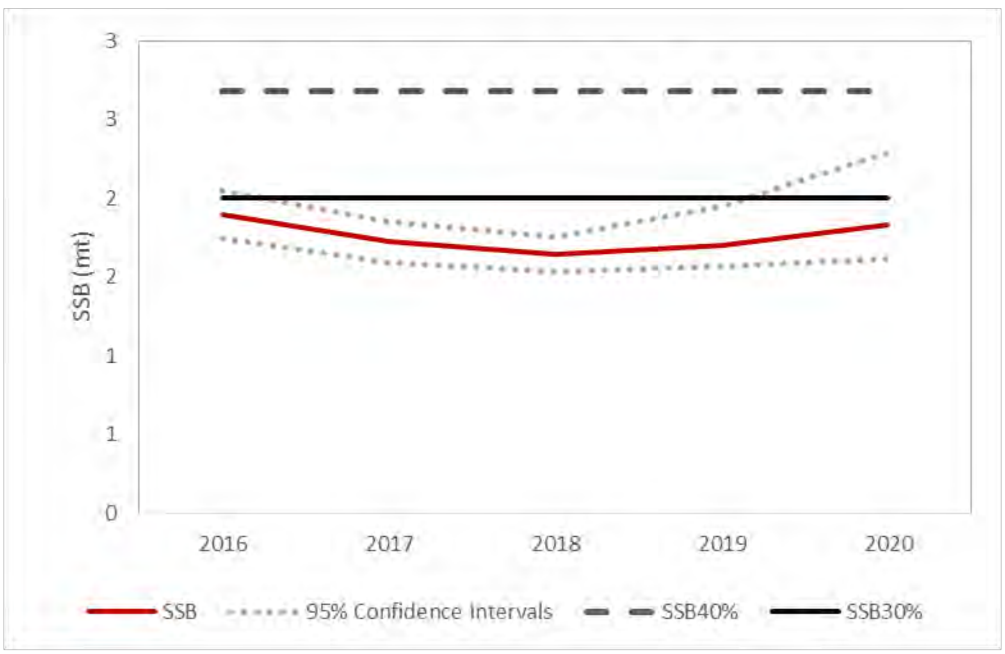


Figure 7.1.6. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the MARI region using SPR reference points.

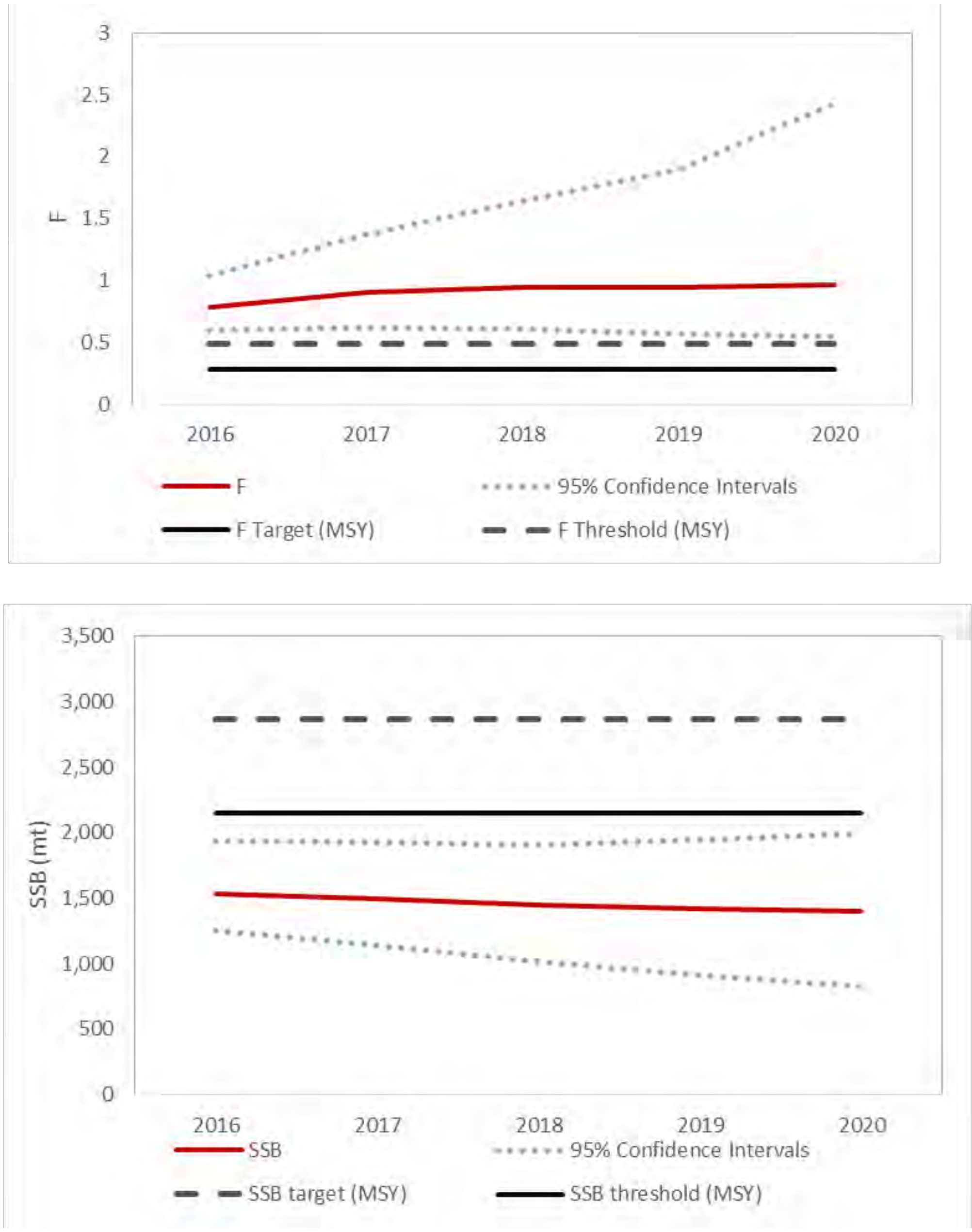
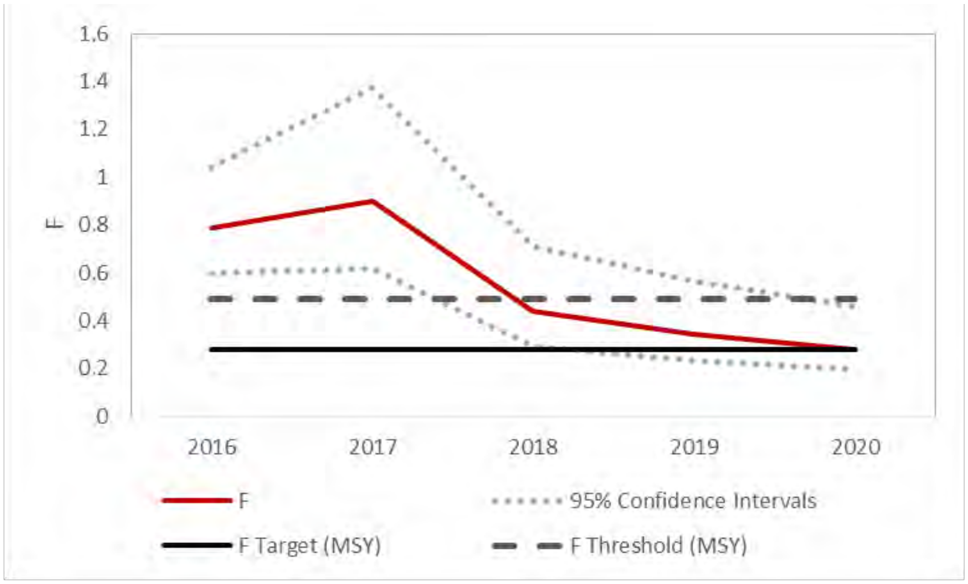


Figure 7.2.1 Short-term projection results for F (top) and SSB (bottom) under status quo landings for the LIS region relative to MSY reference points.



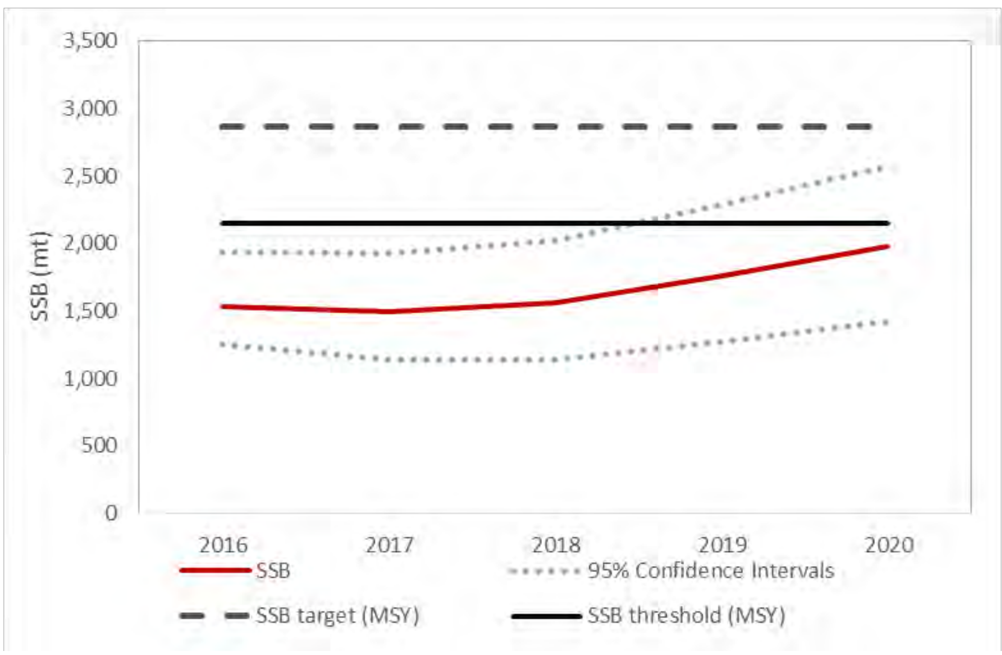
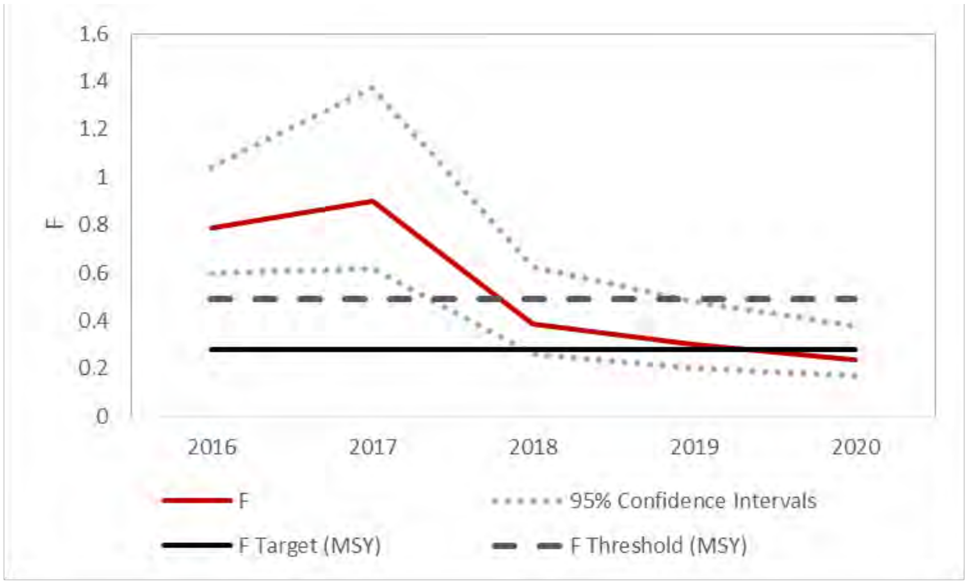


Figure 7.2.2 Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the LIS region using MSY reference points.



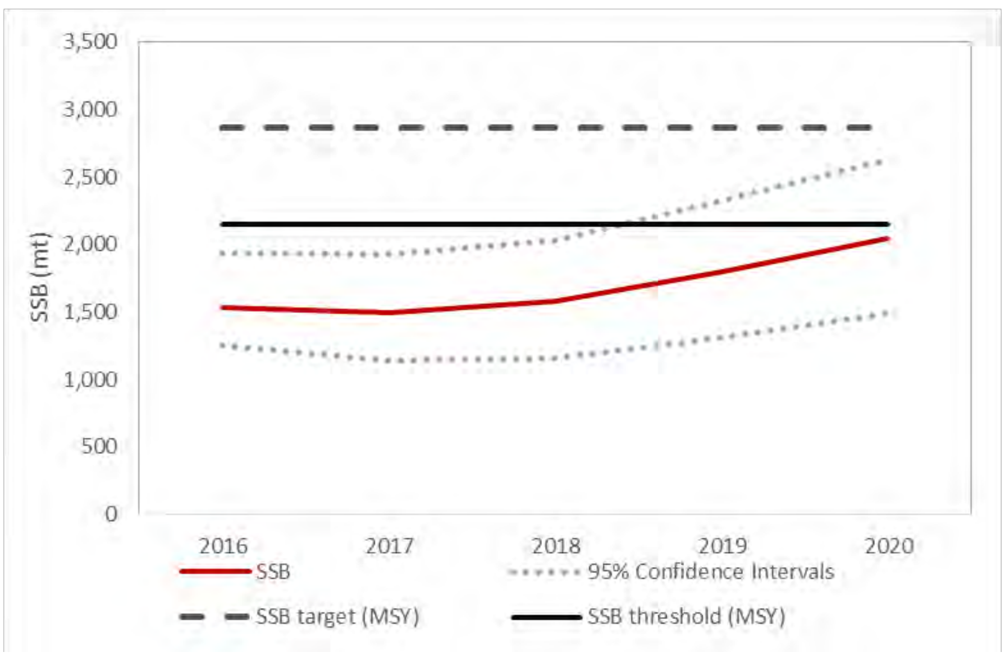


Figure 7.2.3. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the LIS region using MSY reference points.

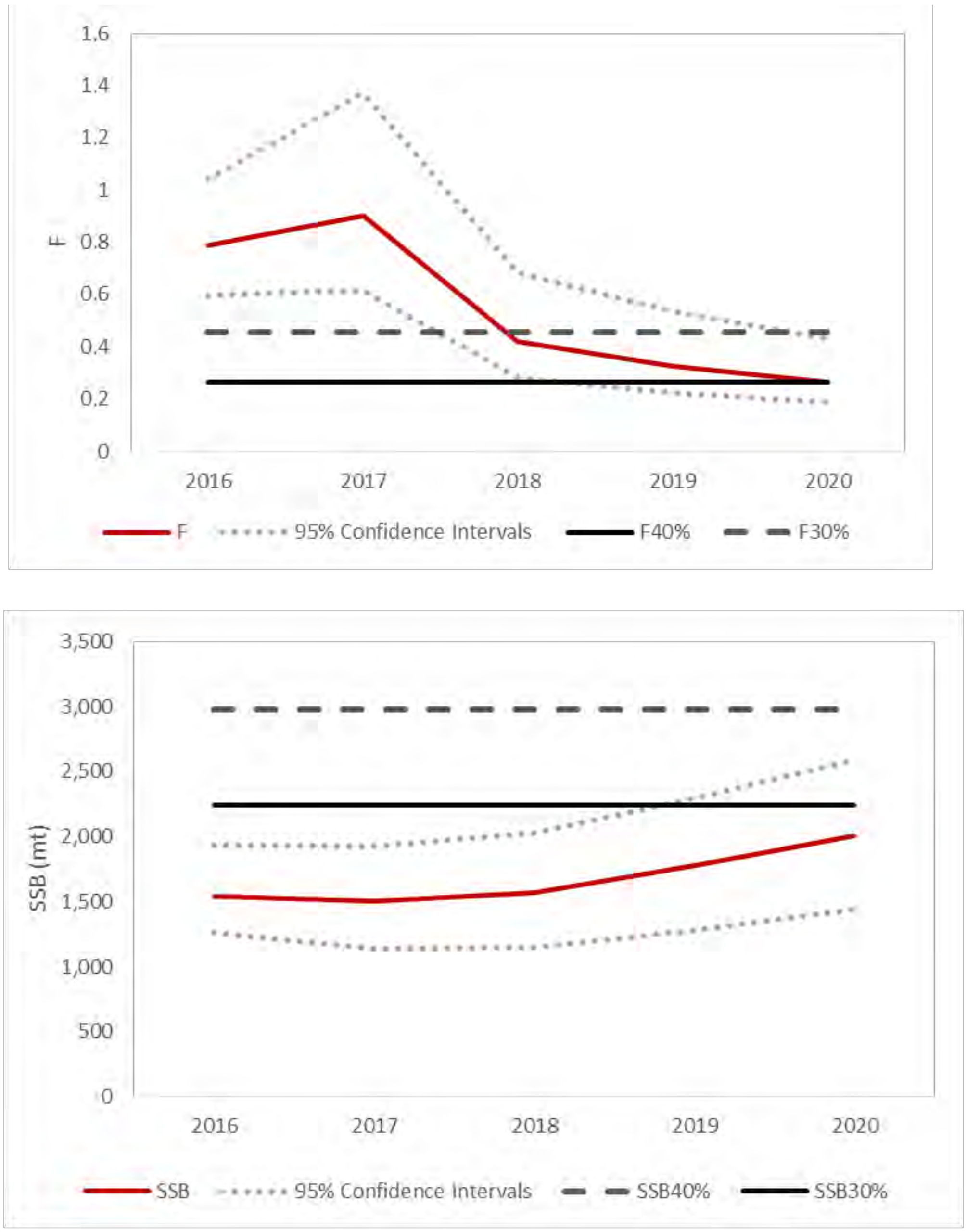
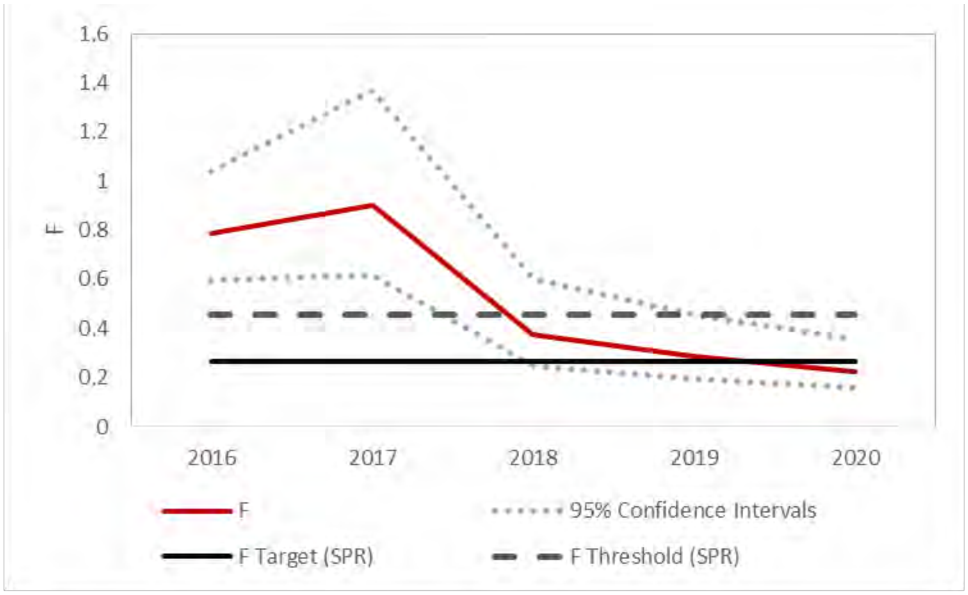


Figure 7.2.4. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the LIS region using SPR reference points.



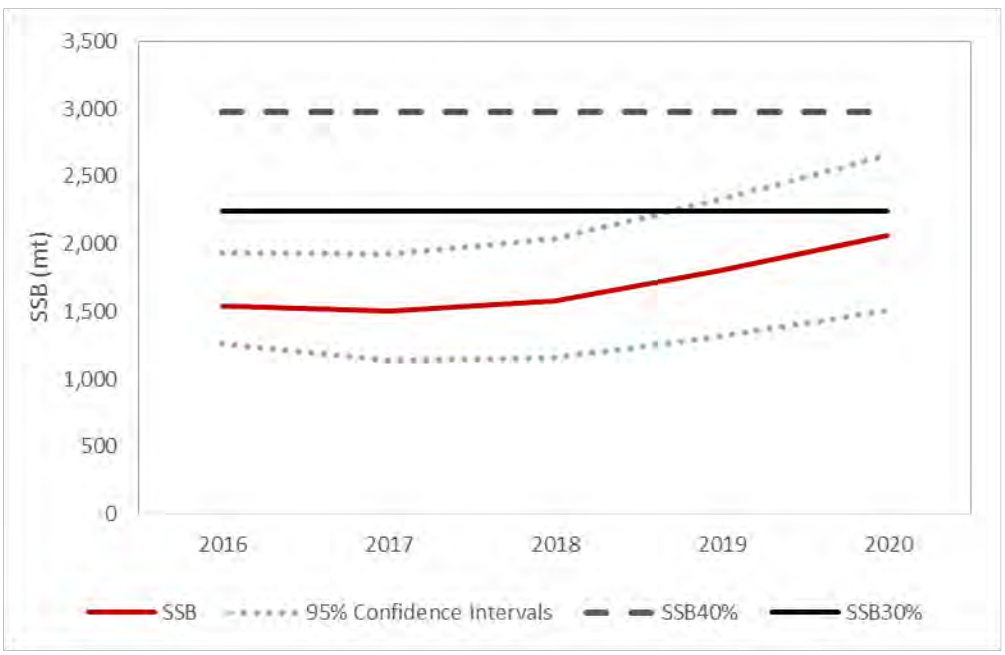


Figure 7.2.5. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the LIS region using SPR reference points.

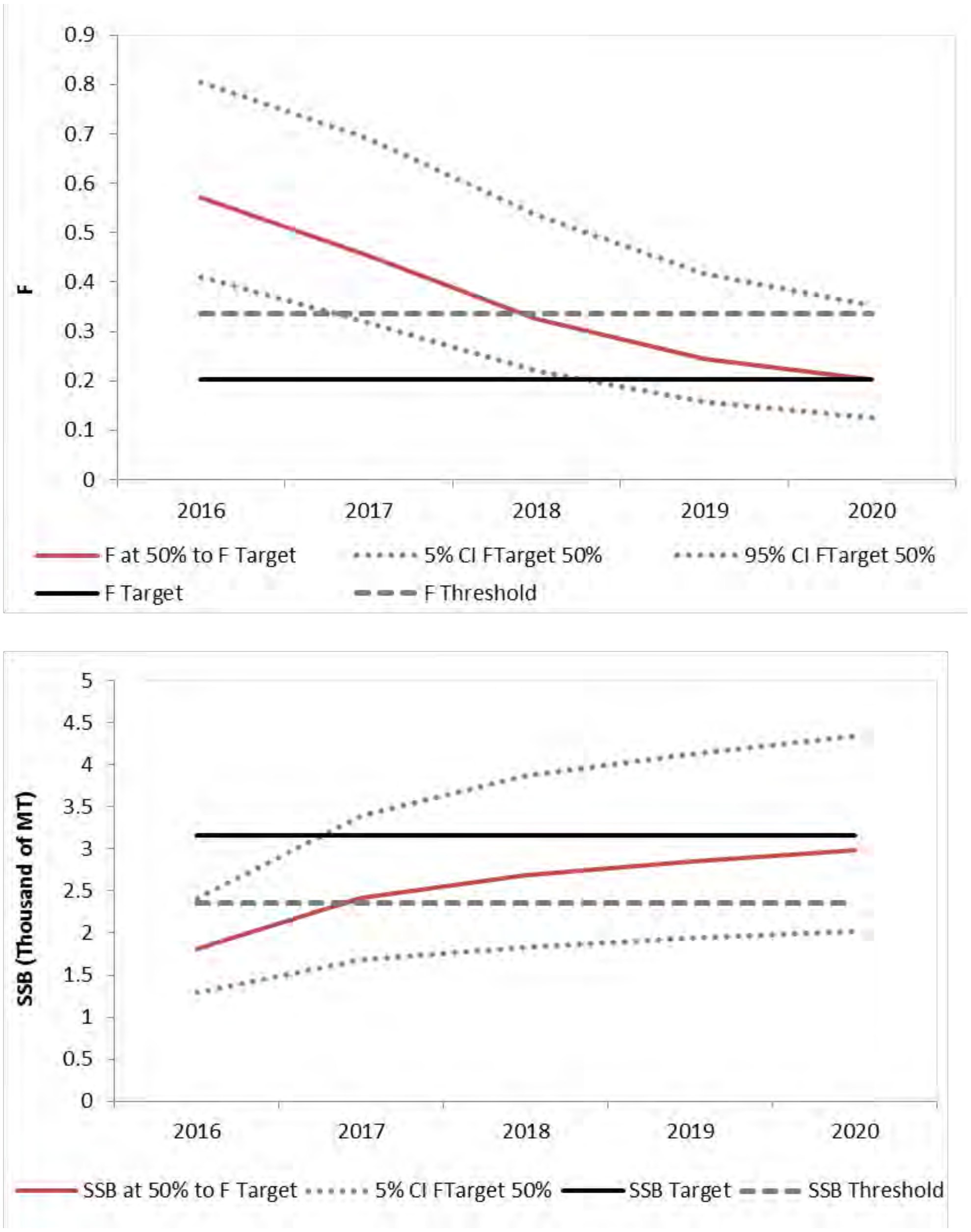


Figure 7.3.1. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the NJ-NYB region.

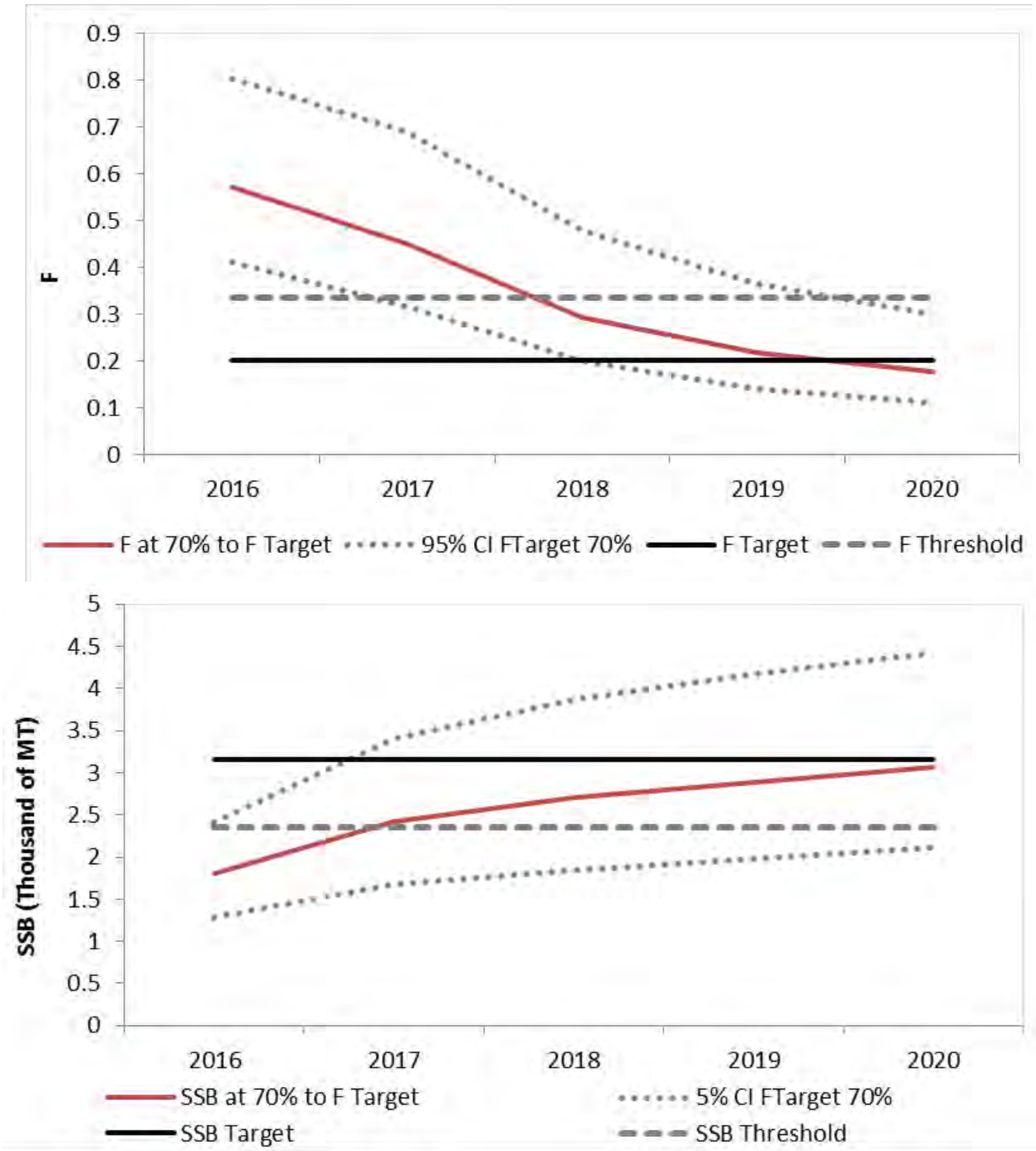


Figure 7.3.2. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the NJ-NYB region.

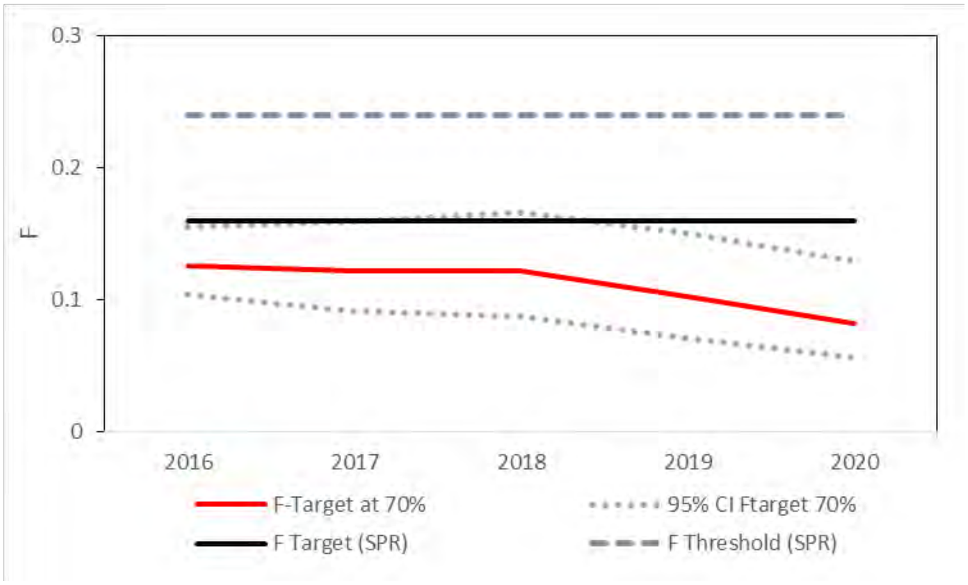
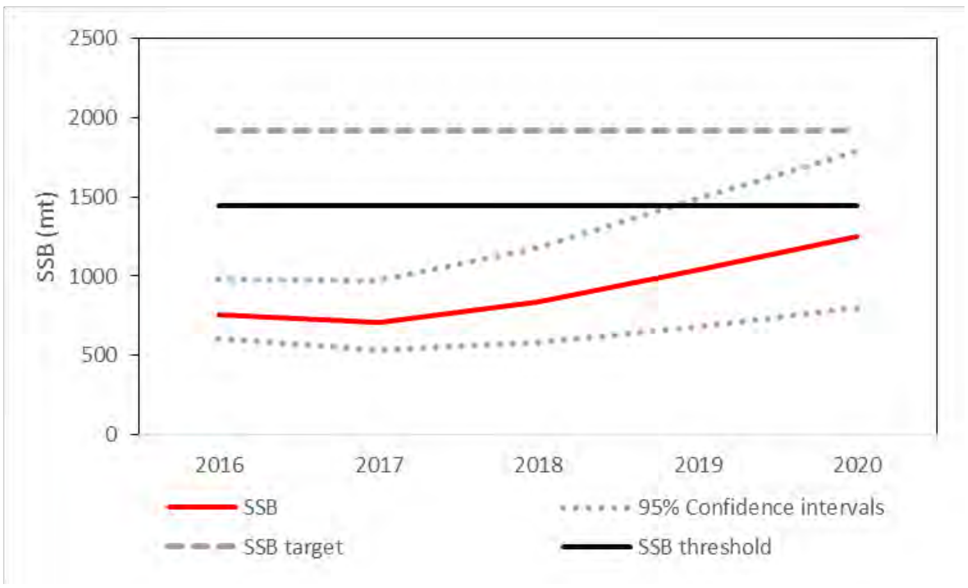
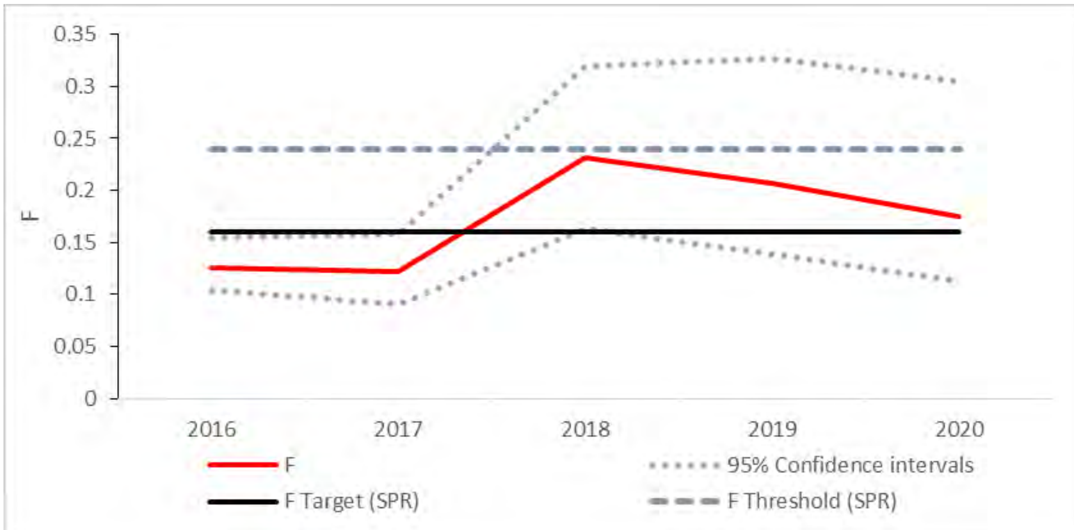


Figure 7.4.1. Short-term projections of F (top) and SSB (bottom) under status quo harvest



scenario for the DMV region.



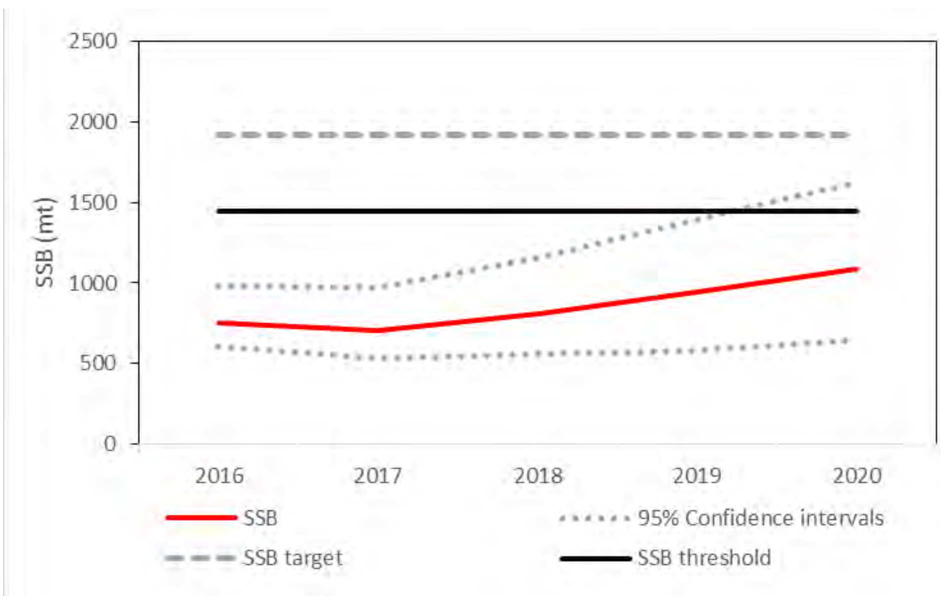
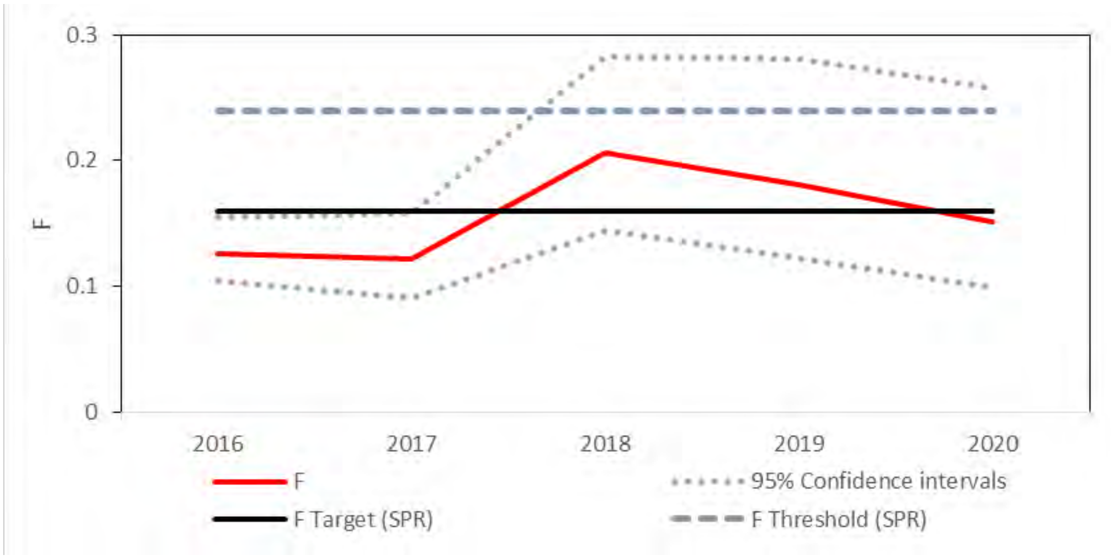


Figure 7.4.2. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the DMV region.



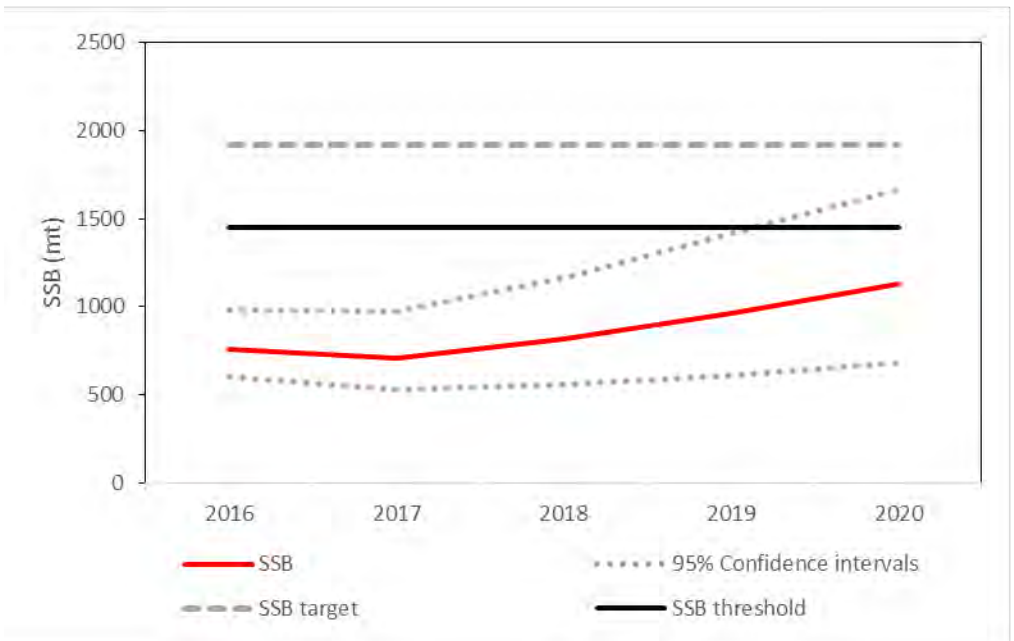
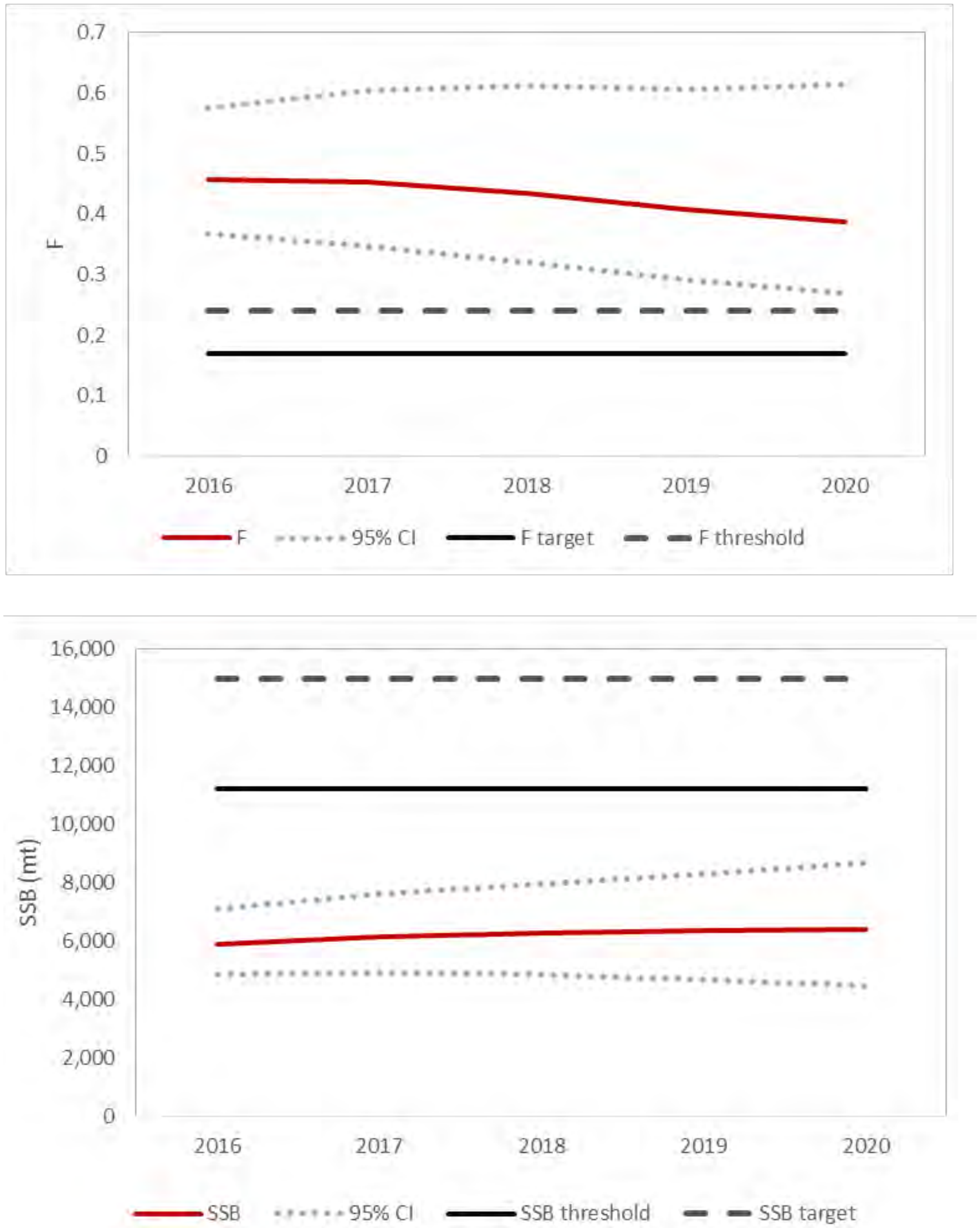
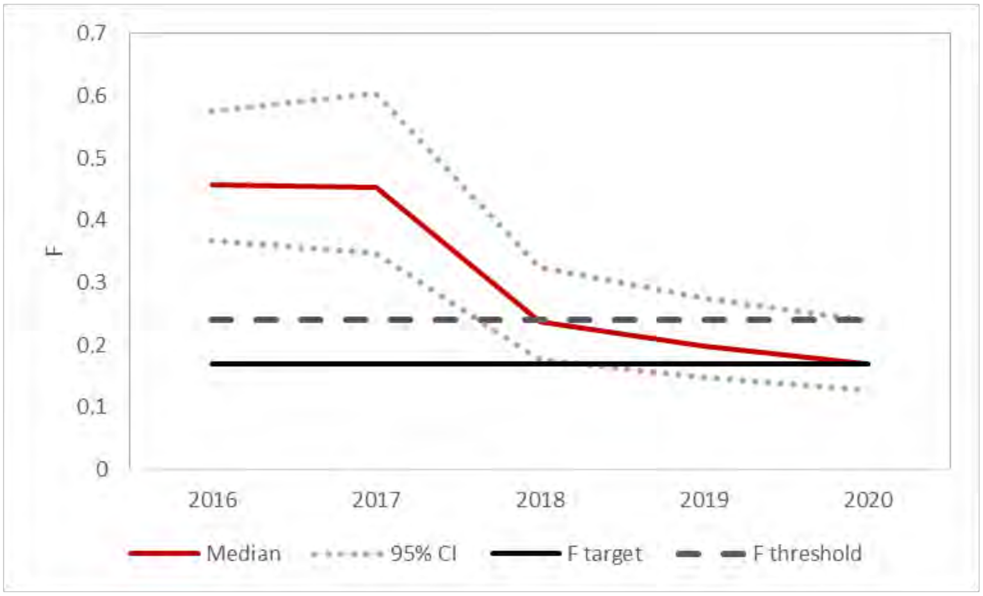
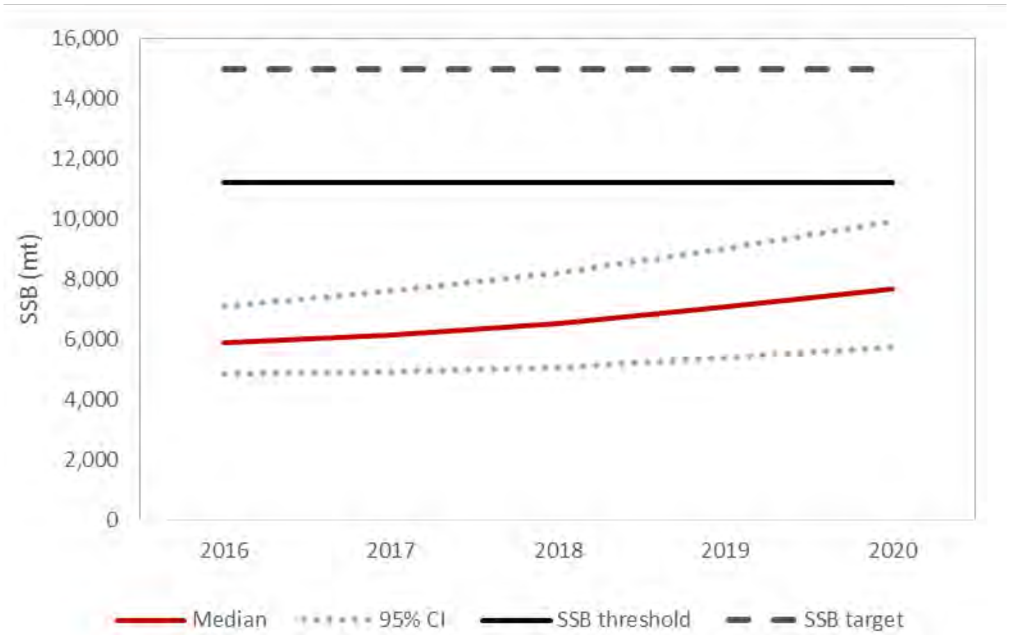


Figure 7.4.3. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the DMV region.



7.5.1. Short-term projection results for F (top) and SSB (bottom) under the status quo harvest scenario for the coast relative to MSY-based reference points.





7.5.2. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the coast using MSY-based reference points.

Coast

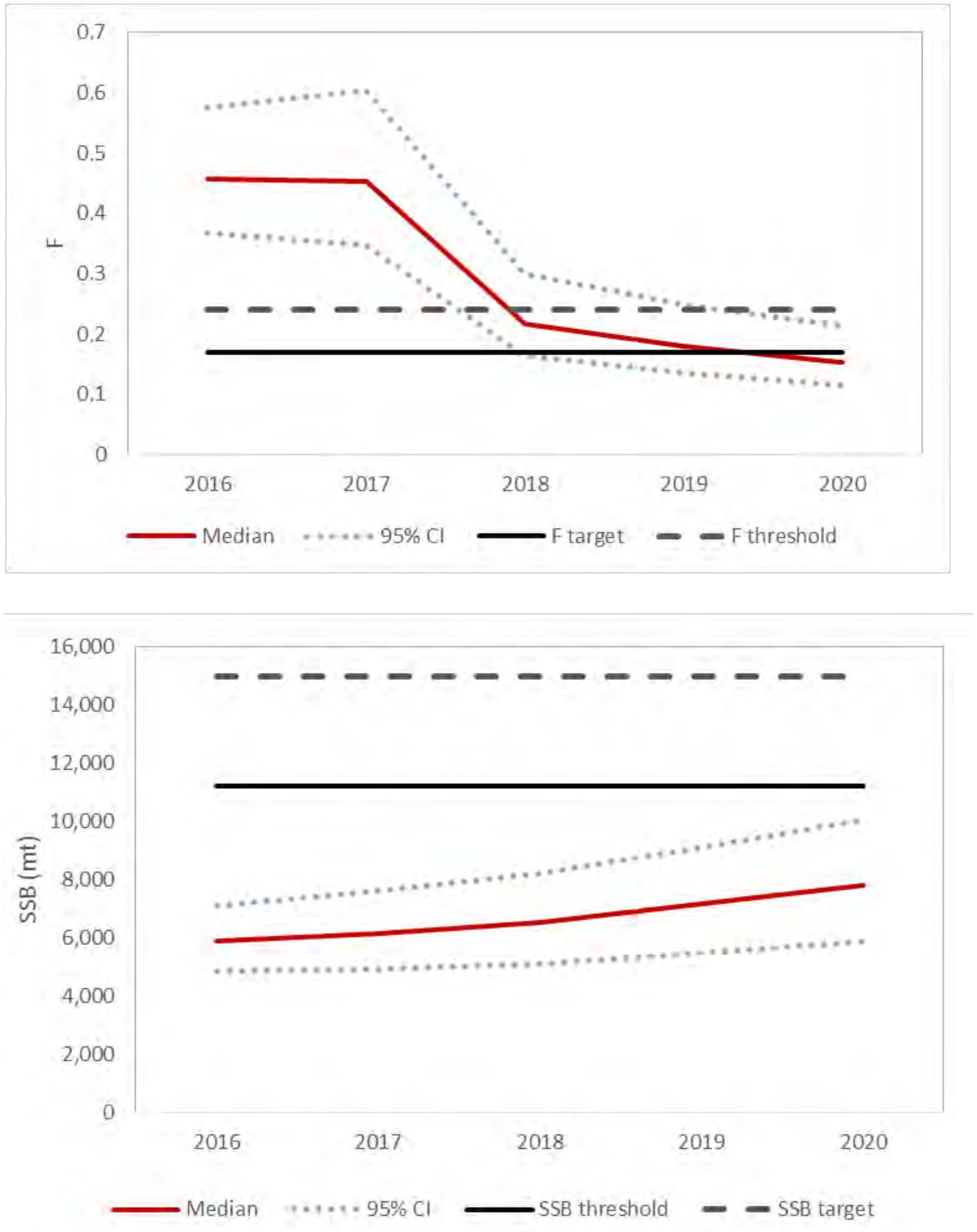
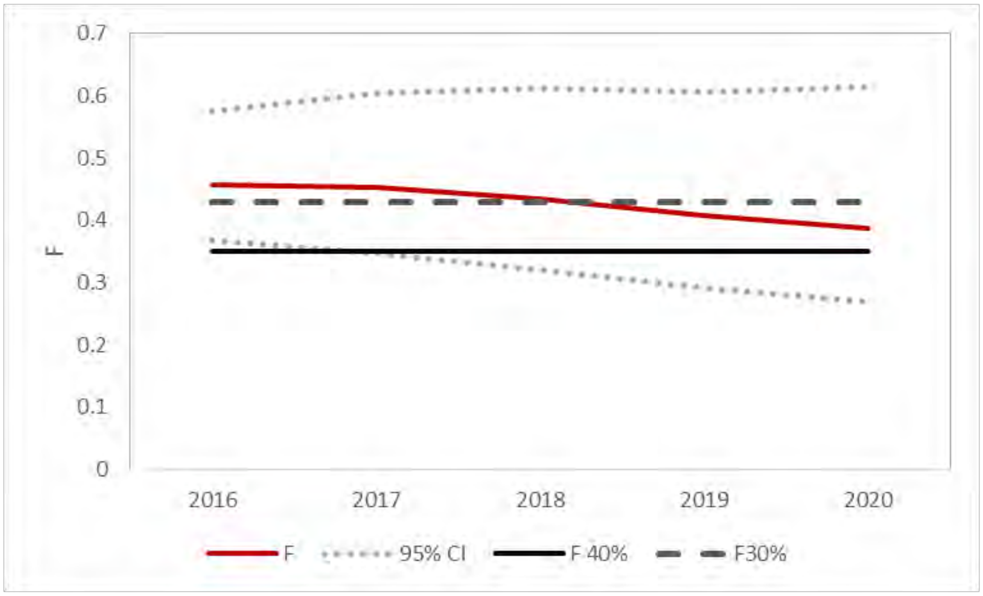


Figure 7.5.3. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the coast using MSY-based reference points.



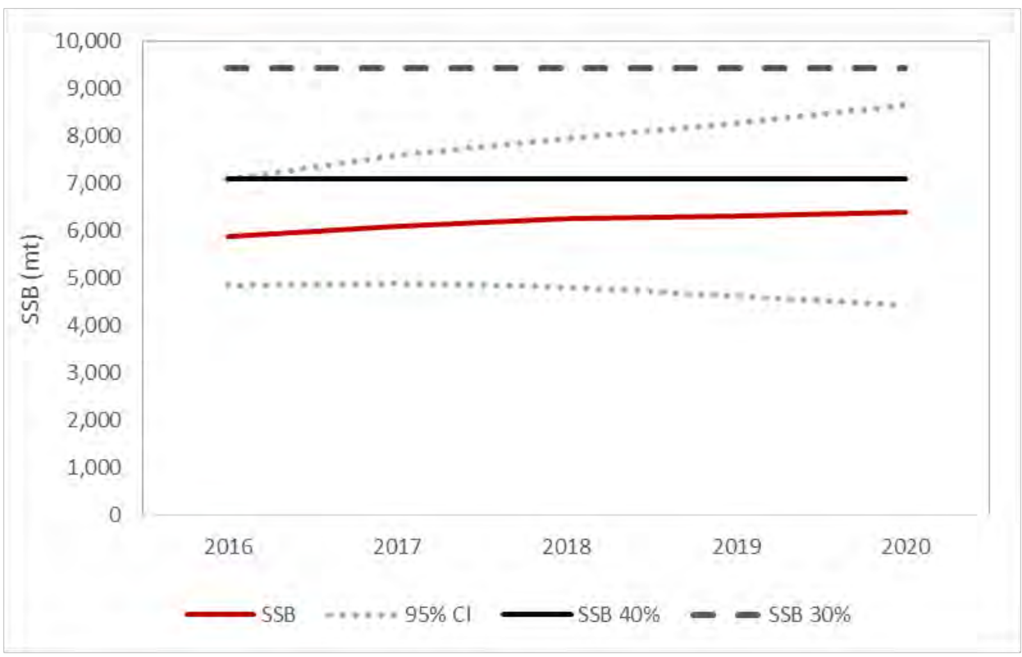
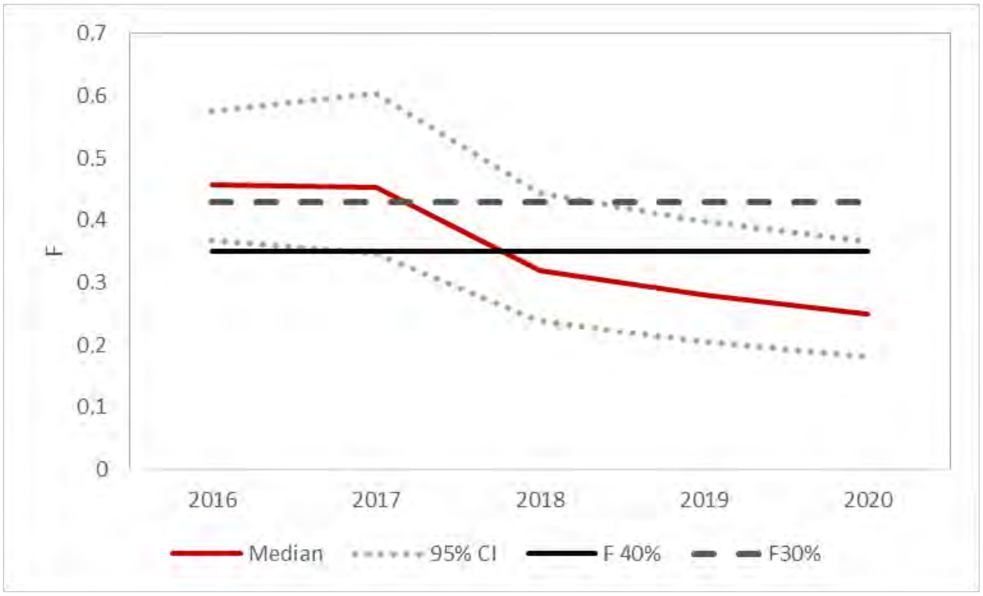


Figure 7.5.4. Short-term projections for F (top) and SSB (bottom) under the status quo harvest scenario for the coast relative to SPR-based reference points.



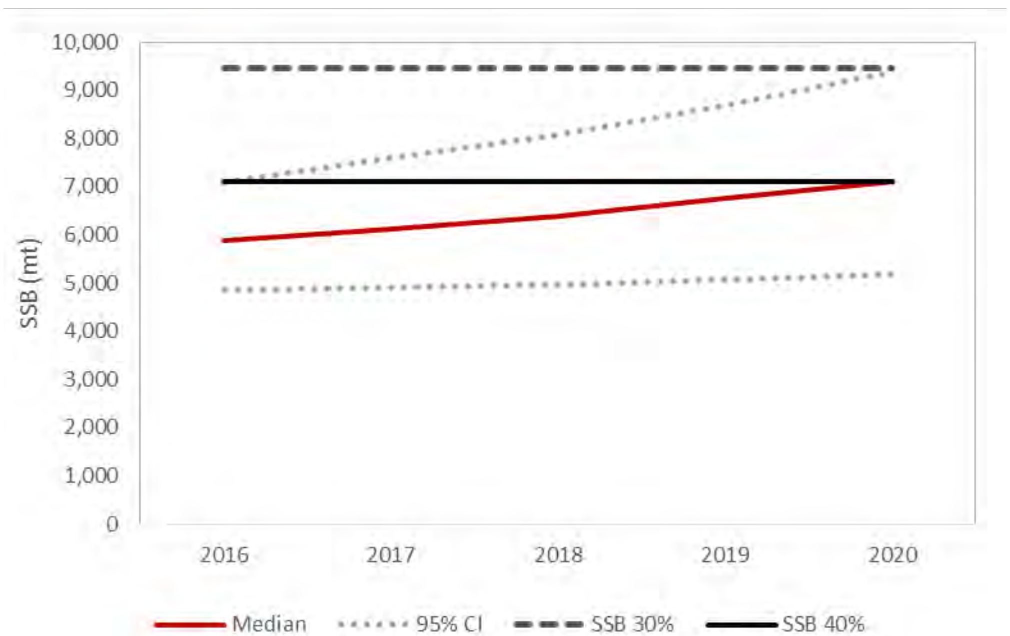
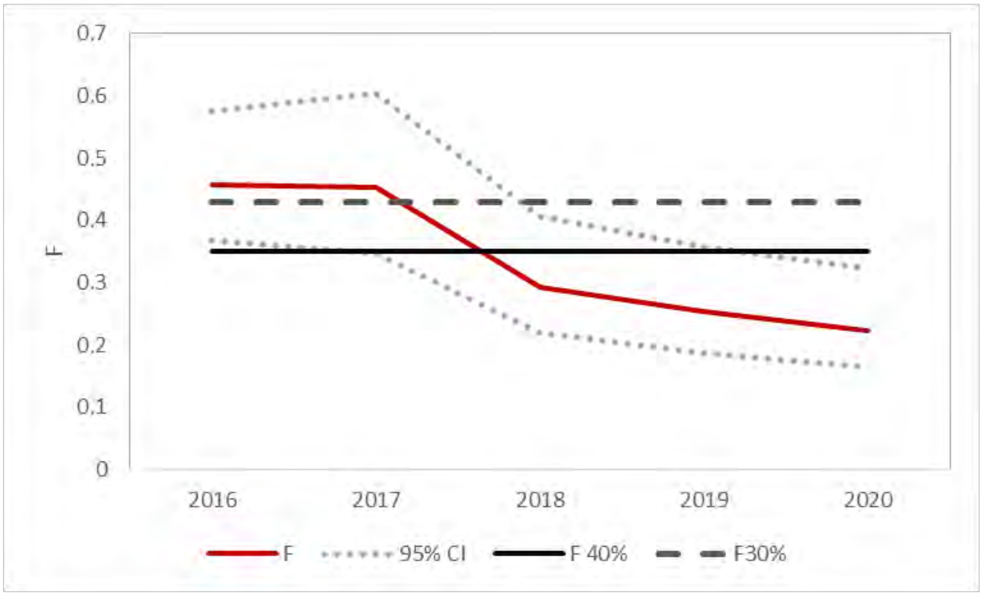


Figure 7.5.5. Short-term projection results for F (top) and SSB (bottom) with a 50% probability of achieving F target in 2020 for the coast using SPR-based reference points.



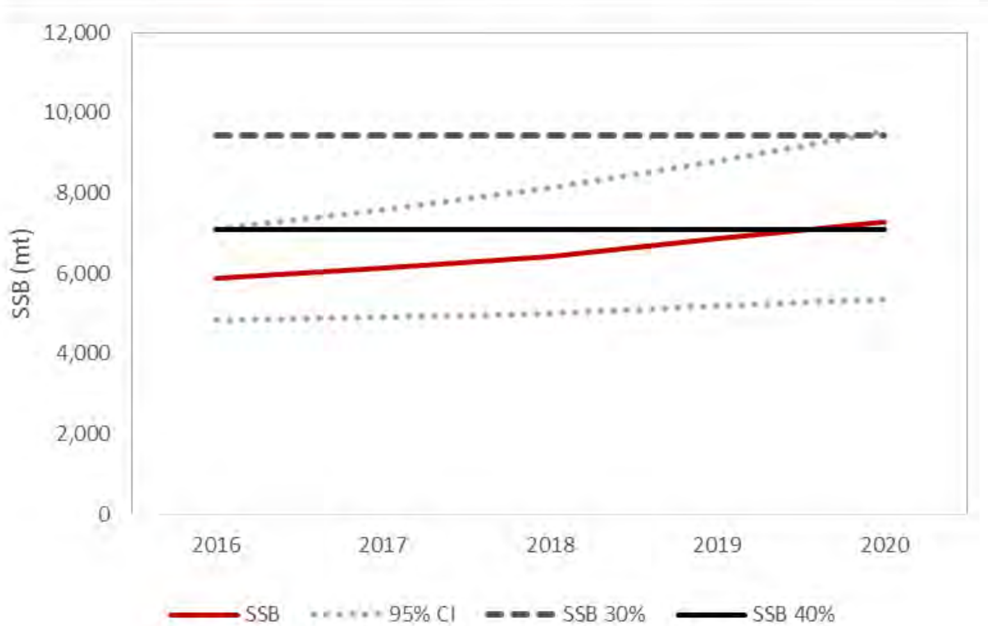


Figure 7.5.6. Short-term projection results for F (top) and SSB (bottom) with a 70% probability of achieving F target in 2020 for the coast using SPR-based reference points.

Atlantic States Marine Fisheries Commission

Summer Flounder, Scup, and Black Sea Bass Management Board

October 25, 2016
3:30 – 4:30 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(M. Luisi)*	3:30 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from February 2016	3:30 p.m.
3.	Public Comment	3:35 p.m.
4.	Review Marine Recreational Information Program Wave 4 Harvest Estimates for Summer Flounder, Scup, and Black Sea Bass (if available) (*K. Rootes-Murdy*)	3:45 p.m.
5.	Consider Management Approaches for 2017 Summer Flounder and Black Sea Bass Recreational Fisheries **Possible Action** • Summer Flounder Working Group Report (*K. Rootes-Murdy*)	3:55 p.m.
6.	Update on Stock Assessment Progress for Black Sea Bass (*K. Rootes-Murdy)*	4:20 p.m.
7.	Consider 2016 FMP Reviews and State Compliance (*K. Rootes-Murdy*) **Action** • Summer Flounder • Scup • Black Sea Bass	4:25 p.m.
8.	Other Business/Adjourn	4:30 p.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

MEETING OVERVIEW

Summer Flounder, Scup, and Black Sea Bass Management Board Meeting
Tuesday October 25, 2016
3:30-4:30 p.m.
Bar Harbor, Maine

Chair: Mike Luisi (MD) Assumed Chairmanship: 10/15	Technical Committee Chair: Greg Wojcik (CT)	Law Enforcement Committee Representative: Snellbaker (NJ)
Vice Chair: Bob Ballou	Advisory Panel Chair: Vacant	Previous Board Meeting: February 2, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, PRFC, VA, NC, NMFS, USFWS (14 votes for Black Sea Bass; 12 votes for Summer Flounder and Scup)		

2. Board Consent
- Approval of Agenda
- Approval of Proceedings from February 2, 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Review Marine Recreational Information Program Wave 4 Harvest Estimates for Summer Flounder, Scup, and Black Sea Bass (3:45-3:55 p.m.)
Background • Wave 4 harvest estimates should be posted by October 15, 2016.
Presentations • Presentation of wave 3 and 4 MRIP harvest estimates for summer flounder, scup, and black sea bass by K. Rootes-Murdy (if available)
Board Actions for Consideration • None

5. Consider Management Approaches for 2017 Summer Flounder and Black Sea Bass Recreational Fisheries (3:55-4:20 p.m.) Possible Action
Background • Addendum XXVII (2016) specified regional management program for the summer flounder recreational fishery in 2016 only, and the continuation of ad-hoc regional management for the black sea bas fishery in 2016 with the option to extend in 2017 by Board action. (**Briefing Materials**) • Based on the results of the 2016 Stock Assessment Update for Summer Flounder, the Board voted in August to reduce the coastwide recreational harvest limit in 2017, an approximate 30% decrease from 2016. The states will likely need to adjust current recreational management measures in 2017 to achieve the harvest limit reduction. • A Summer Flounder Working Group will meet in October 2016 to discuss approaches for recreational management in 2017. (**Supplemental Materials**) • The Black Sea Bass Benchmark Stock Assessment is scheduled to be completed and peer-reviewed by early December 2016. The results of stock assessment is scheduled to be presented to the Board and Council in February 2017.
Presentations • Review of Summer Flounder and Black Sea Bass Recreational Management options for 2017 by K. Rootes-Murdy
Board Actions for Consideration • Initiation of an addendum for the Summer Flounder recreational fishery for 2017 and later to continue regional management or alternative approaches. • Initiation of an addendum for the Black Sea Bass recreational fishery if neither the continuation of ad hoc regional management approaches nor coastwide management measures are preferred.

6. Update on Stock Assessment Progress for Black Sea Bass (4:20-4:25 p.m.)
Background • The Black Sea Bass Benchmark Stock Assessment report will be peer-reviewed in December. The Stock Assessment Working Group has explored modeling techniques to address spatial differences in abundance and distribution. • The Mid-Atlantic Fishery Management Council's Scientific and Statistical Committee is scheduled to consider the assessment report and peer review report in January 2017. • The Council and Commission will review the assessment, peer review report, and SSC recommendation at the MAFMC's meeting in February 2017.
Presentations • Update on Stock Assessment Progress for Black Sea Bass by K. Rootes-Murdy
Board Actions for Consideration • None

7. Consider 2016 FMP Reviews and State Compliance (4:25-4:30 p.m.)
Background • Summer Flounder, Scup, and Black Sea Bass Compliance Reports are due June 1. • The Plan Review Team reviewed state reports and drafted the annual FMP Review. (**Supplemental Materials**). • Based on preliminary landings data, the black sea bass coastwide quota was exceed in 2015. Once final landings are available in fall 2016, staff will work with federal, state, and Council partners to determine the needed reduction for 2017. • Delaware has requested *de minimis* status for summer flounder and scup.
Presentations • Overview of the Summer Flounder, Scup, and Black Sea Bass FMP Review Reports by K.Rootes-Murdy
Board Actions for Consideration • Accept 2016 FMP Review and State Compliance Reports • Approve *de minimis* requests from Delaware for summer flounder and scup

9. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

SUMMER FLOUNDER, SCUP AND BLACK SEA BASS MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
February 2, 2016

These minutes are draft and subject to approval by the Summer Flounder, Scup and Black Sea Bass Management Board.
The Board will review the minutes during its next meeting.

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INDEX OF MOTIONS

1. **Approval of agenda** by consent (Page 1).

2. **Approval of proceedings of November 2015** by consent (Page 1).

3. **Move to approve Option 2B, Adaptive Regional Management for summer flounder under Section 3.1 and then Option 1, no extension beyond 2016 under Section 3.1.1** (Page 16). Motion by Brandon Muffley; second by Dave Simpson. Motion carried (Page 20).

4. **Move to approve Option 2, ad hoc regional measures for black sea bass under Section 3.2 and Timeframe Option 2, one year extension through 2017 under Section 3.2.1 in Addendum XXVII** (Page 20). Motion by Dave Simpson; second by Steve Heins. Motion carried (Page 22).

5. **Motion to amend: Move to amend that it be for Option 1, no extension** (Page 20). Motion by Adam Nowalsky; second by Rob O'Reilly. Motion failed (Page 21).

6. **Move to approve Addendum XXVII as modified today** (Page 22). Motion by Bill Adler; second by Dave Simpson. Motion carried (Page 22).

7. **Move to approve the black sea bass proposals and methodologies as presented today; however no state may have more open days in any mode in 2016 than in 2015** (Page 25). Motion by Adam Nowalsky; second by Pat Augustine. Motion fails (1 in favor, 8 opposed, 4 abstentions) (Page 26).

8. **Move to approve the black sea bass proposals and methodologies for use in 2016 management as recommended by the Technical Committee** (Page 27). Motion by Mr. Gibson; second by Steve Heins. Motion carried (11 in favor, 1 opposed) (Page 27).

9. **Move to nominate Bob Ballou as Vice-Chair to the Summer Flounder, Scup, and Black Sea Bass Board** (Page 28). Motion by Steve Heins; second by Dave Simpson. Motion passes unanimously (Page 28).

10. **Motion to adjourn** by consent (Page 28).

ATTENDANCE

Board Members

Terry Stockwell, ME, proxy for P. Keliher (AA)
Doug Grout, NH (AA)
Rep. Sarah Peake, MA (LA)
Bill Adler, MA (GA)
Nichola Meserve, MA, proxy for D. Pierce (AA)
Bob Ballou, RI, proxy for J. Coit (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
David Simpson, CT (AA)
Lance Stewart, CT (GA)
Steve Heins, NY, proxy for J. Gilmore (AA)
Emerson Hasbrouck, NY (GA)
Pat Augustine, NY, proxy for Sen. Boyle (LA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Roy Miller, DE (GA)
John Clark, DE, proxy for D. Saveikis (AA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
David Blazer, MD (AA)
Mike Luisi, MD (Chair)
Bill Goldsborough, MD (GA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Louis Daniel, NC (AA)
Doug Brady, NC (GA)
Martin Gary, PRFC
Sherry White, USFWS
Mike Ruccio, NMFS

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

John Maniscalco, Technical Committee Chair

Staff

Robert Beal
Toni Kerns
Kirby Rootes-Murdy

The Summer Flounder, Scup, and Black Sea Bass Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, February 2, 2016, and was called to order at 3:25 o'clock p.m. by Chairman Michael Luisi.

CALL TO ORDER

CHAIRMAN MICHAEL LUISI: Good afternoon everyone. I would like to call to order a meeting of the Summer Flounder, Scup and Black Sea Bass Management Board. My name is Michael Luisi; and I've been passed the baton from Dr. Pierce to serve as your chairman for the next couple years, for which the clock has already started ticking. We set the alarm this morning on two years from now.

APPROVAL OF AGENDA

CHAIRMAN LUISI: Thank you and we have a lot of different items on the agenda today, starting with consent of the approval; I'm sorry, approval of the agenda. Does anyone have any changes to the agenda? Seeing none, it is approved by consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN LUISI: Regarding the proceedings from the November, 2015 meeting is there any edits, additions or changes to the proceedings? Seeing none; those will be approved by consent.

PUBLIC COMMENT

CHAIRMAN LUISI: We didn't have anyone sign up for public comment, but does anyone in the audience wish to speak regarding anything that is not on this current agenda?

Seeing no one from the audience, we will have discussion today on final action that will need to be taken for the draft addendum for summer flounder and black sea bass. At that time there will be an opportunity for the public to provide comment; after we have a motion that is debated by the board.

REVIEW OF THE 2016 BLACK SEA BASS COMMERCIAL QUOTAS

CHAIRMAN LUISI: With that I will go ahead and turn the microphone over to Kirby, who is going to discuss the review of the 2016 black sea bass commercial quotas.

MR. KIRBY ROOTES-MURDY: I'll go through this fairly quickly. Back in October of 2015 the board revised the black sea bass commercial quota to 2.71 million pounds. In December of 2015, NOAA released the final rule on the 2016 commercial quota for summer flounder, scup, and black sea bass.

At that point through reconciliation between state data and data reported through SAFIS, the finalized 2014 landings and NOAA determined that there was an overage of about 8,896 pounds. In January of this year the board received a memo on revised 2016 state quotas for black sea bass and 2016 summer period stakeholders for scup.

Up here on this slide we have what the final 2014 black sea bass landings are by state, and what the coastwide overage is. If any states are interested in how this played out relative to what was presented in October, I'm happy to go over that. Then after accounting for this coastwide overage, those states that were over their state specific quota took a reduction even with the increase in the coastwide quota. In that memo you have the final, or at least the initial 2016 black sea bass state-by-state quotas, and I say initial because depending on transfers throughout the season that number may change. With that if there are any questions on the black sea bass state quotas for 2016, I'm happy to answer them now.

CHAIRMAN LUISI: Any questions for Kirby on the presentation? Okay seeing none; we'll go ahead and move on to the next item on the agenda.

DRAFT ADDENDUM XXVII FOR FINAL APPROVAL

CHAIRMAN LUISI: The next item, we have a series of presentations. Kirby is going to present some information regarding the Draft Addendum XXVII. John Maniscalco is here to report out on the TCs findings.

We also have Mark, who will be providing us some comments on the Law Enforcement Committee. What I thought we would do, since these issues while each and every one of them is new in some way, you know the issues in this addendum are things that we've had a lot of debate on over the last few years, regarding regional management, regarding black sea bass overages and the necessary reductions that come as a result of that.

REVIEW OPTIONS

CHAIRMAN LUISI: We'll kind of step through the presentations, and I'll try to find a time in there when I think we can get some questions on the addendum. We'll get through all of the presentations before we would consider motions to move the addendum along and finalize the addendum as needed today. With that Kirby is going to review the options in Addendum XXVII.

MR. ROOTES-MURDY: As Mike walked us through; I'm going to go through the addendum first, just so everyone is familiar with what the options are and what the public saw. I'll go through that fairly quickly and then I'm going to touch on what the public comment summary was. First the public hearings and then the written comments, after that I'll go through briefly what the advisory panel report was, and then John will walk through the Technical Committee's comments on the draft addendum specific to summer flounder.

After that Mark will give the Law Enforcement Committee report. The draft addendum was approved for public comment at the Joint ASMFC/Mid-Atlantic Council meeting in December, 2015. Proposed regional management options for summer flounder and black sea bass recreational fisheries in 2016 and 2017, and the public comment period closed on January 21, 2016. The Draft Addendum XXVII seeks to address concerns over the equitable access to summer flounder recreational fishery along the coast.

In previous years prior to 2014, state-by-state harvest targets were becoming viewed as increasingly problematic because of the need to take reductions when states went over their harvest allocation, as well as states that were under would have liberalizations, which caused big discrepancies on a state-by-state basis on what management measures were.

In addition to that fishery performance along the coast has also varied a lot during the last 20 years. In recent years we've been trying to address how that has been changing over time. In the draft addendum on Page 22 through 26, there is in that appendix a breakdown of how the states score out, so to speak, in terms of a couple of different metrics; retention rates, nearest neighbor management measures, trips that are targeting summer flounder.

Some interesting things the document puts out are that the retention rates are highest in the states of Virginia, Delaware, Rhode Island, and Massachusetts, and lowest in the states of New York, New Jersey, and Maryland. Interest or avidity in relation to successful trips is also varied across the coast as well. Trips targeting summer flounder are lowest in the states of Massachusetts, but highest in the states of New York and New Jersey; and the highest success rate for targeted trips has been in the state of Massachusetts. In recent years New Jersey has had the lowest score when you compare these metrics across the states and across the coast.

The draft Addendum XXVII outlines kind of a step approach to make a decision for 2016 and 2017. There is first Option 1 that lists either to go with a coastwide set of management measures, or conservation equivalency. Under conservation equivalency there is the ability to have state-by-state harvest targets, which were used as I said from 2001 until 2013.

The other route is to have adaptive regional management. That was what was used the last two years. Sub-option 2A has the regional alignment for what was in place in 2014 and 2015. Choosing that option would continue that regional alignment; Sub-option 2B allows for New Jersey to split its regulations east and west of the COLREGS Line in Delaware Bay.

This information again is on Page 8 and 9 of the draft addendum. Under Option 1 there is a breakdown of what the state-by-state harvest targets would have been in 2015, and what they will be in 2016 if that option is chosen. It also has a breakdown in what the state-by-state harvest estimates are through Wave 5, and what you can see is that a number of states would have been over their state harvest target; and therefore would need to take a reduction in 2016.

Option 2 as I mentioned before is adaptive regional management that has been in place the last two years. Under this option states implement the same bag and size limit within a region. The season start and end dates may vary, but the number of days within the season must stay the same among the states in a region.

The effort by the Technical Committee is to have the proposed measures within a region to be similar to the previous year's regulations so there aren't huge swings year to year on what the management measures are. It is important to note that this is not intended to implement new state allocations, nor is it intended to set a precedent for state allocations based on harvest.

The Technical Committee as I said would work to develop regional measures that the board would review and approve. The document contains what the regional management measures would be for the states and the two regional alignments set ups for 2016. The first regional management option, Option 2A, has a breakdown of what the management measures were in 2014, 2015, and is proposed for 2016 in the draft addendum.

Option 2B, as I mentioned before draws a line in the Delaware Bay along the COLREGS Line. West of that New Jersey would have a different set of management measures in the Delaware Bay relative to Delaware. In previous years there has been a two inch difference in the minimum size.

This regional alignment would make a one inch difference, so New Jersey would effectively come down from 18 inches to 17 inches. For possession limit they would also come down to 4 fish instead of 5 fish for the rest of New Jersey, and a season length of 128 days, which would mirror the rest of the state of New Jersey. The difference is that once you get east of the COLREGS Line, the ocean side of New Jersey is held to the regional management measures that were in place the last two years and is consistent with New York and Connecticut.

East of the COLREGS Line, New Jersey's measures are 18 inch size limit, 5 fish possession limit, and 128 day season. It is important to understand that by the way that regional alignment in regions that can be formed under conservation equivalency stipulates that a state has to have the same management measures as the other states within a region; because no other states in the northern region that had been in place the last two years, Connecticut, New York, and New

Jersey are looking to offer a similar area specific set of management measures.

New Jersey is going to become its own region under this context, while setting its measures similar to the other states in the former region. On Page 28 and 29 in the draft addendum there is a decision tree to help the board walk through the options that are included in the document. It is important also for the board to keep in mind that conservation equivalency was approved by the board in December of 2015.

That first step has already been taken. The next step down is to choose between either state-by-state or regional management. As I just walked through, there are two different options for regional management under adaptive regional management option. For summer flounder there are four options for a timeframe. The first one would make it so it is only in place for 2016.

Option 2 will give the board the ability to extend it another year through 2017. Option 3 would give the board the ability to extend it up to two years, so up through 2018 and then Option 4 would create a no sunset, so the addendum would continue in perpetuity until a new addendum that offered different regional management alignments was developed.

Unless there was an interest to change the regional alignment in a year or two years this would stay in place until such a document was developed. This is included on Page 13. I am going to go through the black sea bass part of the document fairly quickly. The statement of the problem is similar to what was outlined for summer flounder.

Regional management for the recreational fishery has been in place since 2011. It was crafted to alleviate the issue that coastwide set of measures was having on different states throughout the management unit. The draft addendum offers options for continuing the regional management approach that has been used from 2012 to 2015.

In the document there are two options put forward. The first is to go with the FMP status quo, which would be a coastwide set of management measures. The other option is to continue the ad hoc regional management approach, where the states of Massachusetts through New Jersey craft measures to the best needs of their state's interest and to account for harvest that primarily takes place in their state waters.

The states of Delaware south through North Carolina north of Hatteras would set their measures more consistently with the federal measures. I outlined a little bit more what Option 2 has in terms of the ad hoc regions. It is important to note in the document it lays out what the reduction is set for in 2016. Based on preliminary Wave 5 data, the northern states would need to take the reduction of about 23 percent.

John is going to go through a little bit more on the black sea bass proposals on how that breaks down and why the northern states would likely be taking that reduction. Similar to summer flounder there is a four-option approach for the timeframe. The first one, no extension beyond 2016, Option 2 would allow for the extension through 2017, Option 3 through 2018, and Option 4 would create a no sunset clause. That is the draft addendum. Unless there are any questions on the draft addendum I will continue on to the public comment summary. Public hearings were held in January of 2016 in the states of Virginia through Massachusetts, 105 people attended across seven states.

Commissioners were in attendance for a number of those public hearings. Written comments were submitted and a total of 52 comments were submitted by e-mail or by fax, and nine groups and organizations provided comments. A breakdown of how the public comment summary is included in the supplemental materials. We have hard copies in the back of the room if anybody needs one of those.

PUBLIC COMMENT SUMMARY

In terms of the public hearing summary for summer flounder, support was split between four states for Options 2A; the regional management status quo, and Option 2B, New Jersey/ Delaware Bay region. There was no clear majority in the other three states of New York, Virginia, and Massachusetts.

That is the breakdown on the state-by-state comparison of public hearings. In terms of total number of people at public hearings, the total number that were in favor of Option 2B, the New Jersey/Delaware Bay region was 42 compared to approximately 10 people who were in support of the regional management status quo.

Again, this is a breakdown on people who gave us confirmation or affirmation that they were in favor of one of the options that was included in the draft addendum. We received a number of public comments that didn't pertain to options that were in the draft addendum; and I'll go through those a little bit.

Reasons that were cited in support of Option 2B were concerns over the different size limits in the Delaware Bay and the economic impact that has had on southern New Jersey fishermen, particularly in concern over trips that they are losing to their southern neighbor Delaware, in terms of charterboats.

The other concerns that were raised were over different management measures that have been had on the shared water body as well as the fact that while the management measures have been different, they are fishing on the same size fish in these two states. The preferred time table that was indicated through public hearings under this option was Option 1, just for 2016.

As a majority of these comments came from the New Jersey public hearing I just want to make a note that the preference stated from that was a return to state-by-state conservation equivalency in 2017 or a majority of those who were in favor of Option 2B. There were a few comments in support of Option 2A. The main reasons that were given were that regional management measures have worked in the past two years.

Concern expressed over New Jersey becoming its own region and concern over the number of regions in management measures under Option 2B. Again what they're saying here is that there would be six regions as opposed to five, which is starting to mirror the number of states or close to the number of states in the management unit, which is getting closer to what the breakdown was under state-by-state harvest targets. The preferred timeframe option varied along the coast when it came to support of the status quo, but they were all for multiple years, so beyond 2016; either Options 2, 3, or 4. For black sea bass there were a few comments in support of options that were in the draft addendum. Thirteen were in support of Option 2, continuing the ad hoc regional approach.

Reasons cited were that it has worked well the past two years and that interest in maintaining the separate management measures for the southern states and those that the northern states craft, and the preferred timeframe that was indicated was for either Options 1, just for 2016 or for Option 2, 2016 and 2017.

But the majority of the comments we received were concerns over the mismatch and what anglers are observing in terms of the abundance out on the water and the current harvest limits. It was noted during the New

Jersey public hearing the state is interested or should be considering going out of compliance.

In terms of written comment summary, the majority of comments received on summer flounder did not specify an option in the draft addendum. Many were requesting a 17 inch size limit for southern New Jersey fishermen that extended north beyond the Delaware Bay to varying degrees. Some outlined it as to the extent of the Little Egg Inlet, others extended it further north.

Reasons cited were similar to those given in public hearings, concern over the different size limit in the Delaware Bay, and concern over different management measures in shared water bodies. The preferred time table that was a majority of those that were in favor of an option in the addendum was for just 2016.

There were also a few comments in favor of Option 2A, Regional Management Status Quo. Reasons cited were similar to those in the public hearing; the regional management has worked over the last two years, concern about New Jersey becoming its own region and preferred timetable varied, depending on the state in which the public comment came from.

For black sea bass the majority did not specify an option in the draft addendum. The overwhelming majority of the written comments we received took issue with the 23 percent reduction and recommended it not be implemented in 2016. Of written comments received, only three were in favor of continuing the ad hoc regional approach with reasons cited primarily that it has worked well for the past two years.

ADVISORY PANEL REPORT

We held an Advisory Panel call earlier last week to go over the options in the draft addendum. Six were in favor of Option 2B, the Delaware Bay Option with reasons cited that was similar to both the written comments and public hearing comments. Only two were in support of Option 2A, which was Regional Management Status Quo.

Six of the AP members were in favor of continuing Option 2B, the Ad Hoc Regional Management with a preference for ad hoc regional approaches versus coastwide set of measures. That is the summary of what the public comment was. I will take any questions if folks have them at this point.

CHAIRMAN LUISI: At this time I would like to direct questions to Kirby, if you can try to keep your thoughts to questions rather than comments on the actions in the addendum.

MR. BOB BALLOU: Kirby, I just want to make sure that I am clear on the actions taken by the board to date with regard to summery flounder, 2016 reconciles with the decisions that are before the board today. My understanding is, my recollection is that the board – and you noted this – did agree to adopt conservation equivalency for 2016.

In addition, and that was at the joint meeting in December. In addition at our board meeting in November, as I remember, the board agreed to extend the provisions of Addendum XXVI, regional management for 2016 as well. In a sense those two issues have already been addressed and decided upon by the board.

Now I think the key caveat is that Addendum XXVII, which sort of primarily addresses the issue of New Jersey's request to be a region by themselves, also includes extended timelines beyond 2016. Is it for that reason that we're back to looking at conservation equivalency and regional management again, having already essentially decided them at our last two meetings; if you follow my question?

MR. ROOTES-MURDY: Yes, you're correct in everything and I just want to make sure it is clear. The draft addendum offers multiple timeframes for when regional management could be extended out beyond 2016. Without that addendum, or if the addendum is not approved today, for 2016 summer flounder regional management just for 2016 is an option that is available.

CHAIRMAN LUISI: Bob, I can add to that. Thinking back to our meeting in November, there was a concern that if we initiate an addendum and it doesn't become finalized due to the change in the regional approach that we would find ourselves having to revert to straight conservation equivalency.

We almost put a backstop to how far back we would fall if this addendum today does not become final. If it is voted down we would revert to the current status quo, which are the regions that we're currently in. Does that help clarify? I was a little concerned, but confused a little bit too as to why in this draft it allows for the board to go back and revisit all of that; and the board certainly can.

If the board wants to revisit each one of those options and vote for coastwide measures or change something. The board can do that. It would require a two-thirds vote, since we've already voted on those options to this point. Maybe we won't have to do this too many more times down the road, but if we have to in the future perhaps that could be clarified. If we end up taking action with the council and by ourselves as a board leading up to this, it should be made sure that it is clear so the public isn't confused; because I think in some cases that could confuse the public.

MR. ROOTES-MURDY: Just one other follow-up so that it is clear. The addendum also has options for black sea bass, a deviation from what the FMP status quo is. Without the addendum for black sea bass coastwide management measures would be in place for 2016. When we get to the boards preference on what options to go forward with, then we'll handle it in two ways; summer flounder and black sea bass, but understand that without the addendum we also would be coastwide measures for 2016.

MR. DAVID G. SIMPSON: Was John going to speak to the alternatives for summer flounder? I'll hold my question then, thanks.

MR. ROOTES-MURDY: Yes, John is going to go over the Technical Committees review of the Draft Addendum XXVII.

MR. EMERSON C. HASBROUCK: Kirby thank you for your presentation. I have two questions. The first is, can somebody direct me to where in the document it specifically says that if we go with the New Jersey/Delaware Bay option that coastal New Jersey outside of Delaware Bay will in fact correlate and have its regulations the same as New York and Connecticut. That is one question.

MR. ROOTES-MURDY: In the draft addendum it says on Page 12, New Jersey/Delaware Bay option will have a similar size limit as Delaware, and the same possession limit as Delaware, and the same season as the rest of New Jersey north of Delaware Bay. Then in the table it lists what those measures are explicitly.

MR. HASBROUCK: Thank you. My second question may be a little premature, depending on what John's presentation is. I'll ask the question and if I need to ask it after John's presentation I will. I recall that there was some discussion about how the Delaware Bay option with New Jersey was going to require an additional 30,000 more or less fish to be able to accommodate that. Should I follow up that question now, or should I wait 'til John's discussion, because I'm not sure what John is going to cover?

MR. ROOTES-MURDY: Yes so John is going to go over what the number of fish that the Technical Committee has considered, in terms of the different regional breakdowns relative to the harvest limit.

MR. PATRICK AUGUSTINE: Excellent report, Kirby. Question would be that if we do it through 2018, and I should know this answer but I don't. If in fact the harvest report that comes in at the end of 2016 is off the wall, completely out of whack because of this change that we make in Delaware Bay. Does the document allow us to move forward and quickly change that back or are we cast in concrete through 2017/'18? I should know the answer but I don't.

MR. ROOTES-MURDY: Can you repeat the question? I was getting a little confused; and specify are you talking about summer flounder?

MR. AUGUSTINE: On summer flounder if we in fact separate the Delaware Bay between the two sections or regions, if you will, with an inch difference or whatever it is. If at the end of the harvest year and you do your preliminary reporting and we find out that one section or the other has significantly over past their quota, surpassed it by some outrageous amount.

Are we in a position to go ahead and reset that? Who will be penalized? Will it be both regions? I need a little clarification on it, because I personally am supportive of giving this a shot. I'm more concerned that if we go down this road and if we run amok for some reason, what do we do to recoup it, and who pays the balances? I don't know if you can help me with that Kirby.

CHAIRMAN LUISI: Yes Pat, I can try to speak to that and you brought up the point that I was planning to discuss briefly with the board at the end of the meeting, regarding new business. Your concern is it should be on all of our minds. It is something that has been brought up a number of times over the years that we have been manipulating and modifying this regional management approach. The question as I understand it is, if we exceed the recreational harvest limit in 2016, or it is projected that we're going to exceed that limit. We don't have a real mechanism in place in order to deal with that overage regarding who is responsible, or who pays back. Because the regions while they have a theoretical allocation that each region kind of carries along with itself from the 1998 allocations, with the help from other states that provided extra cap space for the fish sharing concept that we use.

There really is nothing to fall back to, to determine who pays back overages and who has to change their regulations to fix that. My thought moving away from today's meeting was, let's put this on the agenda to begin that discussion in May; somewhat of an accountability amendment on how we handle regional management in the future.

I don't have the answer, but what I can tell you is if we do vote to have this in place for a couple years and along the way we see it going off the rails. I believe another addendum could be initiated in that event. We won't have to wait until 2018 to do something. We'll have some flexibility to initiate something new.

By establishing 2018 for instance, if this is sounding familiar to some of you, this is something we've done every year now for two or three years. We would just hold off on having to have this conversation unless there is something new that we want to consider. Does that help answer your question?

MR. AUGUSTINE: Yes it sure does, and he did alert the whole board. That was my concern that maybe only a few of us were paying attention to it and we're just going to say, well, let it happen. Unfortunately when it does happen then we're going to have to scurry. I hope you bring that up for May.

MR. ROB O'REILLY: I promise to stay out of that for right now. But I do have some questions and I'm wondering. I remember that the striped bass Addendum IV drew about 100, 101 participants to public hearings and Kirby, you may have said in total how many attended these meetings. But do you happen to have a rough estimate?

MR. ROOTES-MURDY: For the coast? For the coast I believe it was 105. I had it on one of my earlier slides.

MR. O'REILLY: I guess my question is, I know I was at one public hearing, but did everyone understand this question about one year, two years, three years; no sunset as to where it was coming from? It is a bit unusual, and I think that I understand it and I'm sure others around the table understand why. But did the public have any questions as to why this was posed for Addendum XXVII?

MR. ROOTES-MURDY: I'm not aware of the public requesting additional information on how the timeframe options came up. I attended one public hearing in person, and other staff attended the others. There weren't specific questions as to why multiple timeframes were being offered that I'm aware of.

CHAIRMAN LUISI: Follow up, Rob?

MR. O'REILLY: Very small. We know about adaptive management and we have a very small segment of the public who are attending these meetings. Would there be a good way to at least convey the information that whatever is chosen, in terms of the timeframe for Addendum XXVII measures that the public will understand there is adaptive management.

Already had a couple of comments about what happens if things don't work out, and certainly that is something the public should know about as well that there is adaptive management there. Even if there is a three year or a sunset that doesn't mean that these issues don't come back. I'm just wondering, is that something that staff thinks it would be easy to convey somehow, when this information, these decisions come out later on?

MR. ROOTES-MURDY: Yes, it is included earlier on in the document, but I'll just reiterate it that each year the Technical Committee has to evaluate how the coastwide harvest is proceeding relative to the harvest limit; and in doing so have to make adjustments if there is the anticipation that the following year the harvest is going to go over the harvest limit.

Management measures have to be reevaluated every year. Under Option 2B it kind of locks in how New Jersey would set its measures relative to its neighbors, but the other option, Regional Management Status Quo, doesn't specify what the year-to-year regional management measures are per se. Under both you kind of have the ability to change every year as needed, but we can make sure that that is more explicit in terms of what the management measures are.

MR. BRANDON MUFFLEY: Just to follow up on your point. I wholeheartedly agree that we need to discuss how we deal with overages and how penalties occur in the future. But I just want to point out that regardless of what we do today, if we decide to put New Jersey in its own region for Delaware Bay or we stay at status quo that discussion needs to be had. Because we never really kind of fully fleshed that out in terms of how we would deal with overages; even under the current structure.

CHAIRMAN LUISI: You're correct and before we adjourn today I'll get the board to weigh in on possible ways that we can consider moving forward with that.

MR. THOMAS P. FOTE: There were more than 104 people at the striped bass hearings, Rob. I had 150 in New Jersey alone, so I don't know where that number came from. I'm thinking, yes there weren't a lot of people, I actually did count heads throughout here and if it wasn't for Massachusetts and New Jersey we would only have 25 people at all the other hearings.

That is with 100 on summer flounder, but on striped bass we had a lot more than 100 at all the hearings. We had 150 in New Jersey. There is also nothing in the document that would tap in this year to New Jersey. I mean one of the reasons we don't really have to take as drastic a reduction, can pretty much stay status quo.

But of course New Jersey was actually under 40 percent of what we could have harvested under the other rules, what we were supposed to have harvested. By us basically harvesting way under what we should have, or we could have, we basically helped everybody out. There is no way of rewarding that. In the old days we at least could have actually gotten relaxed on regulations instead of going the other direction, but that is not possible under regionalization. We don't do it one way or the other, we don't penalize. It is one of the things to look at if you're going to reward or penalize somebody for doing that. That is what I'm looking at. But we also know that we were 40 percent under this year. In 2013 when we had no boats in the water and one Wave when we had no boats in the water, all the marinas were still closed because of Sandy in June and July; we went over quota.

We almost doubled the quota we caught, tripled the quota we caught the year before. I might as well get a dice and throw it sometimes when we look at MRFSS figures. We know that next year we could be in the same spot that somebody else is, and that is why we help each other along the way. The south did it. Even when we went conservation equivalency helped bail us out a couple of times in the northeast region.

MS. NICOLA MESERVE: A quick question for staff about some language on Page 14 of the document. The guidance to states about black sea bass regulations puts a threshold at 15 percent for a PSE to set in mode or area specific measures. My recollection was that that 15 percent value was a hangover from MRFSS, so I am wondering if that should be updated for this document in terms of the states setting or their proposals that we're going to look at as part of this meeting today.

MR. ROOTES-MURDY: You are correct. That is a consideration that was put forward by the Technical Committee. I don't think we have a new PSE for mode or area for MRIP specific, so that is also something that would need to be specified. But it is a point that the Technical Committee has brought to the boards attention before.

TECHNICAL COMMITTEE REPORT

CHAIRMAN LUISI: Okay at this time I am going to turn to John to provide us a report on the technical aspects of the addendum, and then we'll have the law enforcement committee report and then move on to taking up the action items in the addendum.

MR. JOHN MANISCALCO: A lot of this has already been covered, but this is just a quick look at harvest from 2013 through 2015. Certainly in 2014 and 2015 the same regulations were in place; 2013 was somewhat different. In the far right column you can see a comparison from 2015 to 2014 it is essentially a ratio of harvest.

In general there was a decline in most states along the coast. New York stayed essentially the same, Virginia increased slightly. All other states decreased, but most significantly in that Mid-Atlantic region with New Jersey being 60 percent lower than they did the previous year with the same regulations.

There has been some concern about the magnitude of harvest coming out of Delaware Bay, so the TC wanted to clarify that; 2015

Delaware Bay harvest was about 15,000 fish. With a proposed liberalization of regulations in Delaware Bay, New Jersey only 17 inches so the size limit decreases by one inch to 17 inches. The possession limit decreases by one fish to four fish; 128 days remains the same.

That liberalizes harvest in Delaware Bay, New Jersey by 35 percent, which is equivalent to approximately 5,500 fish going by 2015 harvest numbers. As noted, New Jersey 2015 harvest was particularly low. If you look at Delaware Bay harvest in a year like 2012 or 2014, where it is closer to1, 1.2 million, Delaware Bay harvest is approximately 85,000 fish. If you take that same 35 percent liberalization, you're looking at approximately 30,000 fish. If you take the 30,000 fish that is relative to 1.87 million fish in the 2016 RHL, so even if New Jersey does harvest at, we'll say more normal rate, the impact from the Delaware Bay liberalization is likely to be small; at least judging by the previous four years of harvest. The current projection for 2016 based upon regional Options 2A and 2B are both approximately 1.6 million fish.

The 2016 RHL is 1.87 million fish. These options projecting underharvest of the 2016 RHL by over 200,000 fish. But the TC wishes to remind the board that under the same, or essentially the same exact regulations in 2014, the coast harvested 2.46 million fish. The RHL will drop again in 2017 by an additional 2.6 percent according to the annual specs.

Continued depressed recreational harvest, which only corroborate the most recent assessment update findings, and that we can look forward to another assessment update this summer. Finally the Technical Committee wanted to address a proposal from Rhode Island Charter Captain's Cooperative.

We've seen something similar before, this is kind of a limited entry group of charter vessels that is seeking an allotment of summer flounder to better serve their customers and their business. What they're doing is asking for a number of fish so they can seek flexibility with regards to size limit, while harvesting under the per angler possession limit.

They wish to reduce discards and provide a more stable business environment. Another aspect of this program is higher quality catch reporting and monitoring, which the Technical Committee representative from Rhode Island did say was for him the best part of this program. In 2013/2014 they had a pilot program that utilized RSA fish.

RSA has been suspended and a similar program request failed to gain board support in 2015. Technical Committee concerns with this program have to do with the biasing of MRIP data and confounding of the intercept data. This would be a mode split. Charter vessels within Rhode Island would be fishing under different sets of regulations.

This is problematic and if you're looking at intercept data would be next to impossible to separate out which vessels were fishing under the cooperative and which vessels were fishing under regulations in place for the rest of Rhode Island. Another aspect of this that is problematic is, as has already been noted, each region or state has a projection or expectation of harvest for the coming year.

But no state has been held to that number it has been kind of fluid, and as long as we remained underneath the RHL, no state has been held accountable or have been forced to change their measures. The question with a cooperative like this is, where do those fish come from and who is held accountable, and what happens if the RHL is exceeded?

Finally just one more note. The TC appreciates the stability in measures. It gives us data to work with having three years or similar measures provides some idea of how much variability you can expect from, you know when stock size and/or MRIP changes what's being harvested in states. That is all I have for now.

LAW ENFORCEMENT COMMITTEE REPORT

CHAIRMAN LUISI: Before we take questions let's go ahead and get the Law Enforcement Committee report. Okay I'm sorry, Bob, did you have something? Are we ready for the Law Enforcement Committee report? Mark, are you ready for that? We'll finish up the presentations, get questions for Mark and John, Kirby and I and then move forward with consideration of the options.

MR. MARK ROBSON: The Law Enforcement Committee was able to meet during our conference call to discuss this addendum on January 7th. There were 18 enforcement members of the committee participating, and before I get into specifics on summer flounder or black sea bass, a general note for both species regarding the timing; specifically in discussing this issue focusing on the conservation equivalency and the regional adaptive measures, the regional management measures.

The Law Enforcement Committee would certainly prefer that timeframes be extended as long as possible. This is kind of a general consistency and stability issue that we've referenced in our enforceability guidelines that the possibilities of changing from year to year and how boundaries are drawn or where regions are laid out creates some real uncertainty and some problems for law enforcement.

That is the reason they just express that desire to try to extend those decision making processes out as far as possible. With regard to summer flounder, the LEC really focused its review on the new option for the region for New Jersey and the Delaware Bay. I'll say right off the bat, we didn't have consensus, so I'll skip right to the bottom bullet on this one.

Part of the reason there is not a consensus is because obviously the members recognize there was an intent to try to provide more consistency within Delaware Bay and recognizing the importance of that. But this was a case where there was a consistency tradeoff, in particular discussing how this might affect enforcement in the southern part of New Jersey, where you have waterways and water bodies that can connect the ocean side to the Bay side of Delaware Bay.

It was pointed out that this was likely to create a lot of enforcement difficulty from the southern end of New Jersey up towards those northern areas where you may have more of the ocean regulations in place. Just as an aside, the comment was made about previous problems with differing recreational regulations in some of the parks in New Jersey as opposed to regular statewide regulations; and at a local and regional level how difficult these things can become for enforcement officers.

We may be thinking in terms of big, broad, geographical areas but what it comes down to in this case is a problem for enforcement in southern New Jersey. On the other hand, I don't think there was a significant concern raised about how this might play out for the state of Delaware. Therefore again, we don't really have a consensus.

But going back to our enforceability guidelines, you know the issue of adaptive regional measures and trying to move to conservation equivalency, recognizing as we do how important this may be to you as a commission. The broader you can have consistency in regulations, especially in recreational regulations; the better off it is from the law enforcement perspective.

This is a situation where we recognize that it is difficult to get to that happy place, but again we go back to our enforceability guidelines in seeking out the broadest possible regions or areas for coastwide regulations; especially where you have a lot of contiguous jurisdictional boundaries. For black sea bass we support the continuation of the ad hoc measures that were in place; again going back to our general guidelines of strongly recommending continuing efforts to maximize regional consistency to the broadest extent possible.

CHAIRMAN LUISI: Questions for John or Mark?

MR. JOHN CLARK: Mark, for the summer flounder I noticed you said there was not consensus among the enforcement agents. I was just curious, because the subject came up at our hearing. How confident is New Jersey enforcement that they could properly enforce the two different size limits around Cape May?

MR. ROBSON: I believe that the answer to that if they were here and able to do that. I don't want to speak too much for the members of the committee, but I think the answer would be they would do everything possible to enforce the regulations that they're presented with.

But the descriptions of inland waterways, and I'm not that familiar with that part of southern New Jersey, obviously. But the combination of access to both the ocean side and the Delaware Bay side, and the difference in regulations in the movements of vessels in and out of those areas will create a lot of challenges for enforcement officers.

MR. O'REILLY: Thank you for the reports. I had a question about the data that John presented, and possibly this will be talked about a little bit later. But our chairman early on said we will look at situations, or at least get a dialogue started how to look at situations when there is a RHL exceedance which is beyond what was in 2014, which was 6 percent but was covered by the 2015 RHL; so there was essentially no payback.

One thing that might be good, and John, maybe you can speak for this that you may already have it. I know that you were the one who originally seeded the 2014 harvest scheme that started regional management. From what I recall it was more or less the 2013 harvest. There were a few changes. I guess what I am really interested in as we go along here is the composite of everything that has occurred since 2013, so 2014 created, I'll call it a de facto target by region.

Then there were landings in 2014. Then there was a de facto 2015 target by region and landings. As we go forward it would be good to be able to trace that when we need to, to know where the shortages were, where the excesses were so that we really can have a clear understanding once we find ourselves in the situation we don't want to be that at least we have a pretty clear idea of what has occurred region by region, and of course state within state. I don't' think that that is difficult, unless you tell me it is.

MR. MANISCALCO: That wouldn't be difficult to generate.

CHAIRMAN LUISI: Okay thanks, John; Steve Heins.

MR. STEPHEN HEINS: John, the New Jersey/Delaware Bay option under Region Option 2B. Would you consider, this is going to be several questions. You mentioned something about even if New Jersey was to harvest at a more normal rate. What is a more normal rate? We've got a number here for a regional harvest target of 490,000 plus fish. What is a more normal rate and would you consider what happened in 2015 to be anomalous? I mean are we setting New Jersey up to greatly exceed this harvest estimate for 2016?

MR. MANISCALCO: New Jersey over the last three years, so 2012, 2013, and 2014 harvests approximately a million fish. I don't think anyone expected them to harvest under 500,000 fish for 2015. The stock assessment does say there is a decline. I've heard reports from fishermen that the fish stayed offshore in that area.

I think the Maryland and Delaware data also show less harvest than we expected. Given the decrease in the RHL for 2016 and the following year, I think that if New Jersey was to harvest a million fish, regardless of changes made to Delaware Bay, we would have to review the measures in place for the coast.

CHAIRMAN LUISI: Did you have another question, Steve? I'll also say that I don't think that the option in Option 2B in this addendum is going to be the cause of an overage. I think the cause of an overage will just be more fish caught, or a variation in the MRIP estimate or whatever it might be. But I'm not convinced that the allowance of one less inch with the reduction in creel limit in Delaware Bay is going to trigger some great response on the harvest end. That is just my opinion.

MR. HEINS: I don't think I have a concern about the 17 inches. I'm just more concerned with that only allocating 490,000 to New Jersey as its own region. It just seems like it is setting them up. We already talked about what potential consequences if we have a mess, and I just see a mess coming.

MR. FOTE: I was a little concerned, I was getting this Rhode Island report about the particular charter boat going to the Technical Committee and basically asking this to get reviewed. If I remember right, this came before the board and we turned it down and didn't send it. Usually the board, we progress when we do something like this. When Louis comes with a proposal for North Carolina or New Jersey comes with a proposal.

We basically get our technical people to put it together, bring it to the board and if the board is going to approve it, it goes then to the Technical Committee. It took me a little aghast how we were going through this thing that had not come before the board first, to say whether we would even consider this to send it to the Technical Committee to be looked at. I am kind of lost. I have never seen that happen before, so I was kind of lost on how that worked. Is that the regular precedent of the way we do things, because from what I know that is not it.

MR. ROOTES-MURDY: Rhode Island representatives came to us. There is an interest group in Rhode Island that is interested in having this continue, this charterboat program. Jason McNamee was interested in getting review by the Technical Committee on the merits of the program.

I was not under the impression that Rhode Island is considering doing this for 2016, as it was indicated that there isn't a set allocation set up for subsector, or even at the state level under regional management for allocation. My understanding was that Rhode Island is not interested in pursuing this per se for 2016, but wanted to get feedback from the Technical Committee on its technical merits, so if Rhode Island has a different opinion on that feel free for them to speak up. But that was my understanding.

MR. MARK GIBSON: I agree with Kirby, we are not looking for this for 2016 we were looking for the technical merits and/or warts, with the possible consideration of a future date.

MR. FOTE: Follow up on that question. Yes but that is not the usual way we do something, especially on a proposal that has been turned down by the board before. It comes to the board first and then the board would recommend it going on. I'm just trying to make sure we have a procedure; because that is a procedure we've been following for years.

I don't want to all of a sudden say how we go around that procedure and go directly to the Technical Committee. We're tasking the Technical Committee with enough work to be done and to basically add some task that one of, even including New Jersey can walk in and say, well we would like you to look at this; while they're doing an addendum and doing everything else. It seems like out of the realm. It should come from the board.

DR. LOUIS B. DANIEL: I've been wrapped around southern flounder management for about the last year, for any of you keeping up with what is going on in North Carolina. I see some parallels here that I would like to bring up to the board just for your consideration as you move into these discussions.

I've not been as involved in this, because it is a jointly managed fishery with the Mid-Atlantic Council and I have staff that handles that for me. But one of the points that were made in the public hearing I think was a mismatch of the information. What the fishermen are seeing on the water and what we're seeing in the stock assessment.

My first question would be, wouldn't some observer program coverage on party charterboats and logbooks really help to get us the better information that we need in order to dispel some of those mismatches? That is question one, because I think that is a critical need that we're still lagging way behind on.

The other issue that we've talked about on several occasions, and we seem to be moving down the same path that we always move, and I think there is time for a change, is in these size limits. I think if you look at the stock status we're overfishing. Spawning stock biomass is not looking as good as it could.

I think a lot of that – and we've got a good recruitment year coming in – which seems to make me believe that recruitment is more variable based on environmental conditions rather than a stable spawning stock biomass. I think one of the reasons why we probably don't have a stable spawning stock biomass is because our entire harvest is female fish.

That is a concern, and we just keep moving in this direction of having 17 and 18 inch size limits, and we're destroying our spawning stock biomass and it looks like we're just going to continue to move in that direction. North Carolina we're looking very closely at the catch rates and how we could save hundreds of thousands of pounds of female biomass by lowering our size limit and trying to put some F on the male fish. I don't know that we've even had that discussion yet. I encourage us to have that discussion with the Technical Committee. I know some folks think, oh my God, dropping the size limit is verboten, you know? But if your Fs on males are zero and your Fs on females are resulting in overfishing you've got a pretty substantive problem. I can't help but look at the landings for North Carolina, where we've landed about a third of our quota over the last many years.

The reason for that is because we have a 15 inch size limit and we don't see fish 15 inches in North Carolina. The stock is not overfished. Right now we've got overfishing occurring. But it has consistently impacted North Carolina over any other state, because we just simply don't see the fish at the southern end of the range that meet the size limit that has been selected.

We're actually taking action in North Carolina. I'm going to be making some changes to our flounder management plan that is going to protect more summer flounder in North Carolina, not harvest more but protect more. But we will be looking at trying to come up with methods to reduce our size limit to harvest more males, and I encourage the commission and this board to begin looking at a similar approach.

CHAIRMAN LUISI: I'll just make a couple quick points. Regarding the disconnect, I think what I heard from the public comments that disconnect I think more applies to black sea bass then it does with flounder. I don't think there is a person here that doesn't truly believe there is some disconnect to what the science is allowing us to take and what fishermen see on the water.

I hope that through the next assessment there will be some solution there or there will be something that will help balance that disconnect, or at least piece it together a bit. Regarding the sex specific issue on flounder, there was a presentation given to the joint meeting of the council and board by Dr. Pat Sullivan, I believe last summer. I think it might have been the August meeting.

There has been some forward movement on factoring in sex specific information for the purposes to help the issue that you bring up, to try to figure out a mechanism for which we could focus harvest not solely on female summer flounder. The idea would be that that information would be factored into the next summer flounder assessment. I'm not sure when that is going to take place, but hopefully by that point that model will be up and running.

CONSIDER FINAL APPROVAL OF ADDENDUM XXVII

At this point right now I would like to move on in the agenda and get away from questions, and get to the last item under the Agenda Item 5, which is consider the approval of the components of Addendum XXVII. The way we intend to do this, we'll need to take up a couple actions. The first action I would like to take up would be the summer flounder action.

We'll then need another action for the black sea bass part of the addendum and then we'll need a board action to finalize the addendum. We need three specific actions at this time, and I'll look to any board member to put a motion on the table so we can begin that debate.

MR. MUFFLEY: I would like to make a motion in regards to the summer flounder aspect of the addendum. **I would like to move to approve Option 2B, Adaptive Regional Management for summer flounder under Section 3.1 and then Option 1, no extension beyond 2016 under Section 3.1.1. If I get a second I'll speak to the motion.**

CHAIRMAN LUISI: Okay the motion is on the board, Dave Simpson second to that motion. Go ahead, Brandon.

MR. MUFFLEY: We've talked about the issue quite a bit and I appreciate the board's willingness to talk about some flexibility. Our inflexibility under state-by-state allocations is kind of why we went to regional management in the first place, adaptive regional management. I think we need to be flexible and evaluate situations as they come up so that we can get these regions aligned as best as we can.

I think this approach that we've taken allows us to address the two inch size limit in Delaware Bay that had never been in existence prior to implementation of regional management. We will constrain the bag limit there to help ensure as best as we can that the harvest stays within the constraints that we have.

I don't think going down this path, based on the analysis that the TC has evaluated, even under the assumption of a higher level harvest back to more normal levels in New Jersey that this is going to be the issue that causes any great problems going forward. We are only putting it up for one year to evaluate how this option plays out for this year, see what the 2016 stock assessment tells us, and then we can reevaluate moving forward.

CHAIRMAN LUISI: Okay we have a motion is there any further discussion on the motion by the board?

MR. HEINS: I am all for supporting each other and I am very much in favor of doing whatever we can to help New Jersey. However, Marine Resources Advisory Council for New York State took up this issue in January and basically voted to oppose Option 2B. They asked that we oppose it here at the table.

I'm not opposed to it. But I do want to share their concerns that the separation of New Jersey out as a separate state could have potential ramifications, not just for New Jersey but for everybody. We do know that the MRIP, we struggle with these estimates. By breaking up into less precise bits we're setting ourselves up for getting back to what we were going through with state-by-state.

I have really concerns about this. I'm glad to hear Brandon day that he would only have this go through 2016 so we could evaluate it. That gives me some measure of comfort, but I'm still very, very concerned that if New Jersey does go back to a normal harvest that we could have some real problems on our hands in 2016.

MR. O'REILLY: I do want to support the motion. I at first thought that there might be two purposes in the no extension beyond 2016, so I definitely would support it. I was a proponent of geographical splits in the past. It was very well intentioned, but ill-fated in Virginia. I still think it would be something in the future when we again have a rebuilt stock.

That would be good to consider not just in Virginia but other states. I know Maryland has had split geographical areas as well. To me the important thing here as well is, we really do need to get back together on all this. I know that there is a shortage of resources, not only at the ASMFC, but also in the states to keep bringing these forward, the addendums forward. But in this case I think it is going to be necessary for several reasons, and also we do have to pay attention that this might be our first challenge in 2016, since 2009 with the year class that is average or subpar with the 2014 year class making its way partly into fisheries by late summer, early fall. For those reasons I'll support the motion.

MR. SIMPSON: I support the motion as well. I think because this is the right thing to do. This is what we should be doing working together to address some of the issues that have developed, frankly as we try to resolve each other's concerns and problems. This started two or three years ago largely over a concern for New York, and frankly New Jersey was a big part of the solution to that. I have faith that they are going to do the best they can to make this work.

I was relieved to see that the sort of cost for accommodating the Delaware Bay/New Jersey side is not great. It won't be the difference between making this and not. I do have my concerns as everyone does that a closer return to normal catch for New Jersey could put us over. But I'll return to my plea every time we get together that especially with the prospect of paybacks that are incorporated into federal plans, mandated through a federal process; that our federal partner do something for conservation on the recreational side for summer flounder.

I do think we need an 18 inch minimum size in federal waters to backstop what we're trying to do in a small water body, upper Delaware Bay where larger fish very arguably that they do not frequent. The same thing for Chesapeake Bay and other areas, so it is another plea that federal government if you're serious about staying within harvest limits and paybacks, you need to be a partner in making sure we don't go over and set some reasonable rules out in federal waters.

MR. HASBROUCK: Back to my 31,000 fish question then. Those 31,000 fish for Option 2B here for the Delaware Bay option. Am I correct in understanding that those fish are going to come out of the coastwide allocation, the coastwide quota so that every region is going to give up a few fish to come up with that 31,000 or do I have that incorrect?

CHAIRMAN LUISI: Let me take a stab at it and then you guys can tell me if I got it completely wrong. The reason why we're considering this option is because there is a difference between the catch in 2015 as it is projected and the quota that was set for 2016. Due to the fact that the catch in 2015 was lower than what we anticipated, I know that I am not the only one. After we set the quota in August and reduced the quota for summer flounder by 25, 26, and 27 percent.

I know I am not the only one that went home and started trying to figure out how we were going to do that. But then by December we were looking at liberalizing in some way. I believe that these few extra thousand fish that will be coming from Delaware Bay, the allowance is there because of the catch from 2015.

If the catch in 2016 reflects more closely what we had in 2014 we are going to find ourselves working through some process to handle that as regions on who essentially does the payback. In my opinion I don't believe that these few extra thousand fish are going to make us or break us at that point. It all depends on how this next fishery operates and what we end up with as harvest at the end of the year.

MR. GIBSON: I can support the motion as well in a similar spirit that Dave Simpson cast it in that this is what we're supposed to be trying to do. We can't give everybody everything that they want, but we can try to give the majority of people some of what they want. I think this works towards that. However, I'm very mindful, and I hope the rest of the board is of some of the things that Louis Daniel said. The last assessment update was a remarkable turnabout in our perception of the status of summer flounder.

If you look at the graphs of SSB and F we have never rebuilt summer flounder, in fact we didn't even really get close to the current rebuilding target. We got over the threshold; we didn't get to the rebuilding target. In every year except one, which I think was two years ago, stock was subject to overfishing.

We have recruitment events that look big first hand and then poof, they vaporize and get moderated down. It is almost like New England Council déjà vu, we think we're on the verge of a success story and then poof the disappearing fish and we're in a lot of trouble. I am very mindful of those and I look forward to the next benchmark assessment. We need to realize that all is not well with our summer flounder. We need to be careful of what we're doing.

CHAIRMAN LUISI: Any other questions? Roy Miller.

MR. ROY W. MILLER: It is not a question Mr. Chair; it is a comment; may I?

CHAIRMAN LUISI: Absolutely.

MR. MILLER: I just wanted to say that I am going to vote in favor of the proposed motion, and my reasoning is the New Jersey delegation approached the Delaware delegation to discuss a potential compromise for 2016. Not everyone may be aware of the process that went on. In my opinion I think that they went about it correctly.

They made a good faith effort to put forth a proposal that in my view is at least worth trying for one year. I have some comfort over the fact that Brandon proposed this only for one year. I have some concerns about the difficulty of enforcement and some concerns obviously if we overshoot the coastwide quota, but for one year I think it is worth a try.

CHAIRMAN LUISI: Okay seeing no additional comments, I'm sorry, Nicola, please.

MS. MESERVE: I can also support this motion. It is consistent with the board's objectives for regional management. I also appreciate the no extension beyond 2016. While I recognize the burden that these addenda put on staff on an every year basis, if we want to do something other than coastwide or conservation equivalency for 2017, it gives the board the option to incorporate those discussions that we plan to have this year about what happens in the event of an overage of the RHL.

CHAIRMAN LUISI: I'll try this one more time; the third time's a charm. Seeing no additional comments; I would like to go to the public for anyone in the audience who would like to provide any comment regarding the motion. Brian. There is a microphone at the end of the table here and if you could just state your name. Brian, also before you begin I know that you may have comment on the black sea bass portion of the addendum too. Feel free to just go into all of that and we can include that as part of the record, thank you.

MR. BRIAN LAUGHLIN: Thank you all for allowing me to speak today. I'm Brian Laughlin, I'm Congressman Frank Pallone's Deputy Chief of Staff, and he has asked me to be here today to speak because he is on the House floor voting, so he was unable to be here. He wrote a letter a couple weeks ago and it is I believe in your packets; but he asked me to come to read from that letter so I'll get started.

"I write today regarding the Atlantic States Marine Fisheries Commission Draft Addendum XXVII to the summer flounder, scup, and sea bass fishery management plan. This addendum proposes actions relating to two important fisheries in New Jersey; summer flounder and sea bass.

Recreational fishing directed at summer flounder and sea bass is a critical component of the state's economy. My district has thousands of private anglers and attracts individual anglers from all over the nation. These anglers support local small businesses and drive the coastal economy of my home state.

It is critical for New Jersey to receive fair treatment in the development of restrictions placed on key recreational species. With respect to summer flounder I request the commission adapt Regional Option 2B, the New Jersey/Delaware Bay proposed region. The option will enable New Jersey to become its own region and allow anglers to have a more equitable size limit within the Delaware Bay area.

As the commission considers the timeframe for summer flounder measures, I request the commission adopt Option 1, which would hold this addendum expires at the end of 2016. Further, I support a less restrictive quota than the proposed 23 percent reduction that is included in the draft addendum for recreational sea bass harvest.

There continues to be a troubling lack of confidence among fishermen and many fisheries managers in the data that guides stock assessments. As Congress considers reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act, the reliability of data collection remains one of our primary concerns.

We must ensure that inaccurate and out-of-date science is not guiding decisions to needlessly restrict fisheries. Recreational anglers in New Jersey and along the Atlantic Coast deserve fair quotas based on sound science. According to NOAA Fisheries, commercial and recreational fishing supported approximately 1.7 million jobs in 2012. New Jersey relies greatly upon the critical industry. I appreciate your attention to this important matter. Frank Pallone."

CHAIRMAN LUISI: Any other public comment on the motion? Seeing none I'm going to bring it back to the board. Any additional comments before we call the vote? Need 30 seconds to caucus? **All those in favor of the motion, please raise your hand; that is 12 in favor, all those opposed, any abstentions, null votes? Seeing none; the motion carries**. Moving on to black sea bass, Tom, I'm going to hold off right now. Very quickly.

MR. FOTE: One of the reasons we're talking about numbers going down and we're looking at what is happening as a trend. When we looked at the statistics from 2007 to 2014, we were down 8 million trips in the Mid-Atlantic region and New Jersey was down 2 million trips. We would like the Technical Committee to please bring in the next meeting, if they could, as to how many trips. Are we continuing on that downward trend on number of trips as we have been going since 2007? Because one of my feelings is we've had a lot less trips and a lot less boats. We've also been down over 50,000 boats in New Jersey since 2007, and it seems to be a continuous slide. That is one of the reason maybe we're getting less trips, because 40 percent of our directed trips were summer flounder.

CHAIRMAN LUISI: Okay thanks, Tom, we'll put that on the list for a future Technical Committee report. Moving on to the alternative we need to take up for black sea bass. I would like to move to look at the board for anyone who is willing to make a motion to get this discussion started.

MR. SIMPSON: **I move to approve Option 2, ad hoc regional measures for black sea bass under Section 3.2 and Timeframe Option 2, one year extension through 2017 under Section 3.2.1 in Addendum XXVII.**

CHAIRMAN LUISI: Max, it is Option 2. Okay we have a motion by David Simpson and a second by Steve Heins. Any discussion on the motion?

MR. ADAM NOWALSKY: **I'll cut right to the chase and I'm going to move to amend that that it be for just no extension Option 1, no extension; and if I can get a second I'll speak further.**

CHAIRMAN LUISI: Let me get that on the board, Adam before I ask for a second. Adam just made a motion to amend. We have a seconder of the first motion was Steve Heins. Yes, the motion by Adam was to amend under Section 3.2 Option 1. However that language reads after Option 1, no extension beyond 2016. Is that your motion, Adam?

MR. NOWALSKY: Yes it is thank you.

CHAIRMAN LUISI: Is there a second to the motion to amend? Rob 'O'Reilly. Adam, do you want to speak to your justification for the motion?

MR. NOWALSKY: Putting aside for a moment the issues with the 23 percent reduction, which I could spend an extended period of time debating here today. Putting that aside for a moment though, we know that there has been a tremendous amount of work that has been put forth largely with the help of the Technical Committee from this board in changing the black sea bass quota.

If not for that work and the 20 percent increase in quota for 2016, we would be looking at something even more drastic here before us today. That work on quota is not done. It continues to be an ongoing process, and I believe that we need to continue to have the flexibility, and we need to have the responsibility to work on this issue.

We have before us today in the northern region, states that were under their target by up to 30 percent this past year, and unfortunately the reported data from one state, a 70 percent increase over the previous year, is what is driving this. This is the variability of the data that is driving this. We need to continue to work as a board. We need to continue to work with our Technical Committee, with our partners at the Mid-Atlantic Council to find a better way to do this. To tell our fishermen that we had a 20 percent increase in quota, but we have to change our regulations to account for a 23 percent reduction. We all go home with egg on our face when we pass measures like that. The need to continue to do so, if we sit here today and just say okay we're going to leave this process in place for two years. I think that the people doing the work, including ourselves, we know we can do better. We're going to continue to do better and this sends the message to our constituents that we're committed to that.

CHAIRMAN LUISI: For a point of clarification. I want to make sure that I am understanding from staff correctly the difference between the options. It is my understanding that the first motion, which includes Option 2. It establishes the ad hoc regional management for 2016, and gives the board the option to just extend those same conditions for one additional year. The board could choose at a later time than today to not extend those conditions for one additional year.

The amended motion simply eliminates that option later down the road, and it will essentially, the way I understand this, if we want to continue regional management we will need to initiate a new addendum at that time, and do the whole process again from start to end. Without that simple extension it will just be a longer term process. I just want to make sure that I'm clear that everyone is clear about the differences between the two. Was I good on that Kirby?

MR. ROOTES-MURDY: Yes that a new addendum is needed if you go with Timeframe Option 1, and you want to do something different than coastwide measures in 2017.

CHAIRMAN LUISI: Okay thank you. Are there any other comments or discussion on the amended motion?

MR. HEINS: I just want to speak to what Adam said about the data, because frankly he did mention that one state is driving all this, and I agree. I am glad he said data not harvest, because I find our number for 2015 to be a little bit no believable, all right. It is way out of whack with everybody else. Although I still support the original motion, I just wanted to support Adam's contention with the data.

CHAIRMAN LUISI: Any other comments? Okay seeing none I will provide another opportunity for any member of the public. Would anyone like to speak on the motion? Okay seeing none; bring it back to the board and take 30 seconds to caucus.

MR. ROOTES-MURDY: Just for the board's clarity on this motion, because New Hampshire and Maine have a declared interest in black sea bass, they will be voting with the board on this matter.

CHAIRMAN LUISI: Is the board ready for the question**? All those in favor of the motion to amend, please raise your hand; that is 5, all those opposed same sign, 7 opposed, any abstentions, 2 abstentions, any null votes? Zero null votes, the motion fails; back to the main motion**. Do we need any further discussion on the main motion? Tom Fote.

MR. FOTE: After attending the public hearing in New Jersey and we had 50 percent of all the people that attend the public hearing, and a lot of them they were not there really so much on summer flounder but black sea bass. Before I did that I attended the New Jersey Marine

Fisheries Council, and all the shows I've gone to since, everybody says no, hell no. As far as I'm concerned I'm going to vote against this motion. The stock assessment says we can be fishing at a higher quota. The Mid-Atlantic Council, because of the ways they set up their rules and everything it put us in a quota that we are that we are doomed to failure, even without the 23 percent reduction. Even if we were just at what the quota was we're doomed to failure anyway, because they have underestimated the number of fish.

They're building our catch figures on an underestimation of the stock and we're catching more fish because the stock is much bigger. For that reason I cannot support this motion, because I have been directed by a whole bunch of people, including the two senators and the Congressman who I was on a podium with on this Sunday. That is the reason I'm going to vote against this.

CHAIRMAN LUISI: Any other comments? Seeing none; need time to caucus? Okay let's go ahead and call the question**. All those in favor of the motion, please raise your hand; 13 in favor, those opposed like sign, 1, null votes, any abstentions, 0, 0 motion carries**. That concludes the action items we needed to take for the black sea bass portion of the addendum. What I'm now looking for is someone on the board to put forth a motion to finalize and move the addendum forward to final. Yes.

MR. WILLIAM A. ADLER: Did you want a motion to approve as adjusted today?

CHAIRMAN LUISI: Absolutely, yes.

MR. ADLER: Okay I'll make that motion to approve this addendum as modified/directed today, however you want.

CHAIRMAN LUISI: That sounds good, okay the motion by Bill Adler; move to approve Addendum XXVII as modified today. Do I have a second? David Simpson. Any discussion on the motion?

DR. DANIEL: Point of Order, Mr. Chairman I think you said XXVII.

CHAIRMAN LUISI: Yes it is XXVII, it says XXVI, but we are on Addendum XXVII. Thank you. Any discussion on the motion?

MR. FOTE: This is tearing New Jersey, because we don't want to vote for black sea bass yet we want to vote for summer flounder. In the spirit of cooperation I am going to have to support the motion.

CHAIRMAN LUISI: All right thanks, Tom. Because this is final action we're going to need to take a roll call vote, and since New Jersey is going to support I'm kind of looking for – **is there any objection to the motion? Seeing no objection the motion passes unanimously.** Thank you! Okay we are pressing up against some time difficulty here today.

We have another meeting after this one, so what I am going to do is ask Kirby to very quickly go through what he had planned for Agenda Item 6 and Agenda Item 7, and we will just try to limit any discussion or questions on those items. I just wanted to make sure that you guys had the information that they plan to present. But we will be selecting a Vice-Chair before we leave. That is one thing we're doing.

SET 2016 SCUP RECREATIONAL FISHERY SPECIFICATIONS

MR. ROOTES-MURDY: We'll go through this very quickly. We are going to go through scup and then we're going to go through sea bass. For scup the board approved the federal measures in December of 2015 for 2016. They are 9 inch minimum size, 50 fish possession limit and open season from January 1 to December 31st. The board moved to continue the regional approach in state waters for 2016, and finalize state measures at the winter meeting.

There are no proposals for new management measures in 2016. This is a background in terms of what the harvest was. In 2015, 70 percent of the RHL was achieved, the northern region could liberalize by 28 percent, but as I mentioned there has been no interest from the states or indicated by the states to change.

The states of Massachusetts, Rhode Island, Connecticut, and New York will maintain status quo measures; 10 inch minimum size, 30 fish possession limit, and an open season of May 1 through December 31st. With a single bonus season Wave for the for-hire vessels at 45 fish possession limit.

The states of New Jersey through North Carolina will set their measures consistent with the federal measures set in December. Because states are staying status quo there is no need for a motion on scup recreational management measures in 2016. If you have any questions let me know.

CHAIRMAN LUISI: Any questions? Seeing none; go ahead, Kirby move on to the next agenda item.

MR. ROOTES-MURDY: All right so for black sea bass, I am going to go through it quickly, but switch it over to John to walk through the Technical Committee's comments on the sea bass proposals. In December of 2015 the board and council voted to continue the ad hoc regional approach stipulated to include it in Addendum XXVII.

The regions have two sets of proposals, there is the northern region proposal that John is going to walk through and then the southern states agreed to set their measures consistent with the federal regulations. Again it is an if/then approach that is applied under that condition. In 2015 total harvest is estimated to be about 3.64 million pounds for black sea bass.

The RHL is 2.3 million pounds, so there is an overage; there is a need to take a 23 percent reduction. The 2016 RHL is going to be 2.82 million pounds and 97 percent of the harvest in 2015 was accounted for through the northern region which is the states of Massachusetts through New Jersey. I'll turn it over to John now to go through the Technical Committee review.

MR. MANISCALCO: As usual the Technical Committee is seeking board approval of methodologies and general principles for future consideration of Wave 6 data, which will be available in mid-February, and public input into final measures adopted by each state. Use of minimum size, increases in harvest reductions; a number of states have submitted proposals with minimum size increases.

When you do that what you're doing is you're increasing the average fish size and the average fish weight of those harvested, which means the full reduction is not necessarily being realized and the TC will address that in a methodology sometime in 2016, so that in the future we can consider that properly. Success in meeting our harvest reductions varies year to year and from state to state, but under the current construct the entire region is subject to the same uniform reduction. If states are unhappy with this arrangement then a different management scheme will be necessary. Regulatory complexity continues to be a problem. We have different possession limits and season lengths, depending on mode and wave in a given state.

This results in calculation and evaluation difficulties. Methods across states have not yet been standardized and some TC members object to liberalizing aspects of measures during a reduction. For example, increasing a minimum size limit and regaining 30 days to your season. Under ad hoc regional management we're not required, but states are encouraged to develop consistent regulations. Measures from state to state lack any sense of consistency. One TC member suggested that future liberalizations when that happens be utilized to create greater regional consistency. As you all know, current management is heavily impaired by catch limits, repeated year-to-year reductions in the face of incredible availability has eroded the ability, credibility and compliance of the fisheries.

There is a 26 benchmark stock assessment to be peer reviewed for December, 2016. Post review new regional alignments may be appropriate. Currently the northern region goes from Massachusetts through New Jersey, and I think New Jersey noted that in their proposal that in the event that the stock assessment includes spatial structure that their placement in the northern region be reconsidered.

On to the state-by-state proposals, Massachusetts in 2015 had a 14 inch minimum size limit, eight fish, and they fished from late in May to the end of August. Their proposals consider using season length and bag limit to achieve the reduction. I am not going to dwell on any individual table for the sake of time.

Rhode Island's 2015 regulations were 14 inch minimum size, one fish for July and August, and then seven fish from September through December. They also used season length and bag limit to achieve their reduction. An additional proposal from Rhode Island considered a load split. In this case, so TC has opposed most splits in the past due to data quality issues, regulatory complexity, and the future difficulties with calculating and evaluating such proposals.

Regardless, most of those have occurred in Connecticut and Massachusetts. The for-hire portion of the black sea bass fishery is relatively small in Rhode Island, and the TC member from Rhode Island calculated it greater than 23 percent reduction to account for some of this uncertainty. However, the most split suggested is optional, meaning for-hire vessels can opt in, which produces additional issues with MRIP data; potentially biasing estimates and confounding the data.

Connecticut in 2015 had a 14 inch minimum size and a mode split, their private mode has three fish from June through August and then five fish from September through December. Their party and charter program had eight fish from late June through the end of December 31st. Connecticut wishes to continue their mode split, however it is not an optional program so some of that data confounding issues do not exist. There are additional reporting requirements for this program. I should say that Rhode Island also implied that they would also impose additional reporting programs for their mode split. Connecticut, their proposal includes minimum size limit changes, season length changes and possession limit changes. New York had a 14 inch minimum size, eight fish and mid-July to the end of December 31st. They will be using season length changes and possession limit changes to achieve the reduction, including multiple possession limits, possession limits differing by Wave.

New Jersey's recreational 2015 fishery included a 12.5 inch minimum size and possession limits that vary from 15 fish to 2 fish. They fished for the last half of Wave 3, the month of July and then from the end of October through December 31st. Their proposals include changes to the minimum size limit, season length, and bag limit to achieve the necessary reduction. That is all I have.

CHAIRMAN LUISI: Okay thank you, any questions? Dave Simpson.

MR. SIMPSON: Yes, just one clarification that Connecticut's party charter letter of authorization program; it is optional, they have to opt in. That obligates them to provide the logbook reports, which is one of the things we really wanted. It does appear that the logbook number is a fair bit higher than the MRIP estimate for that mode, and that is one of the things we wanted to learn about it. But I just want to make that clarification.

MS. MESERVE: A question for John. Is it appropriate to characterize the TCs review of the Rhode Island and Connecticut proposals about the mode within a mode option that Dave just referenced as the TC not endorsing them, because of the implications for MRIP and ability to project regulatory adjustments in future years?

MR. MANISCALCO: That is correct. A mode split, especially when you have potentially different regulations within the same mode, create difficulties in terms of potential bias in the estimates; because once one portion of that mode, we'll say some charterboats might be fishing under different conditions during a season that is otherwise closed to the rest of the charter fleet.

But the way effort is estimated those catches are potentially applied to all charter vessels, for example, so the data is confounded and the estimate potentially biased. Then in future years when you want to try to utilize the intercept data to generate regulations, it is problematic.

MR. SIMPSON: I'm embarrassed. I have to correct my correction. Greg is right. This past year it was mandated. When we changed the season we mandated the party and charterboats what the different season prompted that. Party and charterboats started three weeks later this year than the private sector fishery. I apologize for the confusion.

CHAIRMAN LUISI: I'm surprised you were confused over all that up there. It is quite a challenge to try to figure out and it speaks to the point of how confusing things can often get when we're trying to maximize or make the best use of the resource we're managing. I do need a board action here.

What I do need is an approval of the state specific proposals based on the TC recommendation, and in addition to that we also need the board approval of the methodologies that are used in calculating these regulations, just in case there are changes that happen as a result of the Wave 6 data, which will be upon us shortly.

MR. NOWALSKY: We saw a couple of points of information in that last presentation, TC concerns about increase in size not necessarily gaining the full reduction required. Generally the increase in size is used to offset some change in season. We've historically heard that the best way to constrain the harvest, again according to the data by the TC, is through changes in the number of days, reducing it.

We've also heard today that as these regulations become more restrictive, it has been promoting more noncompliance. The more days open that we have with lower bag limits is promoting noncompliance with that issue. **I am prepared to make a motion to approve the methodologies as presented today. However, no state may have more open days in any mode in 2016 than in 2015.**

CHAIRMAN LUISI: Okay let's get that on the board.

MR. NOWALSKY: Would it help if I repeated that at this point?

CHAIRMAN LUISI: I think we have it. It must be up on the ceiling; Toni is looking on the ceiling.

MR. NOWALSKY: Yes, I just also included the by mode, because we have a number of different modes in a couple of different states at this point.

CHAIRMAN LUISI: I was of the understanding that due to lack of support by the TC on the mode specific options that that wouldn't be part of what the TC was recommending.

MR. NOWALSKY: Well, I believe we're already doing it in Massachusetts and Connecticut, and it looked like the Rhode Island proposal was approved.

MR. CLARK: At one time Massachusetts did have a mode split. They removed it. Rhode Island has a proposal for a mode split this year, and Connecticut has an ongoing mode split.

MR. NOWALSKY: Again, I would just perfect that with no state may have more open days in any mode in 2016 than in 2015.

CHAIRMAN LUISI: Okay we have a motion; do we have a second for the motion? Pat Augustine seconds the motion. Discussion on the motion.

MR. SIMPSON: I'm opposed to the motion, because I don't think there is good evidence to support Adam's suggestion that limiting days is more effective than bag limit. I think I could make a very good argument, but especially in the party charter mode. Limiting the bag drastically limits their incentive to book trips and sell trips and so forth.

It is even true in the recreational fishery. When we are at three fish in July and August, they're not targeting those fish it is a bycatch allowance. I think all of us do this balancing act, right of even with the little state of Connecticut. The variation in the fishery from east to west is fairly profound, so where folks in the Central Sound and Western Sound see fish very early in the season, in the east they do not. Last year was a compromise, we added three weeks to the season to, for the first time in two or three years, give the folks in the Central and Western Sound a little opportunity to take sea bass. I'm opposed to putting any additional restrictions on states as they develop options.

CHAIRMAN LUISI: Okay we had a comment in opposition. Given the time I am going to go back and forth. Do we have anyone that would like to speak in support of the motion? Okay seeing none; I would like to call the question. Why don't we take 30 seconds to caucus? Okay is the board ready for the question? **All those in favor of the motion please raise your hand, 1, all those opposed; that is 8 opposed, any abstentions, 4, null votes; seeing none, the motion fails for lack of a majority.** Okay back to the board.

MS. MESERVE: I would make a motion to approve the black sea bass proposals and methodologies for use in 2016 management as recommended by the Technical Committee, with the exception of the mode within a mode splitting. By that I mean the Connecticut and Rhode Island options or other states that have an optional program for their for-hire fleets. If I get a second I'll speak to the motion.

CHAIRMAN LUISI: Okay Nicola, let's get that up in the way that you want to see it and then I'll ask for a second.

MS. MESERVE: Mode within a mode or the optional for-hire programs.

CHAIRMAN LUISI: How does that read?

MS. MESERVE: With the exception of the mode within a mode splitting within the for-hire fisheries.

CHAIRMAN LUISI: Do you want fisheries up there or program is okay? Let's put fisheries up there. Okay do I have a second for the motion on the board? Seeing no second; the motion fails for lack of a second; back to the board for additional consideration on the issue.

MR. GIBSON: I would move simply the first part of the motion, move to approve the black sea bass proposal methodologies for use in 2016 management as recommended by the Technical Committee.

CHAIRMAN LUISI: Okay we have a motion by Mark Gibson, is there a second; Steve Heins. Any discussion on the motion?

MR. AUGUSTINE: Yes Mr. Chairman, clarification, would it not be appropriate to do it in one motion, because the other part is the state recommendations that the TC reviewed? The state proposals and TC recommendations, isn't that what we're trying to accomplish?

CHAIRMAN LUISI: I think everything is in here. It says the black sea bass proposals and methodologies for 2016.

MR. AUGUSTINE: Okay, I thought the state would be in there but that's fine, got it.

CHAIRMAN LUISI: It is the whole package. Any additional comments, is the board ready for the question? Do you need time to caucus? Okay not seeing any let's go ahead and call the question. **All those in favor of the motion please raise your hand, it is 11, all those opposed same sign; it is 1, any abstentions, null votes? Seeing none; motion carries**. Thank you.

UPDATE ON THE BLACK SEA BASS AND SUMMER FLOUNDER AMENDMENTS

CHAIRMAN LUISI: We have one very quick item on the agenda Kirby is going to provide. He told me it would take a minute, so let's see what he can do here, just a quick update on the black sea bass and summer flounder amendments and then I'll be looking to someone on the board to provide nominations for the Vice-Chair.

MR. ROOTES-MURDY: As I said, I'll go through this very quickly. In August of 2015 the board and council agreed to initiate a scoping process for the draft scup amendment before the amendment before the end of the year. In October of 2015 the council discussed tabling the scup amendment process and to move forward with a new black sea bass amendment.

In December of 2015 the board and council agreed to initiate a draft amendment for black sea bass and to effectively table the scup amendment. The board expressed interest in addressing black sea bass ahead of scup due to some of the current challenges; these include the 2016 benchmark stock assessment, overages in harvest limits over the recent years, commercial landings accountability, and regional approaches to recreational management.

The next steps and these are loosely set forward right now. We do not have an official timetable, but between council and commission staff we're working on the following. The Summer Flounder Amendment, the FMAP would convene over the spring and summer to begin development of management alternatives to be included in the draft amendment, and those draft amendment alternatives would be presented to the board and council at the August, 2016 joint meeting for feedback.

For black sea bass the draft amendment would proceed with a draft scoping document that would be developed over the spring and summer of 2016, and the board would consider that draft document for public comment at that joint August, 2016 meeting. Following that meeting we would move to have a public comment period and scoping hearings in the fall of 2016. I will take any questions if there are at this point.

CHAIRMAN LUISI: Any questions for Kirby okay seeing none; thanks for the presentation, Kirby and I'm sure there will be a lot more to follow up throughout this year on those two amendments.

ELECTION OF VICE-CHAIR

All right the last item on the agenda is for the election of a Vice-Chair.

MR. HEINS: **Mr. Chairman, I nominate Bob Ballou from the Ocean State for Vice-Chairman of the Summer Flounder, Scup and Black Sea Bass Board.**

CHAIRMAN LUISI: Okay we have a motion for Bob Ballou, you can't second that Pat. David Simpson seconds.

MR. AUGUSTINE: You know I want to make a motion. I move that the board cast one vote on behalf of Bob Ballou, greet the new Vice-Chairman of this board.

CHAIRMAN LUISI: Is there any opposition to having Bob serve as our Vice-Chair on this board? **Seeing none; the motion is approved and this is an absolutely classic example of why you should not leave the table and go somewhere else when your name could get called.** No, looking forward to working with Bob. Are there any items to come to the board under new business? Okay motion to adjourn my Bill Adler. Yes, Brandon.

MR. MUFFLEY: Sorry Mr. Chairman, not that I want to hold us up, but do we need to go back and revisit the discussion we had earlier about revisiting overages and how we address those types of issues going forward, or we were just under the assumption we're going to try to do something going forward on that?

CHAIRMAN LUISI: I had planned to talk about it now, but since we talked about it already. I think what I'll do is I'll work with staff to try to get something planned for a discussion at our next meeting in the spring, and we'll move forward from there.

ADJOURNMENT

CHAIRMAN LUISI: Okay I have the motion to adjourn. We are adjourned, see you all later. Thank you.

(Whereupon the meeting was adjourned at 5:36 o'clock p.m. on February 2, 2016.)

Atlantic States Marine Fisheries Commission

ADDENDUM XXVII TO THE SUMMER FLOUNDER, SCUP, BLACK SEA BASS FISHERY MANAGEMENT PLAN

Summer Flounder and Black Sea Bass Recreational Management in 2016

ASMFC Vision: Sustainably Managing Atlantic Coastal Fisheries

Approved February 2, 2016

1.0 Introduction

This Addendum is adopted under the adaptive management/framework procedures of Amendment 12 and Framework 2 that are a part of the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (FMP). Summer flounder, scup, and black sea bass fisheries are managed cooperatively by the states through the Atlantic States Marine Fisheries Commission (Commission) in state waters (0-3 miles), and through the Mid-Atlantic Fishery Management Council (Council) and the NOAA Fisheries in federal waters (3-200 miles). The management unit for summer flounder, scup, and black sea bass in US waters is the western Atlantic Ocean from the southern border of North Carolina northward to the US-Canadian border.

The Commission's Summer Flounder, Scup, and Black Sea Bass Management Board (Board) approved the following motions on November 2, 2015:

1) *Move to initiate an addendum to extend ad hoc regional management for black sea bass recreational fisheries in 2016 and 2017.*
2) *Move to initiate an addendum to address the discrepancies in measures within Delaware Bay.*

This Addendum establishes management of the 2016 recreational summer flounder and black sea bass fisheries.

2.0 Overview

2.1 Statement of the Problem

2.1.1 Summer Flounder

It is important that Commission FMPs strive to provide recreational anglers with equitable access to shared fishery resources throughout the range of each managed species. While equitable access is difficult to characterize, it generally relates to the distribution, abundance, and size composition of the resource with the abundance and distribution of anglers along the coast.

To address the growing concern over equitable access to the resource through state-by-state management measures developed under conservation equivalency, the Board approved Addendum XXV in February 2014 to adopt regional management for the summer flounder recreational fishery for one year. Regions were defined as following: 1) Massachusetts, 2) Rhode Island, 3) Connecticut-New Jersey, 4) Delaware-Virginia, and 5) North Carolina. As Addendum XXV was only specified for 2014, Addendum XXVI continued regional management in 2015 and 2016.

This addendum replaces addendum XXVI, continues regional management, and establishes a management program that allows New Jersey area specific regulations in the Delaware Bay under regional management for 2016 only.

2.1.2 Black Sea Bass

During the past 15 years, the black sea bass recreational harvest target was exceeded seven times, most recently in 2010, 2012-2014 when the harvest target was the lowest in the time series. Extremely high availability of black sea bass in the northern states (Massachusetts through New Jersey) is resulting in recreational overages despite very restrictive management measures. For the past few years, catch and harvest limits have been set at levels that are not reflective of current abundance, placing undue stress on the fisheries. For 2016, catch limits were set using as new method which incorporates important abundance indices. The Commission's Summer Flounder, Scup, and Black Sea Bass Technical Committee (Technical Committee) recognizes this is a positive step toward reconciling the disconnect between abundance, catch limits, and harvest. The Technical Committee expects this will reduce recreational management uncertainty in 2016.

The FMP for black sea bass does not provide an opportunity to craft recreational management measures by regions or state, it only allows for a set of coastwide management measures. Due to the wide geographic range of black sea bass, the application of coastwide minimum size, possession limit, and season restrictions may not affect every area involved in the fishery the same way. Starting in 2011, the Board approved addenda which allowed for state-specific and regional management measures. These addenda addressed the concern that the coastwide regulations have disproportionately impacted states within the management unit. Each of the addenda have had a sunset provision that for either one or two years. The provisions of the most recent addendum (XXV) expires at the end of 2015, and without a new addendum the FMP will require coastwide regulations. This addendum continues the ad hoc regional approach for 2016 with the option of extending it through 2017 by Board action.

2.2 Background

2.2.1 Summer flounder

Amendment 2 (1993), which introduced quota-based management to the summer flounder fishery, initially required each state (Massachusetts to North Carolina) to adopt the same minimum size and possession limit as established in federal waters, allowing only for different open seasons. The consistent measures were intended to achieve conservation equivalency in all state and federal waters throughout the species range. However, states soon found that one set of management measures applied coastwide did not achieve equivalent conservation due to the significant geographic differences in summer flounder abundance and size composition.

To address this disparity, the FMP was amended (in 2001 via Addendum IV and again in 2003 via Addendum VIII) to allow for the use of state conservation equivalency to manage recreational harvests. From 2001-2013, the FMP has allowed for, and the Commission and Council utilized, a state-by-state allocation formula based on estimates of state recreational landings in 1998, to establish individual state harvest targets. Individual states have the flexibility to tailor their regulations – namely, minimum size, possession, and season limits – to meet the needs and interests of their fishermen, provided that the targets are not exceeded. The individual state allocations, as a percentage of the total coastwide recreational harvest limit, are set forth in Table 2.

Re-assessing in the Face of Changing Conditions:

The interim solution of state-by-state conservation equivalency based on estimated state harvests in 1998 was successful initially in mitigating the disparity in conservation burden among states, but the approach is increasingly being viewed as an inadequate long-term solution given recent changes in resource status and fishery performance. Seventeen years have passed since 1998. Even if the allocations were perfectly equitable when adopted over a decade ago, they are now likely out of synch given the substantial variation in stock dynamics that has occurred since then. Over the many years since Amendment 2 was first implemented, the summer flounder spawning stock biomass has increased approximately six-fold, and the number of age classes has increased from 2-3 to 7 or more. These changes have led to geographic shifts in the distribution of the resource (As the stock has rebuilt, its range has expanded). Climate change may also be contributing to shifts in migratory patterns, spatially and temporally. Taken together, these changing conditions have altered the dynamics regarding the challenge of maintaining balance in equivalent conservation burden across the management unit.

Further, the 1998-based allocation formula set forth by the FMP does not reflect changes in socio-economic patterns over the past sixteen years, particularly with regard to the number and distribution of anglers along the coast. During this time, estimates of angler participation have increased 33% from 4.6 million in 1998 to 6.1 million in 2014 (Table 3). Harvest by fishing mode (Shore-based, Party/Charter, and Private/Rental) have also changed over time, with a larger percentage of harvest coming from private and rental boats in recent years (Table 4). Summer Flounder Advisory Panel members for the Commission and Council have noted the continual rise in the cost of fuel, bait and other trip expenditures have impacted anglers financially.

Finally, any attempt to allocate harvest opportunities on the basis of estimated recreational harvests for a given year is necessarily fraught with uncertainty and error, given the general difficulty of measuring recreational catch and effort on a state-by-state basis. Over the past seventeen years, there have seen strides made by NOAA Fisheries to more accurately estimate catch and effort data by reducing the potential for bias. This has been and will continue to be a process in improving precision in estimates for species such as summer flounder, due to factors including weighting survey intercepts, variety of fishing modes, and catch rates.

Alternative Approaches:
A more realistic and flexible gauge of equitable conservation may be needed to enable the summer flounder management program to adjust to past, current, and future changes in the resource and the fishery. The biological characteristics of the summer flounder stock have changed with the rebuilding of the stock. In particular, there has been a substantial expansion in the size and age composition, as more large summer flounder and greater overall abundance have resulted from management conservation measures over the course of a decade. Since 2011 there have been reductions in the recreational harvest limit (RHL) partly because the spawning stock biomass has been less than the biomass target (SSBMSY proxy = SSB35% = 137.555 million pounds). In addition, from 2010-2013 recruitment was below average. These two stock conditions could lower future recreational harvest limits, presenting additional challenges to equitability in fishing and harvest opportunities among states.

2.2.2 Black Sea Bass
The black sea bass recreational fishery is managed on a “target quota” basis. Fifty-one percent of the total allowable landings are allocated as a recreational harvest target and

forty-nine percent is allocated to the commercial sector. From 1996 to 2010, a uniform coastwide size, season, and bag limits had been used by the Commission and Council to constrain the recreational fishery to the annual RHL (Table 5). States were concerned the coastwide regulations disproportionately impacted states within the management unit; therefore, the Board approved several addenda which allowed for state-by-state and regional measures for 2011 through 2013 in state waters only. Each of the addenda expired at the end of one year. The Board passed Addendum XXIII in 2013 to provide the necessary management flexibility to mitigate potential disproportionate impacts through the use of regional ad hoc management. Table 6 shows the individual state regulations for the 2015 fishing year. In 2015, the coastwide harvest is estimated at 3.52 million pounds through wave 5 and is approximately 1.19 million pounds over the harvest limit (2.33 million pounds) (Tables 5 and 7). The FMP for black sea bass does not provide an opportunity to craft recreational measures by regions or state, it only allowed for a single coastwide measure. Due to the wide geographic range of this species, the application of coastwide minimum size, possession limit, and season restrictions may not affect every area involved in the fishery the same way. Additionally, black sea bass migrations may result in differences in availability to the recreational fishery in each state.

2.3 Description of the Fishery

2.3.1 Summer Flounder

In practice, the recreational fishery for summer flounder is managed on a "target quota" basis. A set portion of the total allowable landings is established as a RHL, and management measures are implemented by the states that can reasonably be expected to constrain the recreational fishery to this limit each year. Managing the RHL with a quota system is not practical because landings data are not available in a timely manner.

In assessing the performance of the summer flounder recreational fishery over the last 6 years, fishing opportunities and success vary across the range of the management unit (Appendix A assesses the performance of summer flounder fishery from 2009 through wave 4 of 2015). Using metrics including retention rate, fishing trips, possession limits, season length, and scoring each state in relation to each of other, the fishing opportunity differs on a state-by-state basis with little to no regional distinction; for example, retention rates are highest in the states of Virginia, Delaware Rhode Island, and Massachusetts, and the lowest in New York, New Jersey, and Maryland (Tables 9A-9D). Fishing seasons also vary significantly along the coast, with states such as Delaware through North Carolina open all year, while Connecticut through New Jersey have the shortest seasons within the management unit (128 days in recent years). Interest or avidity in relation to successful trips also varies widely as well; for example, trips targeting summer flounder are lowest in Massachusetts (2.1-2.78 % of all trips between 2013-2015) and highest in New Jersey and New York, yet the highest success rates for targeted trips in relation to harvest is in Massachusetts (Tables 9A-9D). Bag limits also vary across the states from the most restrictive in Delaware through Virginia (4 fish possession limit) to least in Rhode Island (8 fish possession limit). In comparing states to their nearest neighboring state regarding size limit, Massachusetts[1] and New Jersey have the highest difference between their two neighbors (2 inch average difference compared to Rhode Island in recent years) and

[1] Please note that Massachusetts has only one neighboring state with a declared interested in Summer Flounder, which increases the weighting of size limit difference relative to Rhode Island.

smallest average difference between neighbors was Connecticut, New York, and Maryland. In scoring the recreational performance in recent years, New Jersey has had the largest drop in score relative to other states' performance (below average in 2013 to <-2 in 2015).

Recreational Survey Estimates
The Marine Recreational Information Program, or MRIP, is the new way NOAA Fisheries is counting and reporting marine recreational catch and effort. It is an angler-driven initiative that will not only produce better estimates, but will do so through a process grounded in the principles of transparency, accountability and engagement. MRIP replaces the Marine Recreational Fisheries Statistics Survey, or MRFSS, which has been in place since 1979. MRIP is designed to meet two critical needs: (1) provide the detailed, timely, scientifically sound estimates that fisheries managers, stock assessors and marine scientists need to ensure the sustainability of ocean resources and (2) address head-on stakeholder concerns about the reliability and credibility of recreational fishing catch and effort estimates.

The MRIP is an evolving program with ongoing improvements. Most recently, NOAA Fisheries scientists, in partnership with leading outside experts, have created an improved method for estimating recreational catch using data from existing shoreside angler survey data as well as moving from the phone survey to an improved mail survey. The new method addresses a major concern raised by the National Research Council's evaluation of MRFSS –that the MRFSS catch estimation method was not correctly matched with the sampling design used gathering data, leading to potential bias in the estimates. Eliminating potential sources of bias is a fundamental change that lays the groundwork for future improvement and innovations, many of which are already being piloted and implemented. More detailed information on the improvement to the MRIP program can be found at http://www.st.nmfs.noaa.gov/recreational-fisheries/index .

2.3.2 Black Sea Bass
Black sea bass are generally considered structure oriented, preferring live-bottom and reef habitats. Within the stock area, distribution changes occur on a seasonal basis and the extent of the seasonal change varies by location. In the northern end of the range (Massachusetts to New York), sea bass move offshore crossing the continental shelf, then south along the shelf edge. By late winter, northern fish may travel as far south as Virginia, however most return to the northern inshore areas by May. Black sea bass along the Mid-Atlantic (New Jersey to Maryland) head offshore to the shelf edge during late autumn, traveling in a southeasterly direction. They also return inshore in spring to the general area from which they originated, (Moser and Shepherd, 2009). Black sea bass in the southern end of the stock range (Virginia and North Carolina) move offshore in late autumn/early winter. Because they are close to the continental shelf, they transit a relatively short distance, due east, to reach over-wintering areas (Moser and Shepherd, 2009). Fisheries also change seasonally with changes in distribution; recreational fisheries generally occur during the period that sea bass are inshore.

An examination of the previous five years of recreational harvest data shows there is no systematic pattern in state harvest. For the past three years, the states of Massachusetts, New York and New Jersey make up the majority of the coastwide harvest. An examination of average state-specific MRIP harvest estimates by 'Area Harvested' (State v. EEZ waters) for the last three years indicate that the majority of the black sea bass fishery occurs in state waters in Massachusetts, Rhode Island, Connecticut, and New York (60%). For the states of New Jersey to North Carolina, the majority of fishery operates in the waters of the EEZ (NJ and VA 31% and DE, MD and NC 9%).

2.4 Status of the Stock

2.4.1 Summer Flounder

The most recent peer-reviewed benchmark assessment for summer flounder (SAW 57, NEFSC 2013) was updated in July 2015. The assessment uses an age-structured assessment model called ASAP. Results of the assessment update indicate that the summer flounder stock was not overfished but overfishing was occurring in 2014 relative to the updated biological reference points established in the 2013 SAW 57 assessment. The fishing mortality rate has been below its threshold since 1997, but was estimated to be 0.359 in 2014, above the threshold fishing mortality reference point F_{MSY} = 0.309. Spawning stock biomass (SSB) was estimated to be 88.9 million pounds (40,323 mt) in 2014, about 65% of the SSB_{MSY} = 137.6 million pounds (62,394 mt). The 2014 year class is estimated to be about 41 million fish, higher than the previous four below average year classes in 2010-2013 (34, 20, 23, and 27 million fish). NOAA Fisheries declared the summer flounder stock rebuilt in 2010, based on the 2011 assessment update.

2.4.2 Black Sea Bass

The most recently approved benchmark assessment on black sea bass was peer-reviewed and accepted in December 2008 by the Data Poor Stock Work Group (DPSWG) Peer Review Panel. Based on the June 2012 update, the stock is not overfished and overfishing is not occurring, relative to the biological reference points. Fishing mortality in 2011 was F = 0.21, below the fishing mortality threshold. Estimates for 2011 total biomass remain above the biomass maximum sustainable yield. SSB in 2011 was 24.6 million pounds, which is 0.6 million pounds above the SSB_{MSY} target (24 million pounds) and a small decrease from the 2010 SSB estimate. Recruitment at age 1 averaged 26.4 million fish during 1968-1999 and 2000, peaking at 56 million fish. Recruitment estimated by the model was relatively constant through the time series with the exception of high recruitment in the 1975, 1999, and 2001 year classes. The 2011 year class was 21.0 million fish.

3.0 Management Program

3.1 Summer Flounder Recreational Fisheries Management

Adaptive Regional Management

The 2016 summer flounder recreational fishery will divide the coast into six management regions: 1) Massachusetts 2) Rhode Island 3) Connecticut-New York 4) New Jersey 5) Delaware-Virginia and 6) North Carolina. The combined management program of all 6 regions is designed to not exceed the 2016 recreational harvest limit.

Dividing the coastal states into regions allows states the flexibility to mitigate potential disproportionate impacts resulting from coastwide measures. Additionally, regional management allows states to pursue more equitable harvest opportunities, while providing consistent measures to states within the same region, in many cases sharing the same fishing grounds. **This management program is not intended to implement new state allocations and is not intended to set a precedent for new state allocations. Under the adaptive regional approach, states would not give up their (1998-based) allocated portion of the RHL and would not be held accountable for anything other than their allocated portion of the RHL. Lastly, states would retain the future opportunity to continue managing their fisheries in accordance with their allocated portion of the RHL.**

Under adaptive regional management, the Technical Committee will develop proposed measures for each region that, when combined with all regions, would constrain the coastwide harvest to the RHL. The measures will be similar to the 2014 and 2015 regulations for each state, but allow for some flexibility to achieve consistent harvest opportunities among the regions. States within each region would be required to implement the same bag, size limits and season length. Each state would implement a season that, when combined with the other states' seasons length and regional bag and size limit, will constrain the combined regions harvest to the coastwide RHL. Individual state regions (e.g. Massachusetts, Rhode Island, and North Carolina in 2014 and 2015) may set area specific management measures. Once the Technical Committee develops proposed measures for each region, the Board would review and approve a set of regional regulations that, when combined, would constrain the coastwide harvest to the RHL.

For 2016, New Jersey will become its own region. New Jersey would become its own region due to the stipulation outlined under ASMFC Addenda XIV and XVII and the MAFMC's Framework 2 that require each state within a region to have the same management measures. This management program allows more equitable regulations in Delaware Bay between Delaware and New Jersey by allowing New Jersey to craft different regulations on the New Jersey side of Delaware Bay (NJ DelBay) and the rest of New Jersey. Outside of Delaware Bay, the New Jersey regulations will remain consistent (i.e. same size limit, possession limit, and season length) with those in the Northern Region of New York and Connecticut; while the New Jersey Delaware Bay area will have a similar size limit as Delaware, the same possession limit as Delaware and the same season as the rest of New Jersey north of Delaware Bay. The line of demarcation will be along the COLREGS Demarcation Line at the western end of Cape May. Example regional management measures for 2016 are listed in Table 1.

This management program allows for a smaller size limit on New Jersey's portion of Delaware Bay to create a more equitable size limit difference (e.g. 1 inch difference versus the 2 inch difference in 2014 and 2015) while at the same time constraining harvest with a lower possession limit and shorter season. Based on analysis using preliminary 2015 harvest estimates, an additional 5,455 fish or 1% of the New Jersey Delaware Bay total harvest, when compared to the status quo option would be needed under the example option below. This additional amount of fish would be available because the projected harvest estimates for all the regions combined is anticipated to be below the 2016 RHL.

In 2014 and 2015, Connecticut and New Jersey allowed for a separate shore-based minimum size limit (e.g. 16 TL minimum size) at select sites. This was allowed under regional management as all states in the region had and continue to have the option to have shore-based management measures. Under this option, both Connecticut and New Jersey will plan to continue the separate shore-based minimum size limit in 2016 at select sites under this option in each of their respective regions.

Table 1. Example 2016 Regional Management Measures

STATE	Example Size Limit	Example Possession Limit	Example Season (in number of days)	2016 Regional Harvest Estimate	2016 RHL
MASSACHUSETTS	16"	5	132	77,899	
RHODE ISLAND	18"	8	245	158,185	
CONNECTICUT	18"	5	128		
NEW YORK	18"	5	128	596,823	
NEW JERSEY*	18"	5	128		
NEW JERSEY/ DELAWARE BAY COLREGS**	17"	4	128	490,626	
DELAWARE	16"	4	365		
MARYLAND	16"	4	365	244,852	
VIRGINIA	16"	4	365		
NORTH CAROLINA	15"	6	365	39,466	
Total				1,607,852	1,882,562

***New Jersey east of the COLREGS line at Cape May, NJ will have management measures consistent with the northern region of Connecticut – New York.**
****New Jersey west of the COLREGS line at Cape May, NJ inside Delaware Bay will have a similar size limit to the southern region (DE-VA), the same possession limit as the southern region (DE-VA), and the same season length as the northern region of Connecticut – New York.**

3.1.1 Timeframe for Summer Flounder Measures

For 2016 fishing year only

The regions approved in section 3.1 of this addendum are effective immediately and will expire at the end of 2016 (December 31, 2016). States will go through their administrative procedure to implement regional management measures in early spring 2016. After 2016, the management program would revert back to the FMP status quo: The Board and Council specify coastwide measures to achieve a coastwide recreational harvest limit or permit conservation equivalent management measures (e.g. state-by-state measures or voluntary regions) using guidelines agreed upon by both management authorities in Framework 2 and Addenda XIV and XVII.

3.2 Black Sea Bass Recreational Fisheries Management

Ad Hoc Regional Measures for 2016

This addendum establishes a northern and southern region. The northern region will contain the states of Massachusetts through New Jersey and the southern region will contain the states of Delaware through North Carolina (North of Cape Hatteras). All states will agree to the regulations implemented within the region. While not required, states will work to develop consistent regulations to allow for similar recreational management programs within the region. The northern region states of Massachusetts through New Jersey will reduce their regulations based on the region's performance in 2015. The northern region states will implement recreational black sea bass management programs that utilize minimum size limits, maximum possession limits and seasonal closures designed to achieve the required coastwide reduction for 2016 of 23% compared to 2015 projected harvest. The southern region states will set their management measures consistent with the federal measures. Federal measures will be set by NOAA Fisheries in the late spring of 2016. The Technical Committee recommends the following 2016 federal measures: 12.5 inch TL minimum size, 15 fish possession limit, and open season of May 15-September 21 and October 22-December 31. The regulations of the two regions combined will meet the require reduction to achieve the 2016 RHL (2.82 million).

If the northern region state measures do not address the required reduction, a backup set of measures will need to be implemented to constrain landings to the 2016 RHL. The Technical Committee recommends the backup coastwide measures include a 14 inch TL minimum size, 3 fish possession limit, and an open season from July 15-September 15.

Reduction tables, provided by the Technical Committee, will be used to determine which suite of possession limits, size limits and closed seasons would constrain recreational landings to the recreational harvest limit for the state/region. Tables would be adjusted for each region to account for past effectiveness of the regulations. Each region would propose a combination of size limit, possession limit, and closed seasons that would constrain landings to the appropriate level. These regulations will be reviewed by the Technical Committee and approved by the Board.

Note: The 23% reduction in harvest necessary to achieve the RHL is based on preliminary harvest estimates and projections for the remainder of 2015. This value may change as new data are made available.

The federal FMP does not allow for conservation equivalency and would require an amendment to the FMP to make the necessary changes consistent with those in this addendum; therefore, a single coastwide measure is set in federal waters. Federal permit holders have to follow regulations set by the NOAA Fisheries regardless of where they are fishing.

3.2.1 Timeframe for Black Sea Bass Measures

For 2016 fishing year, one year extension option

The regions approved in section 3.2 of this addendum are effective immediately. The final state waters measures for the northern region states will be available in Spring 2016. The Board can take action, through a Board vote, to extend the provisions in section 3.2 ad hoc regional black sea bass management for one year, expiring at the end of 2017 (December 31, 2017). After 2016, measures will revert back to the FMP status quo: one set of coastwide measures in both state and federal waters.

4.0 Compliance:
The management programs for summer flounder and black sea bass contained in Section 3.0 of Addendum XXVII are effective immediately upon its approval (February 2, 2016). States will go through their administrative procedure to implement regional management measures for 2016. States measures will made available to the public as soon as they are finalized.

Tables and Figures

Table 2. State summer flounder harvest in 1998 and the proportion of harvest that state-by-state harvest targets under conservation equivalency are based on

State	1998 estimated harvest (thousands)	Percent of the 1998 harvest
MA	383	5.5%
RI	395	5.7%
CT	261	3.7%
NY	1,230	17.6%
NJ	2,728	39.1%
DE	219	3.1%
MD	206	3.0%
VA	1,165	16.7%
NC	391	5.6%

Table 3. Angler Participation on the Atlantic Coast with percent change from 1998-2014

Angler Participation coastwide from 1998-2014				
Year	Coastal	Non-Coastal	Total	Percent Change from 1998
1998	4,137,554	447,172	4,584,726	
1999	3,797,901	480,630	4,278,531	-6.68%
2000	5,074,359	653,104	5,727,463	24.92%
2001	5,537,676	717,490	6,255,166	36.43%
2002	4,660,668	597,327	5,257,995	14.69%
2003	5,697,540	768,372	6,465,912	41.03%
2004	5,623,004	832,386	6,455,390	40.80%
2005	6,965,785	892,768	7,858,553	71.41%
2006	6,886,353	889,097	7,775,450	69.59%
2007	7,799,919	910,168	8,710,087	89.98%
2008	6,541,755	944,118	7,485,873	63.28%
2009	5,581,259	812,991	6,394,250	39.47%
2010	5,848,691	882,858	6,731,549	46.83%
2011	5,293,098	726,760	6,019,858	31.30%
2012	5,399,706	821,199	6,220,905	35.69%
2013	5,215,365	634,369	5,849,734	27.59%
2014	5,380,148	758,782	6,138,930	33.89%
Source: Personal Communication from National Marine Fisheries Service, Fisheries Statistics Division, 11/30/2015				

Table 4. The number of summer flounder harvested from Maine through North Carolina by mode, 1981-2014.

Year	Shore	Party/Charter	Private/Rental
1981	3,145,683	1,362,252	5,058,639
1982	1,120,521	5,936,006	8,416,173
1983	3,963,680	3,574,229	13,458,398
1984	1,355,595	2,495,733	13,623,843
1985	786,185	1,152,247	9,127,759
1986	1,237,033	1,608,907	8,774,921
1987	406,095	1,150,095	6,308,572
1988	945,864	1,134,353	7,879,442
1989	180,268	141,320	1,395,177
1990	261,898	413,240	3,118,447
1991	565,404	597,610	4,904,637
1992	275,474	375,245	4,351,387
1993	342,225	1,013,464	5,138,352
1994	447,184	836,362	5,419,145
1995	241,906	267,348	2,816,460
1996	206,927	659,876	6,130,182
1997	255,066	930,633	5,981,121
1998	316,314	360,777	6,302,004
1999	213,447	300,807	3,592,741
2000	569,612	648,755	6,582,707
2001	226,996	329,705	4,736,910
2002	154,958	261,554	2,845,647
2003	203,717	389,142	3,965,811
2004	200,368	463,776	3,652,354
2005	104,295	498,614	3,424,557
2006	154,414	315,935	3,479,934
2007	98,418	499,160	2,510,000
2008	79,339	171,951	2,098,583
2009	62,691	176,997	1,566,490
2010	59,812	160,109	1,281,546
2011	34,849	137,787	1,667,240
2012	106,342	96,386	1,996,407
2013	117,289	284,048	2,120,990
2014	62,248	440,750	1,938,626
% of Total, 1981-2014	9%	14%	78%
% of Total, 2008-2014	4%	10%	86%
Source: Personal Communication from National Marine Fisheries Service, Fisheries Statistics Division, 11/30/2015			

Table 5. Black Sea Bass Specifications and Harvest estimates from 1998-2015

Year	1998	1999	2000	2001	2002	2003	2004	2005
Harvest Limit (m lb)	3.15	3.15	3.15	3.15	3.43	3.43	4.01	4.13
Harvest (m lb)	1.51	1.94	4.30	3.98	4.65	3.44	2.88	2.55
Size (inches)	10	10	10	11	11.5	12	12	12
Bag^	--	--	--	25	25	25	25	25
Open Season	1/1-7/30 and 8/16-12/31	All year	All year	1/1-2/28 and 5/10-12/31	All year	1/1-9/1 and 9/16-11/30	1/1-9/7 and 9/22-11/30	All year

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Harvest Limit (m lb)	3.99	2.47	2.11	1.14	1.83	1.84	1.32	2.26	2.26	2.33
Harvest (m lb)	2.31	2.64	2.40	2.56	3.19	1.17	3.19	2.46	3.61	3.52**
Size (inches)	12	12	12	12.5	12.5	Varied by region	Varied by region	Varied by region	Varied by region	Varied by region
Bag^	25	25	25	25	25	Varied by region	Varied by region	Varied by region	Varied by region	Varied by region
Open Season	All year	All year	All year	All year*	5/22-10/11 and 11/1-12/31	Varied by region	Varied by region	Varied by region	Varied by region	Varied by region

^ The state of Massachusetts has a more conservative bag limit of 20 fish.
* In 2009 Federal waters were closed on October 5, 2009
**Preliminary Harvest estimates are only available through wave 5 (September/October) of 2015

Table 6. 2015 Black Sea Bass recreational management measures.
Note: Cells are shaded to help with table readability.

State	Minimum Size (inches)	Possession Limit	Open Season
Maine	13	10 fish	May 19-September 18
New Hampshire	13	10 fish	January 1-December 31
Massachusetts	14	8 fish	May 23-August 27
Rhode Island	14	1 fish	July 2- August 31
		7 fish	September 1-December 31
Connecticut (Private & Shore)	14	3 fish	June 1-August 31
		5 fish	September 1-December 31
CT Authorized Party/Charter Monitoring Program Vessels	14	8 fish	June 21-December 31
New York	14	8 fish	July 15- October 31;
		10 fish	November 1-December 31
New Jersey	12.5	2 fish	July 1-July 31
		15 fish	May 27-June 30; October 22-December 31
Delaware	12.5	15 fish	May 15-September 21; October 22-December 31
Maryland	12.5	15 fish	May 15-September 21; October 22-December 31
Virginia	12.5	15 fish	May 15-September 21; October 22-December 31
North Carolina, North of Cape Hatteras (N of 35° 15’N)	12.5	15 fish	May 15-September 21; October 22-December 31

Table 7. Black Sea Bass MRIP Harvest Estimates (in numbers of fish).

State	Year					
	2010	2011	2012	2013	2014	2015Wv5*
NH	0	0	3,195	12,284	0	0
MA	702,138	194,753	519,910	291,678	457,100	351,424
RI	160,428	50,204	102,548	75,097	214,464	231,609
CT	15,682	8,377	110,858	107,900	406,785	261,446
NY	543,245	274,475	321,516	353,034	423,406	710,694
NJ	687,450	148,486	734,928	345,333	468,400	384,013
DE	21,029	42,962	40,141	36,559	23,878	9,899
MD	36,019	47,444	33,080	29,678	68,468	12,309
VA	29,717	18,964	4,075	21,296	14,368	37,919
NC**	10,850	30,975	3,664	7,785	696	
Total	2,206,558	816,640	1,873,915	1,280,644	2,077,565	1,999,313
NH-NJ	2,129,972	719,257	1,833,096	1,221,885	1,994,033	1,949,085
DE-NC	76,586	97,383	40,819	58,759	83,532	50,228
*2015 estimates are preliminary through wave 5						
**post-stratified data for 2015 is unavailable						

Table 8. 2015 Summer Flounder recreational management measures.
Note: Cells are shaded to help with table readability.

State	Minimum Size (inches)	Possession Limit	Open Season
Massachusetts	16	5 fish	May 22-September 23
Rhode Island	18	8 fish	May 1-December 31
Connecticut	18	5 fish	May 17- September 21
CT Shore Program (45 designed shore sites)	16		
New York	18	5 fish	May 17- September 21
New Jersey	18	5 fish	May 23- September 26
NJ pilot shore program 1 site	16	2 fish	May 22-September 26
Delaware	16	4 fish	January 1- December 31
Maryland	16	4 fish	January 1- December 31
PRFC	16	4 fish	January 1- December 31
Virginia	16	4 fish	January 1- December 31
North Carolina	15	6 fish	January 1- December 31

Appendix I.

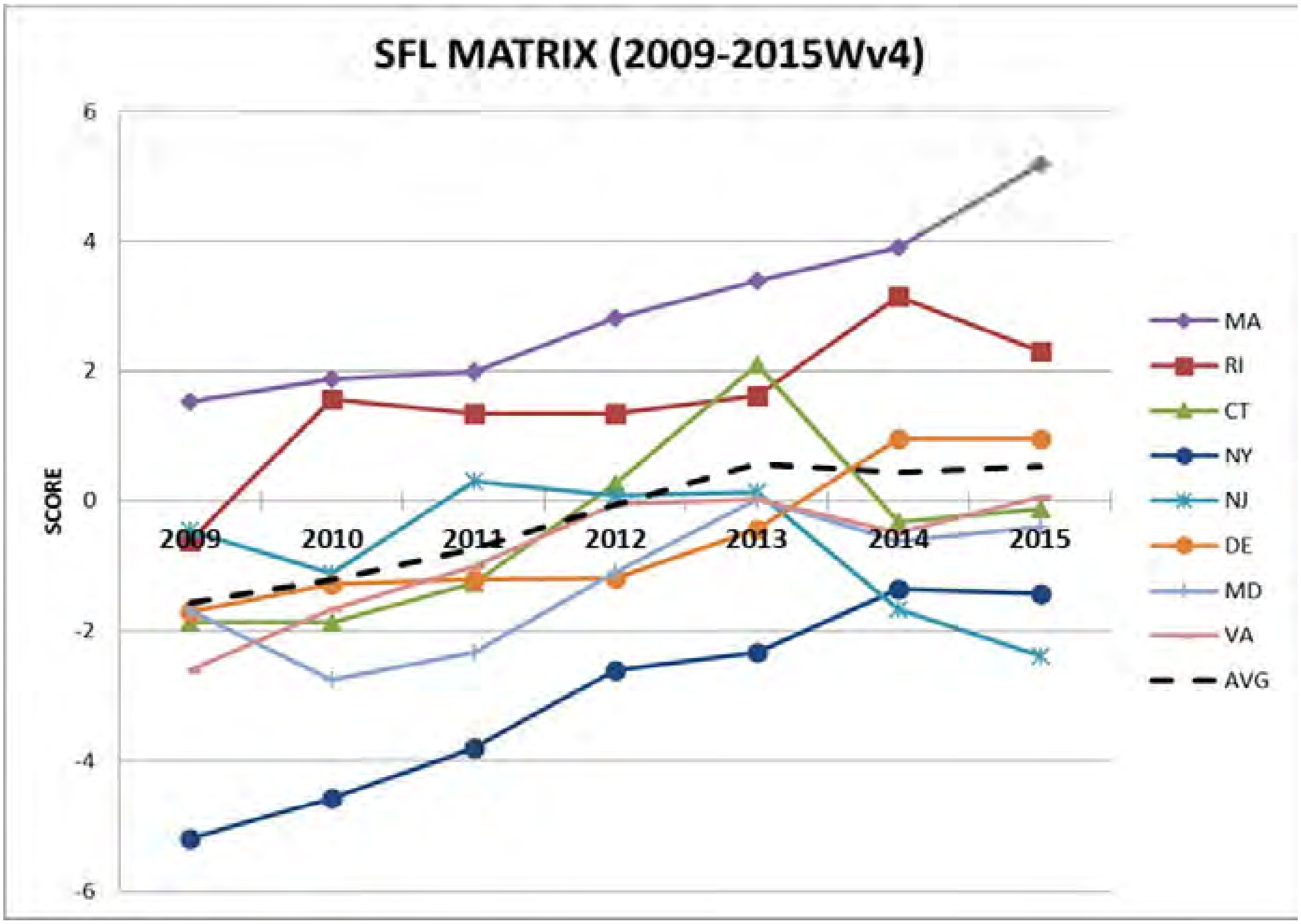

Figure 1. Summer Flounder Recreational Performance by State 2009-2015 Wave 4*#

*The North Carolina recreational flounder fishery regularly catches 3 species of flounder. Due to problems with angler identification of species, released flounder are included in MRIP categories for left eye flounder genus or family. Trip targets are also generally reported as left eye flounder although it is likely that some trips are more likely to catch a particular flounder species. Determining the number of releases and targeted trips for summer flounder based on available information would require assumptions that cannot be tested without further study. Therefore, any fishery metric that includes released or trips targeting summer flounder for North Carolina is too uncertain to be used for management decisions and is listed as NA. For this reason, North Carolina is excluded from this analysis.

#Harvest estimates through wave 4 for 2015 are preliminary and are subject to change as subsequent wave estimates become available.

Table 9A. Recreational Summer Flounder Fishery Performance 2009-2010

YEAR	2009	2009	2009	2009	2009	2009	2009	2009	2010	2010	2010	2010	2010	2010	2010	2010
STATE	MA	RI	CT	NY	NJ	DE	MD	VA	MA	RI	CT	NY	NJ	DE	MD	VA
METRIC	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
RETENTION RATE	34.3%	15.8%	9.5%	5.1%	7.3%	8.3%	7.3%	7.4%	17.4%	34.0%	8.6%	4.8%	5.0%	8.0%	2.0%	9.7%
INTERCEPTS HARVEST : CATCH	0.47	0.32	0.27	0.15	0.29	0.21	0.27	0.16	0.55	0.31	0.24	0.18	0.19	0.22	0.07	0.28
BAG LIMIT	5	6	3	2	6	4	3	5	5	6	3	2	6	4	3	4
#. FISH HARVEST: #. TARGETED TRIPS	0.54	0.49	0.26	0.24	0.44	0.28	0.25	0.33	0.95	0.83	0.25	0.27	0.27	0.25	0.09	0.41
% CORE SEASON (1% of total harvest in wave 1996-1998)	31.7%	100.0%	35.9%	41.3%	57.1%	100.0%	62.0%	100.0%	77.7%	100.0%	56.0%	62.5%	54.9%	100.0%	89.4%	100.0%
% of ALL S/W TRIPS TARGETING SFL	2.7%	14.9%	12.1%	26.0%	35.2%	33.7%	8.8%	28.8%	1.4%	11.5%	9.2%	28.5%	35.0%	26.4%	9.5%	24.4%
NEAREST NEIGHBOR SIZE LIMIT	-2.5	2.0	-1.5	2.3	-1.8	0.5	-0.8	2.5	-1.0	0.5	-0.75	2.25	-1.75	0	0.5	1.5

Table 9B. Recreational Summer Flounder Fishery Performance 2011-2012

YEAR	2011	2011	2011	2011	2011	2011	2011	2011	2012	2012	2012	2012	2012	2012	2012	2012
STATE	MA	RI	CT	NY	NJ	DE	MD	VA	MA	RI	CT	NY	NJ	DE	MD	VA
METRIC	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
RETENTION RATE	24.2%	18.2%	12.0%	4.9%	8.3%	9.8%	3.1%	13.8%	23.2%	21.3%	16.9%	9.2%	13.9%	15.2%	9.6%	23.3%
INTERCEPTS HARVEST : CATCH	0.40	0.43	0.24	0.18	0.26	0.20	0.08	0.29	0.50	0.43	0.28	0.22	0.35	0.23	0.20	0.41
BAG LIMIT	5	7	3	3	8	4	3	4	5	8	5	4	5	4	3	4
#. FISH HARVEST: # TARGETED TRIPS	0.81	0.78	0.39	0.27	0.39	0.28	0.10	0.49	0.79	0.69	0.27	0.43	0.57	0.27	0.18	0.43
% CORE SEASON (1% of total harvest in wave 1996-1998)	95.0%	100.0%	61.4%	83.2%	77.2%	100.0%	93.5%	100.0%	95.0%	100.0%	92.4%	83.2%	79.9%	100.0%	100.0%	100.0%
% of ALL S/W TRIPS TARGETING SFL	2.6%	18.6%	9.3%	33.5%	36.4%	25.8%	5.5%	22.4%	3.4%	13.9%	17.2%	31.7%	39.3%	19.2%	5.7%	23.7%
NEAREST NEIGHBOR SIZE LIMIT	-1.0	0.5	-1	2.25	-1.25	0	0.25	1	-2.0	1.25	-1	1.75	-1.25	0.75	-0.25	0.5

Table 9C. Recreational Summer Flounder Fishery Performance 2013-2014

YEAR	2013	2013	2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	2014	2014
STATE	MA	RI	CT	NY	NJ	DE	MD	VA	MA	RI	CT	NY	NJ	DE	MD	VA
METRIC	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
RETENTION RATE	34.4%	19.6%	23.8%	9.8%	16.0%	18.8%	15.0%	26.8%	25.1%	30.7%	15.8%	10.1%	11.0%	24.1%	11.2%	17.8%
INTERCEPTS HARVEST : CATCH	0.63	0.51	0.54	0.29	0.50	0.31	0.27	0.35	0.61	0.73	0.41	0.30	0.32	0.40	0.24	0.30
BAG LIMIT	5	8	5	4	5	4	4	4	5	8	5	5	5	4	4	4
#. FISH HARVEST: #. TARGETED TRIPS	0.52	0.77	0.98	0.41	0.79	0.35	0.32	0.44	1.30	0.99	0.51	0.39	0.63	0.48	0.32	0.40
% CORE SEASON (1% of total harvest in wave 1996-1998)	95.0%	100%	92.4%	82.6%	70.7%	100%	100%	100%	95.0%	100%	69.6%	69.6%	69.6%	100%	100%	100%
% of ALL S/W TRIPS TARGETING SFL	2.1%	14.0%	24.4%	35.1%	42.9%	20.5%	5.9%	19.6%	2.5%	16.9%	17.2%	32.8%	38.2%	22.3%	9.9%	16.2%
NEAREST NEIGHBOR SIZE LIMIT	-2	1.25	-1	1.5	-0.5	0.25	-0.5	0.5	-2.0	1.0	0.0	0.0	1.0	-1.0	0.0	0.5

Table 9D. Recreational Summer Flounder Fishery Performance 2015 (Through Wv4)

STATE	MA	RI	CT	NY	NJ	DE	MD	VA
METRIC	1	2	3	4	5	6	7	8
RETENTION RATE	45.2%	28.9%	17.9%	12.9%	9.8%	26.0%	16.3%	20.0%
INTERCEPTS HARVEST : CATCH	0.63	0.63	0.38	0.31	0.27	0.40	0.24	0.41
BAG LIMIT	5	8	5	5	5	4	4	4
#. FISH HARVEST: #.TARGETED TRIPS	1.56	0.85	0.63	0.48	0.34	0.46	0.30	0.54
% CORE SEASON (1% of total harvest in wave 1996-1998)	95.0%	100.0%	69.6%	69.6%	69.6%	100.0%	100.0 %	100.0%
% of ALL S/W TRIPS TARGETING SFL	2.78%	29.56%	16.27%	48.85%	45.69%	25.75%	8.03%	18.93%
NEAREST NEIGHBOR SIZE LIMIT	-2.0	1.0	0.0	0.0	1.0	-1.0	0.0	0.5

Atlantic States Marine Fisheries Commission

Shad and River Herring Management Board

October 25, 2016
4:45 – 5:30 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(B. Goldsborough)*	4:45 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from May 2016	4:45 p.m.
3.	Public Comment	4:50 p.m.
4.	Consider Approval of the Nemasket River (MA) Sustainable Fishery Management Plan **Final Action** (*B. Chase*) • Review Technical Committee Memo on the Nemasket River Sustainable Fishery Management Plan	5:00 p.m.
5.	Discuss the Timetable for the Five-Year Update of Shad and River Herring Sustainable Fishery Management Plans (*A. Harp*)	5:15 p.m.
6.	Review Mid-Atlantic Fishery Management Council Decision on Potential Management of Shad and River Herring (*B. Goldsborough)*	5:20 p.m.
7.	Other Business/Adjourn	5:30 p.m.

The meeting will be held at the Harborside Hotel; 55 West Street; Bar Harbor, ME; 207.288.5033

MEETING OVERVIEW

Shad and River Herring Management Board Meeting
October 25, 2016
4:45 – 5:30 p.m.
Bar Harbor, Maine

Chair: Bill Goldsborough (MD) Assumed Chairmanship: 1/16	Technical Committee Chair: Brad Chase (MA)	Law Enforcement Committee Representative: Furlong (PA)
Vice Chair: John Clark	Advisory Panel Chair: Pam Lyons Gromen	Previous Board Meeting: May 3, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (19 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from May 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Consider Approval of the Nemasket River Sustainable Fishery Management Plan (5:00 – 5:15 p.m.)
Background • The Massachusetts Division of Marine Fisheries submitted a Sustainable Fishery Management Plan for river herring in the Nemasket River. It was developed in partnership with the Middleborough-Lakeville Herring Fishery Commission. • The Technical Committee reviewed the document, provided comments and the document was subsequently updated. The Technical Committee recommends the revised Nemasket River Sustainable Fishery Management Plan for Shad and River Herring Board approval. • **Nemasket River Sustainable Fishery Management Plan in Briefing Materials, Technical Committee Recommendation in Supplemental Materials**
Presentations • Overview of the Nemasket River Sustainable Fishery Management Plan and Technical Committee Recommendations by B. Chase

Board actions for consideration at this meeting

- Approve the Nemasket River Sustainable Fishery Management Plan

5. Discuss the Timetable for the Five-Year Update of Shad and River Herring Sustainable Fishery Management Plans (5:15 -5:20 p.m.)

Background

- The Shad and River Herring Sustainable Fishery Management Plans that have been approved by the Board (in 2011/2012) will be reviewed and updated in 2017. As a result, a summary report of each review will be presented to the Board in 2017.

Presentations

- Timetable will be presented by A. Harp

6. Review Mid-Atlantic Fishery Management Council Decision on Potential Management of Shad and River Herring (5:20 -5:30 p.m.)

Background

- At the October Mid-Atlantic Fishery Management Council meeting, the Council did not add Shad and River Herring as stocks in the fishery. The Council emphasized its continued interest in protecting shad and river herring in partnership with the National Marine Fisheries Service and ASMFC. The Council will review its 2017 strategic plan at the December meeting, which will include shad and river herring priorities.

7. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

SHAD AND RIVER HERRING MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
May 3, 2016

TABLE OF CONTENTS

INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).

2. **Approval of Proceedings of May, 2015** by Consent (Page 1).

3. **Move to approve the 2015 FMP Review of the 2014 Fishing Year, and approve de minimis requests for river herring, New Hampshire, Massachusetts, and Florida and for shad, Maine, New Hampshire, Massachusetts, and Florida** (Page 7). Motion by Bill Adler; second by Steve Train. Motion passes unanimously (Page 8).

4. **Move to nominate John Clark as Vice Chair to the Shad and River Herring Management Board** (Page 8). Motion by Michael Armstrong; second by Dave Simpson. Motion passes unanimously (Page 8).

5. **Move to adjourn** by Consent (Page 8).

ATTENDANCE

Board Members

Terry Stockwell, ME, proxy for P. Keliher (AA)
Steve Train, ME, GA
Cheri Patterson, NH, proxy for D. Grout (AA)
Ritchie White, NH (GA)
Mike Armstrong, MA, proxy for D. Pierce (AA)
William Adler, MA (GA)
Rep. Sarah Peake, MA (LA)
Sarah Ferrara, MA, Legislative proxy
Bob Ballou, RI, proxy for J. Coit (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Dave Simpson, CT (AA)
Mike Falk, proxy for Sen. Boyle (LA)
Jim Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Andy Shiels, PA, proxy for J. Arway (AA)
Loren Lustig, PA (GA)
David Saveikis, DE (AA)
John Clark, DE, Administrative proxy
Craig Pugh, DE, proxy for Rep. Carson (LA)
Roy Miller, DE (GA)
Mike Luisi, MD, proxy for D. Blazer (AA)
Bill Goldsborough, MD (GA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Cathy Davenport, VA (GA)
Michelle Duval, NC, proxy for B. Davis (AA)
Mel Bell, SC, proxy for M. Rhodes (GA)
Robert Boyles, Jr., SC (AA)
Pat Geer, GA, proxy for Rep. Burns (LA)
Spud Woodward, GA (AA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Bryan King, DC
Mike Millard, USFWS
Derek Orner, NOAA

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Staff

Bob Beal
Toni Kerns
Max Appelman
Kirby Rootes-Murdy
Jeff Kipp

Guests

John Bullard, NOAA
Charles Lynch, NOAA
Jon Hare, NOAA
Wilson Laney, USFWS
Dan McKiernan, MA DMF
Stew Michels, DE DFW
Joe Cimino, VMRC
Jeff Deem, VMRC
Shaun Gehan, Gehan Law, DC
Susanna Brian, Baltimore, MD
Jeffrey Pierce, Alewife Harvesters, ME
Abden Simmons, Maine Elver Fishermen's Assn.
Jeff Kaelin, Lund's Fisheries, NJ
Arnold Leo, E. Hampton, NY

The Shad and River Herring Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, May 3, 2016, and was called to order at 11:58 o'clock a.m. by Chairman Bill Goldsborough.

CALL TO ORDER

CHAIRMAN BILL GOLDSBOROUGH: Good morning everyone, by my watch it is still two minutes before noon, so it is still morning. Welcome to the Shad and River Herring Board. My name is Bill Goldsborough. I have the honor of being the new Chair of the Board. I may have forgotten that sequence; since we haven't had a meeting in a year, but Terry Stockwell is the previous Chairman. I want to thank Terry for his service. He didn't let any species get listed on his watch.

APPROVAL OF AGENDA

CHAIRMAN GOLDSBOROUGH: Let's all take a look at the agenda. Does anybody have any additions or changes they would like to recommend? Seeing none; we'll consider the agenda approved.

APPROVAL OF PROCEEDINGS

CHAIRMAN GOLDSBOROUGH: The proceedings from the May, 2015 meeting, or in the meeting information, does anybody have any changes to offer for them? Seeing none; the proceedings from the May 2015 meeting stand approved.

PUBLIC COMMENT

CHAIRMAN GOLDSBOROUGH: We'll take public comment at this time for any issues that are not on the agenda. I see a hand in the back. Des, there is a public microphone right back there.

MR. DESMOND KAHN: For those of you who don't know me my name is Desmond Kahn; I worked for Delaware for a couple of decades, and I was on many of the technical committees for the Commission during that period. I sent you all an e-mail, or as many of you as I had the e-mail addresses for an e-mail yesterday; on the subject of striped bass predation on shad and herring.

In that e-mail, I attached a paper that I presented last summer at the American Fishery Society annual meeting in Portland, Oregon. I was invited to speak at a symposium on conservation and utilization for sustaining our fisheries. The title of my talk was management of a top inshore predator; deferring recreational and commercial goals, and the impacts on other fisheries.

I am sure many of you are aware of a couple of the points I'm briefly going to try to make today. We're trying to manage shad and herring, yet at the same time we have built up one of their primary predators to very high abundance levels. I think we're kind of working across purposes there. My background is in ecology, and in ecology we've learned that when a primary predator builds up the high abundances, its primary prey usually decline.

I am sure many of you know that the primary prey of striped bass has been found to be members of the herring family, including shad and river herring. There is conclusive scientific evidence now that in several river systems, particularly the Connecticut River and the Delaware River, striped bass predation has driven down the abundance of American shad and river herring. I presented some graphs of that in my paper. This was documented in the Connecticut River by Dr. Victor Creeco, who is really the world's authority on American shad. He's published more peer reviewed scientific papers on this topic than anyone on the topic of American shad. He documented that in the 2007 assessment, but with Tom Savoy, who also works for Connecticut.

Dr. Creeco has since retired, but they tried to bring this information to the board, but their report was removed from the body of the report, and put in as an appendix. A separate report for the Connecticut River was written, and their names were put on the report, and it was published as part of the assessment; although they never saw this report.

If you go back to that assessment and you look at the appendix, you will find their report detailing the way that striped bass predation really controlled the abundance of shad. I think we have to start taking a look at some of the tradeoffs in our management among species, and really take an ecosystem-based approach. I would like to encourage you to start thinking about that. Thank you very much.

CHAIRMAN GOLDSBOROUGH: Thank you Des. From that e-mail it looked to me like it didn't go to the most current list of Board members, so maybe staff can make sure that all of you that may not have gotten it do get it. I found the presentation to be very interesting; a good reminder about the ecosystem-based management needing to be a priority. Okay let's move on to Agenda Item Number 4. Jeff, I'll give you the floor.

TIMETABLE FOR AMERICAN SHAD AND RIVER HERRING STOCK ASSESSMENTS

MR. JEFF KIPP: I'll just be giving a quick update on the upcoming American shad and river herring assessments, and a slight change to the assessment schedules for those species. Just a little background, the most recent stock assessments for American shad, there was a benchmark stock assessment in 2007.

There was a benchmark stock assessment for the river herring species in 2012. What we're proposing is a stock assessment update for river herring in 2017. That recommendation was made in the 2012 benchmark assessment, with an update in five years, which would be 2017, and a benchmark assessment ten years from that assessment, which would be 2022.

We did have a call with the Technical Committees and discussed this recommendation, and felt that this was still an appropriate recommendation. Technical Committee members did note that there are some beneficial monitoring efforts that have come, due to Amendment II, that will hopefully be useful in a benchmark assessment; but due to the short time series of those monitoring efforts, an update at this time is still appropriate.

There is also the need to develop robust stock specific ocean bycatch estimates; that preclude a lot of the assessment approaches that are done in other assessments and for other species. But there are some developments with some genetic studies, looking at the ocean bycatch that hopefully will be useful in a benchmark assessment down the road.

We did propose to move this assessment update from 2018, where it was originally on our stock assessment schedule up to 2017; and that is due to NOAA Fisheries revisiting the Endangered Species Act Listing Determination made in 2013, which they said they would be revisiting five years from that date. They are hoping to have the information from this assessment update for that revisiting of that listing determination. For the America shad stock assessment, we're proposing an update of that assessment to be completed in 2018. But we did want to note, we want to keep flexibility to potentially change that to a benchmark assessment, and that determination would be made at a data workshop, when we have a better chance to look at the data that have come online since the last benchmark assessment for American shad.

Similar to river herring, there were notes of the beneficial monitoring efforts due to Amendment III for that species. However, again it was noted that there would be a particularly short time series for most of those new monitoring efforts, and again for American shad as well there is the need to develop robust, stock specific, ocean bycatch estimates for that species as well; to move to some more complex assessment approaches.

We've proposed to move this assessment update from 2017 to 2018, to accommodate the river herring assessment; and those changes to the stock assessment schedule will be presented tomorrow to the policy board. The timetables for these assessments moving forward, we plan to have a webinar with the Technical Committees and Stock Assessment Subcommittees in late May, and I did want to note here that the Stock Assessment Subcommittees for shad and river herring will need to be repopulated.

Kirby will be reaching out to the commissioners to repopulate those Stock Assessment Subcommittees. We plan to have a joint data workshop for shad and for river herring in the fall of 2016. Due to the overlap in some of the folks that will be working on those assessments, and also some of the similarities in the data that we'll be going over, we felt that this was a more efficient use of a data workshop to combine those.

Then following that data workshop, efforts will focus on completing the river herring assessment update in 2017. Once that update is completed, we'll then focus our efforts on completing the American shad assessment update by 2018. That is my update, and if there are any questions on those upcoming assessments, I can take those now.

CHAIRMAN GOLDSBOROUGH: Any questions for Jeff on the stock assessment timetable? Yes, Rob.

MR. ROB O'REILLY: Not on the timetable, but more if I may, on the genetic study to look at the ocean intercept fishery. I'm curious as to what is thought about there for that type of study. There were some studies done in the past, both tagging and genetic; but it was mitochondrial DNA study in the nineties.

I think before the ASMFC went on the closeout of the American shad intercept fishery, there was talk of maybe having sort of a synoptic study to look closely at the intercept fishery. But that never really materialized, so I'm wondering how involved this next study is, and will it utilize the results from the former studies; which those studies didn't really corroborate each other very well.

In fact the tagging study in the early nineties had sort of contradictory results, depending on which study it was. One study gave more of a northern intercept of northern stocks, Connecticut and other stocks north, and the second time around it was more of a southerly approach, as far as where the fish were being intercepted. The mitochondrial DNA study didn't really balance that out either. A couple of questions would be, are you going to tap into the old existing data and how involved is this genetic study going to be? What type of a genetic study is it going to be exactly? Is it a nuclear DNA study? What's anticipated?

MR. KIPP: The study was recently published in 2012 that I mentioned specifically. I don't know the details of it, but it did find disproportionate effects of ocean bycatch on some of the different genetic distinct stocks. I think that information will be synthesized with the studies you just mentioned, and some of that other information.

However, I think that information will come more into play when we move to benchmark assessments, when we have a better handle on the ocean bycatch; not only the magnitude of that bycatch, but also how to partition that across the different stocks we're assessing the population at. I think again that information will come more into play when we move to a benchmark assessment, and again we'll synthesize that genetic study with, hopefully any of the other existing information, being tagging study or genetic studies that have been done in the past.

MR. O'REILLY: Sort of a follow up. The absence of a shad fishery in the ocean, and the absence of a directed fishery, and the absence of a directed fishery in the bay, for the most part for many, many years, this type of information could be very good for the natal areas to have this information.

CHAIRMAN GOLDSBOROUGH: Anything else on the assessment timetable? Emerson.

MR. EMERSON C. HASBROUCK: On the American shad assessment in 2018, is that going to be an update or a full benchmark assessment?

MR. KIPP: The plan right now is that that will be an update of the 2007 benchmark stock assessment, with the potential to move to a benchmark assessment, if the Technical Committee and Stock Assessment Subcommittee feel that that is warranted, once we sit down at the data workshop happening this fall; and feel that there are either new data that could be incorporated, or different assessment approaches that were not looked at in that 2007 assessment that could potentially be useful in a new benchmark assessment in 2018.

REPORT FROM DATA STANDARDIZATION COLLECTION WORKSHOP

CHAIRMAN GOLDSBOROUGH: Let's move on to Agenda Item 5.

MR. KIRBY ROOTES-MURDY: I am going to go through this item pretty quickly, and happy to take any questions as they may come up. In May of 2015, the TC and members of the TEWG recommended to the board that a workshop be conducted, looking at data collection and standardization of current monitoring programs across the coast.

The focus would be on those fishery independent survey programs. This recommendation really went hand in hand with some of the research needs that were outlined in the 2012 stock assessment for river herring. In November of 2015, staff worked with NOAA Fisheries in pulling together a data standardization collection workshop that was approximately two and a half days in Baltimore.

We had 30 participants, including 15 state agencies, 2 federal agencies, NOAA and U.S. Fish and Wildlife, 1 federally recognized tribe, and members from Canada's Department of Fisheries and Ocean. Going into the workshop we had each of those representatives send us their monitoring program write-ups first, and their data; to kind of categorize it by survey type, to really try to break it out and discuss each of these really by category and biological sampling. Coming out of that workshop, the group was able to make a number of recommendations, as I said by survey type, looking at what are the best ways to move most of the surveys that are being conducted along the coast towards a more standardized approach?

That was generated primarily from those state and federal partners who are currently leading those surveys, and have been doing them for a long time series. Trying to get these surveys in line in term of a standardized approach, by survey type, is really important for being able to compare across different parts of the coast; and this approach is useful for helping us move forward in the next stock assessment.

In highlighting both what the best ways to move towards standardization and the financial cost in doing so, the workshop was really useful in outlining how we can start to move things towards more uniform approaches across different regions of the coast. The other part was recommendations on biological sampling, to make sure that all the current agencies involved in monitoring river herring are able to collect the same data, and was able to then utilize that in the next assessment.

The workshop report was completed in early 2016. We have it now up on our website. It was included in the meeting materials. We have a hard copy available in the back of the room if people are interested. At this point, I'm happy to take any questions. I'll also point out that Jeff Kipp was also there, and took part, and between the two of us we're happy to answer all questions you have on the workshop.

CHAIRMAN GOLDSBOROUGH: Questions on the workshop. Seeing none; thank you, Kirby. Let's move on then to Agenda Item 6.

UPDATE ON ACTIVITIES OF THE RIVER HERRING TECHNICAL EXPERT WORK GROUP

MR. ROOTES-MURDY: On a related note, I'm going to provide you guys an update, on some of the activities of the River Herring Technical Expert Working Group, also referred to as the TEWG. TEWG activities in 2015, some of the major highlights that I just wanted to make clear to the board were this time last year the conservation plan was made available online.

This is a website that lives on NOAAs website, and basically lays out all the current monitoring programs, the research needs, the management program in place for river herring across the coast; and it was helped informed by the TEWG in providing the specific information that is needed to further the conservation of river herring.

In addition to the Conservation Plan there was funding of a number of restoration projects, including doing run counts in the St. Croix Watershed, doing dam removals on the Exeter River, and barrier removals in Connecticut. Another important point that will be touched on later on today, with climate change, is NMFS participation in the Northeast Fisheries Science Center's Climate Vulnerability Assessment.

One procedural thing that I wanted to highlight for the board moving forward is that the TEWG leading up to making the Conservation Plan publically available, had been meeting quarterly and having subcommittee meetings in support of those quarterly meetings. Because the Conservation Plan is now online and we are in more of a maintaining that plan and providing updates when needed, full TEWG meetings are now going to be twice a year. Subcommittees can still meet as often as they see are needed for talking about issues relevant to their subgroup, but there will be a move to also have an annual report that highlights what the previous year's big research endeavors were, conservation endeavors, and outcomes of TEWG meetings.

We're in the process of finalizing the 2015 Executive Summary. That has gone out to TEWG members this week, and we will hopefully have that up online in the next couple weeks. With that I'll take any other questions there are on TEWG activities.

CHAIRMAN GOLDSBOROUGH: Questions for Kirby on the workgroup? You guys are making it way too easy. Let's move on to Agenda Item 7.

CONSIDER APPROVAL OF 2015 SHAD AND RIVER HERRING FMP REVIEW AND STATE COMPLIANCE

MR. ROOTES-MURDY: I'm going to go through the 2015 Shad and River Herring FMP Review and Compliance Report. Generally there has been a steady decline in landings over time, as many of you are aware. This has been in part to the moratorium that was implemented through Amendments II and III. States with shad commercial landings were New Jersey, Virginia, North Carolina, South Carolina, and Georgia.

States with river herring commercial landings were Maine, New Hampshire, New York, Maryland, North Carolina, and South Carolina. Again, states that are able to maintain these fisheries are ones that have demonstrated through their sustainable fishing plans that they can do so. This is a report again for 2014 fishing year as opposed to 2015.

We have a lag in the time between when we received compliance reports and were able to report out on them. In 2014, a total of 776,000 pounds of American shad were landed and 1.8 million pounds of river herring were landed, and 119,000 pounds of hickory shad were landed; and this is coastwide.

The largest states for landings of shad were North Carolina and South Carolina, and the largest landings for river herring was Maine at 1.8 million pounds. In looking at river herring passage counts, the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Pennsylvania, Maryland, and South Carolina all currently collect data on river herring passage counts.

Coastwide in 2014, 2.86 million river herring were counted. Coastwide for shad it was 747,000 shad. What this represents relative to the 2013 fishing year, is about a 1 percent increase in the passage counts for river herring and about a 96 percent increase for shad. When looking at coastwide stocking programs, currently Maine, Massachusetts, Pennsylvania, North Carolina, and South Carolina are currently engaged in stocking programs.

For 2014, 26.4 million shad were introduced and contributed, as well as 296,000 alewives. Percentage increase is relative to 2013 is about a 45 percent increase for American shad, relative to 2013, and about a 10 percent increase for river herring; compared to 2013. Another component of the shad and river herring compliance reports are sturgeon interactions.

In 2014 there was 101 interactions reported in the states of Rhode Island, Connecticut, New Jersey, North Carolina, South Carolina, and Georgia, all released alive with the exception of one fatality. Last, in terms of de minimis requests. The states of Maine, New Hampshire, Massachusetts, and Florida have submitted de minimis requests for shad and for river herring. New Hampshire, Massachusetts, and Florida have requested for river herring and all these states meet the requirements for de minimis. At this point I'll take any questions any of the board members have on compliance reports and FMP review for shad and river herring.

CHAIRMAN GOLDSBOROUGH: Questions for Kirby. John Clark.

MR. JOHN CLARK: I just wanted to point out you didn't have Delaware listed as a state that is stocking shad, and we are.

CHAIRMAN GOLDSBOROUGH: Other questions on the FMP Review or the Compliance Reports or the de minimis requests. Bill Adler.

MR. WILLIAM A. ADLER: Is it appropriate for a motion to accept the de minimis recommendations yet?

CHAIRMAN GOLDSBOROUGH: If I see no other hands. Can we take this hand first Bill, I'll come back to you. Cheri.

MS. CHERI PATTERSON: I just had a question on the Compliance Reports. On unreported, again I'm sorry; I'm a little new to this committee or this board. What is done with all of the unreported information that is indicated in the states compliance reports?

MR. ROOTES-MURDY: It is a good question. You're referring to the biological sampling requirements that are asked of the states, or samplings that are done of different fisheries?

MS. PATTERSON: Well, I believe that there are standards that are defined, as to what a compliance report needs to submit. I presume that if those are not included in the compliance report that that is what is reflected under unreported information and compliance issues. Are those ever pursued to be completed throughout the year, or are they something that is a repetitive pattern that is never really addressed and we're missing information due to all this?

MR. ROOTES-MURDY: It is a good question. For shad and river herring, one of the issues we've run into is that because there has been a moratorium for much of the fisheries that used to be in place for both species along the coast. A lot of the reporting requirements, for biological sampling that are contingent on recreational fisheries, and commercial fisheries to be taking place, then preclude us from being able to get data on those fisheries when they are no longer happening.

There are requirements that came out of Amendment II and Amendment III, asking for states to have these reports out annually, but if they don't have those fisheries anymore, then they no longer are able to collect that data. The other issue that a number of the states have is in terms of funding and staffing. That if they aren't able to annually provide that data through a fishery independent survey, because they don't have staff able to do it, then it becomes an issue where they annually aren't able to report out on it, even if it is a requirement.

MS. PATTERSON: Is that defined? It isn't really indicated that clearly on a state-by-state basis under the under reported information. Can that in the future be defined; so that we can understand those reasoning are behind some of this unreported information?

MR. ROOTES-MURDY: Yes, and this was discussed by the Plan Review Team, and we took notes on that and went through each item that a state, for example hadn't provided information and was noted. Though I thought I provided summary information under that for most of the states. If you have specifics on certain states, I can go back and give you some more information; and in the future we can look to provide more information under each of those items that are not listed in depth.

MS. PATTERSON: Yes, I'm willing to take this offline. Thank you.

CHAIRMAN GOLDSBOROUGH: Any other questions for Kirby? Roy.

MR. ROY W. MILLER: Mr. Chairman I'm curious about the Massachusetts de minimis request for river herring. Mike, I seem to recall many years ago now, a considerable effort on the part of Massachusetts for providing fish passage for river herring. Has that program fallen on hard times? It was Buzzy DiCarlo, if memory serves that was your expert in that regard. Have the river herring subsequently disappeared from those systems that were laddered?

MR. MICHAEL ARMSTRONG: No, actually the program is quite robust, and our runs are really back to historic levels right now, in part due to the ladder work we've been doing. But we requested de minimis, because right now we have zero harvest from the runs.

CHAIRMAN GOLDSBOROUGH: Other questions? Okay Bill, I'm back to you.

MR. ADLER: **I would like to move to approve the 2015 FMP Review of the 2014 Fishing Year, and approve these de minimis requests for river herring, New Hampshire, Massachusetts, and Florida and for shad, Maine, New Hampshire, Massachusetts, and Florida**.

CHAIRMAN GOLDSBOROUGH: Thank you, Bill, is there a second? Second from Steve, is there any discussion on the motion? Seeing none; all in favor raise your right hand please. Oops, I'm sorry. We're going to wait until we get the motion up on the board; make it official here. Okay, Bill, does that reflect your motion? Okay let's try this again. **Motion is on the board, all in favor please raise your right hand; opposed same sign, abstentions, and null votes. Motion passes unanimously.** All right we're on to Agenda Item 8, Roy.

ELECT VICE-CHAIR

MR. MILLER: Mr. Chairman, just out of curiosity, considering what we just did. Since so many states are closed for river herring directed harvest, like in our state are. Perhaps in this next updated stock assessment, it would be good if we reexamined the definition of de minimis, and what the requirements are for a de minimis state; in terms of reporting.

CHAIRMAN GOLDSBOROUGH: Good point, Roy, thank you. Okay, as I said at the outset, I have just descended to the Chair, which means the Vice-Chair seat is vacant and we need to fill it. I'll take any motions for Vice-Chair. Mike Armstrong.

MR. ARMSTRONG: I would move to nominate John Clark as Vice-Chair to the Shad and River Herring Management Board.

CHAIRMAN GOLDSBOROUGH: Thank you, Mike, is there a second? I see a second from Dave Simpson. We need Pat Augustine here, but maybe lacking that I'll just go the old fashioned way and say, all in favor please raise your right hand, opposed same sign, abstentions, and null votes. **Seeing none; the motion passes unanimously.** Congratulations, John, and thank you.

ADJOURNMENT

CHAIRMAN GOLDSBOROUGH: Is there any other business to come before the Shad and River Herring Board? Seeing none; we are adjourned.

(Whereupon the meeting was adjourned at 12:33 o'clock p.m. on May 3, 2016.)

David E. Pierce, Ph.D.
Director

Commonwealth of Massachusetts

Division of Marine Fisheries
251 Causeway Street, Suite 400
Boston, Massachusetts 02114
(617) 626-1520
fax (617) 626-1509

August 22, 2016

Ashton Harp
River Herring Fishery Mgt. Plan Coordinator
Atlantic States Marine Fisheries Commission
1050 N. Highland Street, Suite 200 A-N
Arlington, VA 22201

Re: Nemasket River Sustainable Fishery Plan for River Herring

Dear Ashton,

The Massachusetts Division of Marine Fisheries submits the attached Sustainable Fishery Plan for river herring in the Nemasket River for review by the Atlantic States Marine Fisheries Commission.

The Division received a petition from the Middleborough-Lakeville Herring Fishery Commission in December 2013 to open river herring harvest in the Nemasket River. We have since worked with the Herring Fishery Commission to prepare this Sustainable Fishery Plan. The plan has received extensive review from our Division staff and by the Massachusetts Environmental Police.

We request your assistance to schedule the plan's review by the River Herring Technical Committee and Management Board as soon as possible.

Sincerely,

David E. Pierce, Ph.D.
Director

Cc: Dan McKiernan, Mike Armstrong, Greg Skomal, Brad Chase, *MarineFisheries*
David Cavanaugh, Middleborough-Lakeville Herring Fishery Commission

Enc: Nemasket River Sustainable Fishery Plan for River Herring

MarineFisheries
Commonwealth of Massachusetts

Middleborough · Lakeville Herring Fishery Commission
Bank Building, 20 Centre Street, Middleborough, Massachusetts 02346

Nemasket River Sustainable Fishery Plan for River Herring

Developed Cooperatively by the Massachusetts Division of Marine Fisheries and
Middleborough-Lakeville Herring Fishery Commission

August 2016

INTRODUCTION

The Taunton River watershed in southeastern Massachusetts contains at least 10 tributaries that support river herring runs of which the Nemasket River is acknowledged as the most productive in Massachusetts. River herring harvest in Massachusetts has been prohibited since 2006 due to concerns over declining stocks. The objective of this sustainable fishery plan is to allow a reopening of the recreational river herring fishery in the Nemasket River, located within the towns of Middleborough and Lakeville, Massachusetts (Figure 1).

River herring were an important food source for Native American tribes living along coastal rivers. Locally, the Wampanoag people established villages along the Nemasket River (which means “place of fish”) and caught herring during the annual spring migration. The Wampanoag taught the early European settlers to catch herring for sustenance and for fertilizer. Soon after Middleborough was incorporated as a town, laws were established for commercial and personal river herring harvesting. The early Middleborough rules provided allowances for citizens to catch herring, with shares given to widows, orphans, and the poor. Mill owners along the river were required to allow the passage of herring during the annual migration. Also around this time, a long-standing practice began to elect or appoint herring wardens to oversee the herring catch and enforce the fishery regulations. The Town of Lakeville split from Middleborough in 1853 and established itself as a separate town. The incorporating legislation specifically states that Lakeville and Middleborough jointly own and control the Nemasket River Herring Run and jointly share profits (Appendix 1).

The herring in the Taunton and Nemasket Rivers consist of two species, commonly known as river herring. Most river herring in the Nemasket River are alewives (*Alosa pseudoharengus*); typically arriving in mid-March, although in warm winters, they can arrive in late-February. Blueback herring (*Alosa aestivalis*) follow two to three weeks later. Herring are present throughout April and into May. Traditionally the upstream migration peaks in April and fades during the second or third week of May, although in times of abundance the run can continue into June.

WATERSHED

The Taunton River starts at the confluence of the Matfield River and Town River, and flows into Mount Hope Bay near the City of Fall River. The Taunton River is unique among large coastal rivers in Massachusetts in having no main stem dams. The entire watershed is 562 mi^2 and covers a wide range of rural, suburban, and urban areas in 43 towns and cities. One stream flow gauge station is present on the main stem river in Bridgewater (USGS #01108000; drainage area = 261 mi^2). The mean April discharge for the time series to present is 887 cfs. The river was used extensively for commerce and water power during colonial and industrial times. Presently, the mills have long since been closed, water quality has improved, and the Taunton River is now designated as a Wild and Scenic River by the U.S Congress.

The eleven-mile long Nemasket River starts at the Assawompsett Pond dam and flows north, entering the Taunton River near the Bridgewater/Middleborough line. The Nemasket River is flat and slow throughout the entire length and has only one small section of what could be considered rapids, a short distance below Wareham Street in Middleborough. The river is crossed by ten roads (including a multi-lane highway) and two railroad tracks. The low river slope and changes in water supply withdrawals may have contributed to recent increases in aquatic vegetation and siltation. The upper one third of the river forms the boundary between Middleborough and Lakeville. For approximately the lower two thirds of its length, the Nemasket River flows entirely within Middleborough.

Overall, river herring migrate approximately 23 miles and must pass three obstructions in the Nemasket River on the way from Mount Hope Bay to the spawning grounds in the Assawompsett Pond complex. A partially restored colonial mill complex is located at Oliver Mill Park, an attractive and popular public park that includes a large and functional pool and weir fish ladder (Figure 2). The second obstruction is a remnant industrial mill dam and a movable bascule gate from a previous power plant at Wareham Street. A concrete pool and weir fish ladder is located here; originally built in 1874 and reconstructed many times, most recently by *MarineFisheries* in 1996 (Reback et al. 2004). The third obstruction is the Assawompsett Pond dam where a 1968 Denil fish ladder, the first Denil built in Massachusetts (Reback and DiCarlo 1972), provides passage. Recently, water level operations have allowed passage directly through the gates of the dam, negating the need for the fish to use the ladder.

SPAWNING HABITAT

The Assawompsett Pond complex consists of Assawompsett Pond, Pocksha Pond, Great Quittacus Pond, Little Quittacus Pond, and Long Pond providing over 5,000 acres of river herring spawning and nursery habitat. The first four are directly connected, forming the largest naturally occurring pond in Massachusetts. This amount of habitat is certainly a contributing reason why the Nemasket River hosts the largest river herring run in Massachusetts. Much of the surrounding watershed land, except for Long Pond, is owned by cities, the state, or conservation trusts. Long Pond has experienced more traditional lakeside development, with many seasonal cottages now trending towards year-round neighborhoods.

All ponds in the Assawompsett Pond complex except Long Pond are protected water supply reservoirs for the cities of Taunton and New Bedford. As such, the cities vigorously protect the watershed, and did not even allow fishing from the shore for almost a hundred years. Given the protections and goals of the water supply, the lakes have maintained suitable water quality. The lakes are shallow and prone to temperature changes, although except for years of very low water, there has been no observed limitation of spawning or nursery habitat quality. Spawning adult herring can access the entire pond complex, except for Little Quittacus Pond (not shown in Figure 1) which is gated off to ensure herring do not enter the intake pump at the New Bedford water treatment plant. Juvenile herring remain in the complex for several months, until exiting during a seaward migration occurring primarily in the fall.

HERRING FISHERY COMMISSION

The towns of Middleborough and Lakeville have a long standing commitment to manage and protect the Nemasket River herring run. This tradition has been supported by monetary incentives and interest to sustain a natural resource used widely by the public. Over the years, individuals and commercial enterprises were allowed allotments of herring and commercial licenses were issued through annual bids. For many years, Middleborough and Lakeville residents were allowed one bushel of herring annually. Commercial herring fishing on the Nemasket River ended in 1965. For many decades, herring wardens were appointed by the Selectmen, but no formal program was in place. In 1996, the current Middleborough-Lakeville Herring Fishery Commission was established and new harvest rules were promulgated. Any Middleborough or Lakeville residents could buy a permit allowing up to four dozen (48) herring being taken per week, with four days open for harvest. Three hundred permits were reserved for residents of other communities. The harvest was overseen by the wardens and several volunteer observers. The season ran from the last Wednesday in March to June 15, although catching usually ended in May as the herring run faded. This system remained in place until *MarineFisheries* instituted the ban on recreational herring harvest in 2006.

The current Commission consists of seven volunteer fish wardens, appointed jointly by the Boards of Selectmen in Middleborough and Lakeville. Wardens are the voting members of the Commission and are assisted by several volunteers. The Commission is broadly charged with administering and enforcing herring harvest regulations, maintaining and enhancing herring habitat, and public education on the herring run. It was agreed that since the spawning grounds and river boundaries were in both Middleborough and Lakeville, and the law gave control of the herring run to both towns, then both towns should work jointly to protect the herring. Operating as a Chapter 44, Section 53E and ½ revolving fund agency, Commission funds came solely from the sale of herring permits. With the ban on herring catching, no permits have been sold and no operating funds have been generated since 2005. Through frugal management practices the Commission presently maintains an annual operating budget.

POPULATION AND HARVEST ESTIMATES

Early in the 20th century Belding (1921) reported the Nemasket River herring run was underperforming mainly due to blockages and pollution related to mill works on the river. The herring harvest in 1912 was reported as 200 barrels (about 140,000 fish) with an estimated potential of 2,000 barrels (about 1,400,000 fish) (Belding 1921). A review of more recent river herring surveys by *MarineFisheries* (Reback and DiCarlo 1972; Reback et al. 2004) and Herring Commission files reveals a pattern of improvement in the herring run during the 20th century that may reflect rebounding habitat quality as mills closed, improved passage at obstructions, and the stewardship of the Herring Commission.

Volunteer herring counts were established in 1996 and utilize a ten-minute count at the top of the Wareham Street fish ladder, along with recording air temperature, water temperature, weather at the time of the count, and barometric pressure. The volunteer counts were provided to *MarineFisheries,* who calculate annual estimates of herring passage based on extrapolating the ten-minute counts.

The Nemasket River herring count data was revisited in 2012 to generate run size estimates using a random stratified sampling design recommended by *MarineFisheries* (Nelson 2006). The updated analysis partitions 10-minute counts into three periods of each day. This approach avoids bias that can occur when counts are concentrated at a time of day of run peaks and these data influence the extrapolated results for other times of the day. The updated analysis results in lower run size estimates than the earlier method (Table 1, Figure 3). The run size time series shows a low point in 2004 and 2005 of less than 250,000 herring with a moderate increasing trend since the harvest ban in 2006. The series high estimate was over 1.3 million fish in 2002 followed by about 840,000 fish in 2013. These catch numbers relative to other herring counts in Massachusetts support the commonly held assertion of the Nemasket River being the largest herring run in the state.

For decades prior to 1996, the residents of Middleborough and Lakeville were allowed one bushel of herring per year, although recreational harvest enforcement was not consistent and was poorly reported. The illegal harvest of herring mainly for lobster and striped bass bait became a growing problem that no records can accurately describe. In 1996, local control was formally established and the Herring Commission has since endeavored to record recreational herring catch numbers. Issued permits were formatted to allow Herring Wardens at the catching station to record the number of fish taken on each catching day. Harvest permitting ceased with the state-wide ban in 2006.

Stocking Source. The Nemasket River has been a source of river herring for stocking to augment or create runs at other rivers for many decades. For the last ten years, the Commission participated in formal multi-year stocking programs in cooperation with *MarineFisheries.* Typically, the Commission provided 2,000 herring per year to restock other runs on a five-year program. The five-year period allowed for one or two years of continued stocking after the first returns of spawning fish should have occurred. Stocking efforts have been recently conducted for the Town, Concord, and Ten Mile rivers, and in cooperation with the Rhode Island Department of Environmental Management, University of Massachusetts, and *MarineFisheries* for stock enhancement and research purposes.

SUSTAINABLE HARVEST PLAN

ASMFC. The Atlantic States Marine Fisheries Commission's (ASMFC) Amendment 2 to the Interstate Fishery Management Plan for Shad and River Herring gives states guidance for developing Sustainable Fishery Plans (SFP) for river herring (ASMFC 2009). These plans are to be developed and approved by State jurisdictions then reviewed by the ASMFC Technical Committee and if suitable forwarded to the ASMFC Shad and River Herring Management Board for approval. The premise is that SFPs should allow harvest while not diminishing the potential future reproduction and recruitment of herring stocks. The SFPs are based on Sustainability Targets that relate management responses to population action and warning levels. SFPs can be river-specific, regional or state-wide. The ASMFC guidelines also state that a minimum of 10 years of demographic data is needed to support Sustainable Fishery Plans.

> ***ASMFC Sustainability Targets.*** *The recommended sustainability targets in Amendment 2 included: spawning stock biomass, fish passage counts, mortality rates, repeat spawning ratio, and juvenile abundance indices. From these measures, thresholds or targets shall be set to prompt action level (mgt. action such as fishery closure or regulation change) or warning level responses (documentation and mgt. planning).*
>
> *Five state plans were reviewed and approved during 2011–2012 (ME, NH, NY, NC and SC). Most sustainability targets are based on exploitation rates and escapement targets related to fishery dependent harvest or independent herring passage counts. Single applications occur for both using a recruitment failure definition and a juvenile index as targets. Two states are investigating the use of population metrics (mortality, length, CPUE, and repeat spawning ratio) as sustainability "measures" or warning limits.*

Herring Commission Objectives. The Middleborough-Lakeville Herring Fishery Commission sent an inquiry to *MarineFisheries* on December 18, 2013 in regard to the potential and process for opening harvest of river herring at the Nemasket River. Consequently, several meetings occurred to discuss the topic and *MarineFisheries* staff evaluated the available biological and count data that could be used to develop metrics for a river herring sustainable fishery plan. The Commission, with their decades of experience managing the Nemasket River run, stated their belief that their previous harvest system of permitting, reporting, and limited harvest days under Commission supervision would allow a sustainable harvest. They support this contention by outlining that the modest harvest of 1999–2005 averaged about 15% of the annual run count with no evidence of impact on future recruitment. Furthermore, these harvest years include the two lowest run counts in the time series (2004 and 2005) that were followed by nearly 10 years of steady improvements to run counts. Therefore, they expressed an interested in opening harvest to allow similar catches as occurred in 1999–2005, that when removed from the present stock, would constitute an exploitation rate of less than 10% of the run size.

State Role. *MarineFisheries* supports this request conceptually and has proceeded to evaluate the existing biological and count data from the Nemasket River and four additional herring runs to provide regional context and to gain a wider perspective on recent stock changes. From this review, the following framework is presented for a Nemasket River Sustainable Fishery Plan for river herring.
The proposed SFP would commence in 2017. The harvest ban would at that time have been in place for 11 years (2006–2016) and the count time series duration will be 21 years.

Management Unit. The SFP has a river-specific management unit of the Nemasket River herring run in the Towns of Middleborough and Lakeville.

Sustainability Measures. The ongoing run count with calculated run size will serve as the primary measure to monitor the Nemasket River run status.
Sustainability Target. One fishery-independent sustainability target will be used. Harvest will be capped at 10% of the time series mean (TSM). This value will be recalculated each year. This level was selected as a conservative level of harvest that will be lower proportionally than 1999–2005 harvest levels in the Nemasket River and will allow within-year management measures to adjust daily limits and close harvest when the harvest target is reached. Table 1 and Figure 3 provide the run count statistics that formed the basis of the recommended sustainability target. The review also considered reductions from the 25th percentile as conservative levels of harvest. The selected harvest target of 10% of the TSM produces a similar harvest as a 15% reduction from the 25th percentile and was preferred due to the reduced complexity.

Primary Action Threshold. The 25th percentile of the Nemasket River run count time series will serve as the primary action threshold to trigger a management response to declining run size.

Management Actions. With two consecutive years where the Nemasket River run count is below the 25th percentile, the sustainability target will be reduced to 5% of the TSM for the following year. Three consecutive years with the run count below the 25th percentile of the time series will trigger a minimum 3-year closure the following year. In order to reopen the harvest, an opening threshold of three consecutive years above the TSM would have to occur.

Secondary Threshold. An annual exploitation rate of 10% of the run size will serve as a secondary threshold or warning limit. An exploitation rate of 10% of annual run size would recently have been similar to a harvest target of 10% TSM; but also would provide an alternative annual signal of how harvest relates to run size. Two exploitation rates in approved SFP presently target 18% (SC) and 20% (NH) of average run counts. Annual exploitation rates will be tracked each year with a threshold of 10% assigned as a warning limit. Following a single, annual exceedance of this threshold, *MarineFisheries* will meet with the Middleborough-

Lakeville Herring Fishery Commission to review harvest records and management practices and document the review and cause of increase in exploitation rate in a joint memorandum.

Potential Future Metrics. With the SFP implementation, and increasing time series, efforts will be made to develop additional primary and secondary thresholds. *MarineFisheries* has conducted annual biological sampling of alewife and blueback sex, size, and age data at the Nemasket River since 2004 (Tables 2 and 3, and Figure 4). These data allow the calculation of age, length, and weight statistics and estimates of sex ratios, mortality, and survival. The target sampling level is 100 river herring per week for the duration of the run to meet suitable levels of power to discern trends (Nelson et al. 2011) for both sexes and species. The targeted run duration is usually six weeks. Aging is conducted using otoliths and following published *MarineFisheries* protocols (Elzey et al. 2015).

The data derived from biological sampling can provide additional information on population status and supporting evidence for management measures. However, as found in Nelson et al. (2011), the length and age metrics for river herring analyzed to date in Massachusetts provide little predictive power when related to population abundance. Mean lengths and mean ages of fish within a run can point to long-term changes in demography, but the current time series appears to be tracking inter-annual fluctuations in year class recruitment into the population and indicates that robust age structure has not been recovered. With these conditions, it is not presently possible to clearly identify thresholds associated with the biological data. This limitation is not unexpected nor prevents the development of future metrics: 11 years of size and age data allows the tracking of only two generations of river herring. *MarineFisheries* recommends that biological data continue to be collected from the Nemasket River herring run with the goal of developing population thresholds based on the following metrics:

Age Structure. Evidence of age structure truncation is present now in Massachusetts river herring populations, including the Nemasket River population. Additional cohorts to evaluate age structure or mortality rates may become useful for setting warning limits. Changes in age structure will be examined annually using the χ^2 test as described in Davis and Schultz (2009).

Repeat Spawners. A target percentage of repeat spawners in annual spawning run could be used for setting a warning limit. However, with the present focus on otoliths for aging, it would take a renewed effort to collect and process a subsample of scales from older Nemasket River herring to compare to earlier scale samples.

Escapement Targets. Alternatively to annually opening harvest at the start of the run, the Commission could consider not allowing harvest until a suitable escapement target of incoming spawners was met. The escapement target would depend on real-time reporting from an electronic or video counting station at one of the Nemasket River fishways and relate counts to a metric on spawning habitat productivity. For example, the Maine Department of Marine Resources uses a calculation based on spawners per surface acre of spawning and nursery habitat (Havey 1961, Havey 1973) to set escapement targets. This would guarantee a certain number of spawners entering the spawning habitat and guard against unexpected low returns. One potential drawback in some systems could be focusing the harvest on later arrivals that may have a higher proportion of younger fish or blueback herring.

HARVEST MANAGEMENT

Opening harvest in a single river creates management and enforcement challenges given that Massachusetts has about 80 rivers within 48 coastal towns that contain river herring runs. The Nemasket River is presently the only river proposed for harvest in 2017. Ideally, a regional approach would be established to allow several runs to open at the same time. This would reduce concerns over harvest compliance and enforcement while providing a larger opportunity for Commonwealth citizens who are not town residents to purchase harvest permits. This has been a goal of *MarineFisheries*; however, while several Towns have expressed an interest in opening harvest, no other herring runs presently have the full complement of favorable stock status, a suitable data series, and the infrastructure and dedication found in the Middleborough-Lakeville Herring Fishery Commission.

The prior system of harvest management in the Nemasket River was managed by the Middleborough-Lakeville Herring Commission until the 2006 state-wide ban (Appendix A2). They used a proven system of selling an unlimited number of permits to residents and 200–300 permits to non-residents with a weekly maximum catch of 48 fish that could be taken on four open days at only one catching area. Catching was only allowed in the presence of a Commission herring warden or volunteer observer. The permits were printed with punch-card features on the border that allowed the herring wardens to mark each weekly harvest.

The Commission was interested in opening harvest in 2017 with an approach similar to pre-2006 that allowed a large permit base to have access to 48 fish per week with the acknowledgement that many permit holders won't maximize their allowable catch. Following review of three alternative management options, the following approach was selected for balancing the interest of providing access to many harvesters and preventing overages of the harvest target (10% of TSM = 55,967 fish).

> **Harvest Management.** Typically 600-700 resident permits were sold per year in the decade prior to the harvest ban and non-resident permits were capped at 200-300 and provided via lottery. The available harvest records do not presently allow a determination of the harvest rate per permit or number of inactive permits. However, the Commission's impression is that a majority of permits did not realize their maximum harvest rate and many were inactive or marginally used. Therefore, this proposal seeks to limit the potential for overharvesting the sustainability target by reducing the harvest period to five weeks, reducing the harvest days to three per week, and reducing the weekly catch limit per permit to 20 fish. Using the range of permits sold previously, this approach would have a potential maximum harvest that ranged from 80,000 to 100,000 fish (800 to 1000 permits). By allowing unlimited resident permits and 250 non-resident permits via lottery the Commission is expecting about 900 total permits. The maximum harvest under this scenario would be 90,000 fish. An assumed harvest rate of 50% of the maximum potential harvest would result in a harvest of 45,000 fish.

The potential for harvest to exceed the sustainability target exists for this approach if a high proportion of permit holders takes the full weekly harvest each week. This proportion is expected to be low given the Commission's past experience. This outcome is hard to predict but will be easily tracked once harvest is open. The SFP will diligently monitor harvest performance by permit and week in order to make annual adjustments to relate the harvest target to the numbers of permits issued.

The previous "punch-card" permit system would be augmented with the issuance of daily catch cards to each permit holder that harvests herring. The card would indicate the date, permit number, and number of fish. State regulations will be changed by *MarineFisheries* to require that any possession of river herring in Massachusetts be accompanied by the Nemasket River harvest permit and the daily harvest card. Herring frozen in bags must have the original daily harvest card placed in the bag.
The permits and daily catch cards would be professionally printed on waterproof paper.

The usage of harvested river herring trended sharply towards striped bass bait in the decade leading up the state-wide harvest ban. *MarineFisheries* recognizes that a component of the concern that led to the state-wide ban on river herring harvest was excesses in the harvest for striped bass bait. Recreational bait use will be allowed; however, the SFP seeks to promote and encourage traditional uses of consumption of river herring as grilled, pickled, and smoked fish and fried roe. To do this, the Commission will accommodate herring consumption requests as able. For example, requests for only females for roe harvest might be allowed when manageable. In these cases, the Commission should record the female only harvests and compensate on a daily basis as needed by providing males for bait use.

Native American Harvest. The Commonwealth of Massachusetts recognizes the aboriginal practice of the Wampanoag tribe to harvest river herring in Massachusetts. An agreement has been signed between the parties with the tribe agreeing to harvest only for sustenance purposes and to report their harvest by river to *MarineFisheries.* The tribe's harvest is not bound to SFP measures; however, an accurate accounting of their harvest in the Nemasket River will be essential for a successful SFP. *MarineFisheries* will discuss the possibility of issuing free permits to the Wampanoag tribe and to coordinate with the tribe to encourage responsible harvest and record keeping.

STATEWIDE REGULATIONS AND ENFORCEMENT

For this harvest opening to be successful and enforceable, the process will need a tightly managed accounting system for daily harvest, well-planned coordination with the State Environmental Police, and participation from Town law enforcement. A coordination meeting will be held with the Massachusetts Environmental Police, *MarineFisheries*, Town Police, and the Herring Fishery Commission each year prior to the season start. *MarineFisheries* will enact changes to the existing state regulations that ban state-wide harvest to allow harvest and possession of Nemasket River herring in accordance to this SFP and the Herring Fishery Commission regulations. This process will include a review of existing penalties for non-compliance and updating the penalties as needed.

The Massachusetts Environmental Police has recommended that the Commission provide information on permit records and seasonal harvest records to improve the enforcement of harvest regulations. The ideal approach would be to have an online source of permit records and the names and schedules of herring wardens available at the start of each season with weekly updates in harvest by permit. The Commission does not have the present capacity to provide an online permit data source or online weekly updates of harvest. However, the Commission recognizes the value in these communications for law enforcement and will endeavor to work with *MarineFisheries* to prepare a spreadsheet of permit holder information and river herring warden names, schedules, and phone numbers for the start of the 2017 season.

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TABLES & FIGURES

Table 1. River herring run counts and harvest data for the Nemasket River, Middleborough, MA. Recorded at the Wareham Street fishway.

Year	Original Run Count (No.)	Updated Run Count (No.)	Permits (No.)	Harvest (No.)	% of Count (%)	Summary Statistics	
1996	1,094,860	696,666				TSM	559,673
1997						Median	548,835
1998	866,538	651,441				Minimum	225,904
1999	1,043,906	766,694	742	104,992	0.14	Maximum	1,361,691
2000	1,069,286	560,986		76,426	0.14	75% TSM	419,755
2001	476,779	284,498	1966	59,514	0.21	1st Q	387,894
2002	1,919,402	1,361,691	2698	86,301	0.06		
2003	792,990	548,835	2113	61,945	0.11	10% of 1st Q	38,789
2004	578,000	244,832	2109	64,593	0.26	15% of 1st Q	58,184
2005	401,000	225,904	1931	33,964	0.15	20% of 1st Q	77,579
2006	505,246	313,242				10% of TSM	55,967
2007	659,880	462,000					
2008	848,848	392,451					
2009	760,717	383,338					
2010	763,884	489,931					
2011	662,052	512,139					
2012	NR	567,952					
2013	NR	840,033					
2014	NR	590,105					
2015	NR	741,048					

Time series mean (TSM), 75% of TSM and first Quartile are derived from the count time series and displayed in Figure 2.

Table 2. The number collected (n), mean length (mm), and standard deviation (SD) of river herring from the Nemasket River by sex during 2004-2014.

	Female			Male		
Year	n	Mean Length	SD	n	Mean Length	SD
2004	127	291.5	14.36	141	282.6	15.15
2005	130	280.4	15.20	148	273.0	16.11
2006	127	275.3	13.66	197	265.1	13.35
2007	255	278.1	12.41	395	276.6	12.84
2008	228	281.9	12.49	276	269.1	12.94
2009	191	278.3	11.33	313	268.1	11.06
2010	277	272.1	10.69	276	272.1	10.67
2011	220	287.1	11.21	283	275.2	11.42
2012	154	284.3	13.44	229	270.3	12.50
2013	213	279.5	9.79	284	270.5	10.14
2014	236	287.2	11.63	324	277.2	11.24

Table 3. The annual number alewife by age in biological samples collected from the Nemasket River during 2004-2014.

Female

Age	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
2	0	0	0	0	0	0	0	0	0	0	0
3	0	4	27	22	2	0	22	17	59	115	73
4	23	50	56	163	38	48	80	95	72	48	93
5	52	54	34	59	134	60	71	57	19	6	6
6	40	19	6	5	33	36	14	7	2	2	1
7	8	1	1	1	5	4	2	2	2	0	1
8	0	1	0	1	0	0	0	0	0	0	0
Totals	123	129	124	251	212	148	189	178	154	171	174

Male

Age	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
2	0	0	0	0	0	0	0	0	9	11	0
3	4	10	62	41	36	8	42	36	91	113	103
4	39	51	91	257	76	118	88	98	61	42	59
5	65	17	31	82	110	98	51	44	12	6	11
6	30	17	9	12	37	29	7	4	1	0	2
7	1	6	1	1	1	1	1	0	1	0	0
8	0	0	1	0	0	0	0	0	0	0	0
Totals	139	101	195	393	260	254	189	182	175	172	175

Figure 1. Nemasket River Watershed

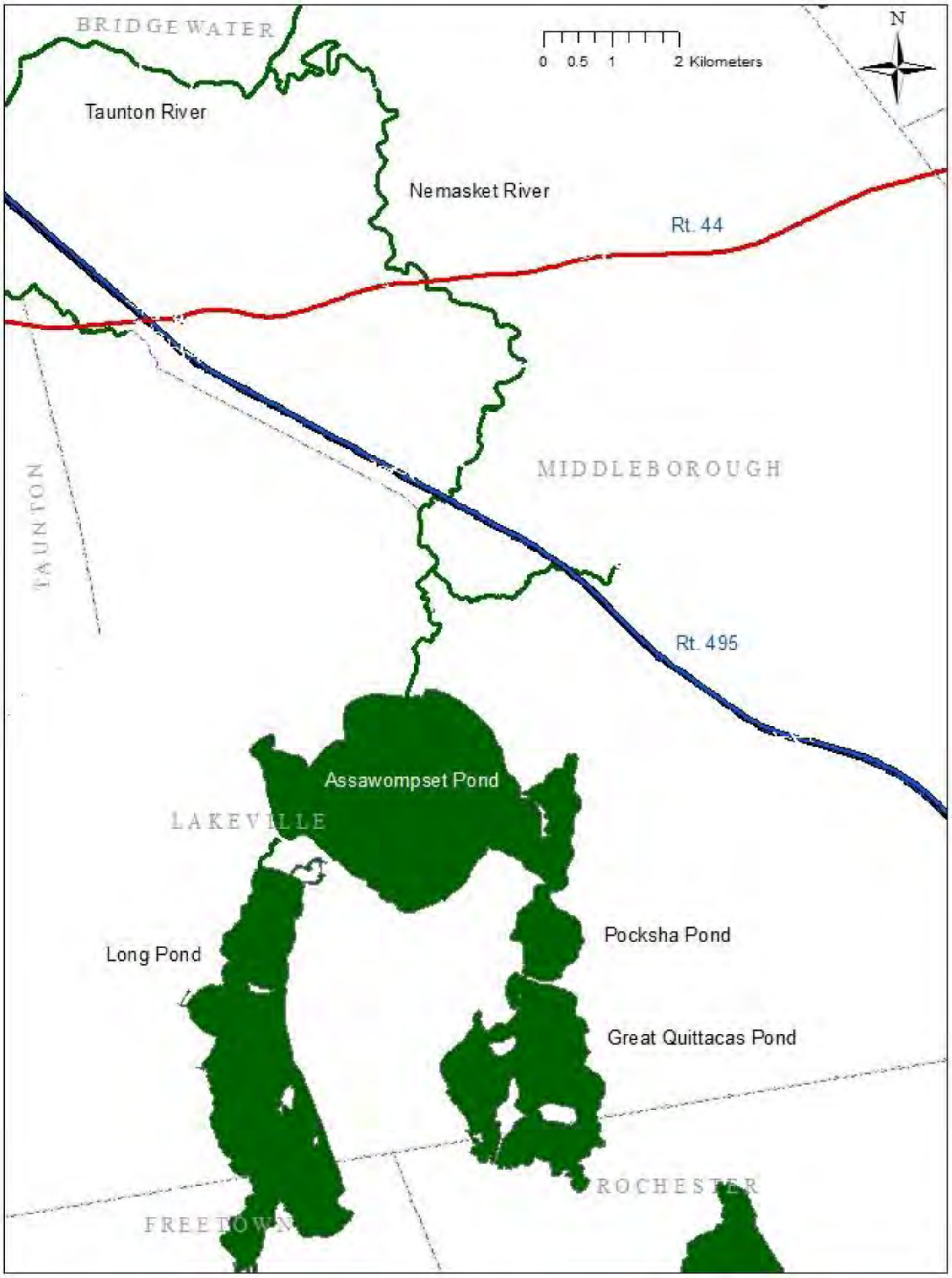


Figure 2. Oliver Mill Park, Nemasket River, Middleborough.

Figure 3. Annual river herring run count estimates for the Nemasket River, 1996 - 2015. The horizontal lines delineate the time series mean (TSM), 75% of the TSM, and 25th percentile (1st Q).

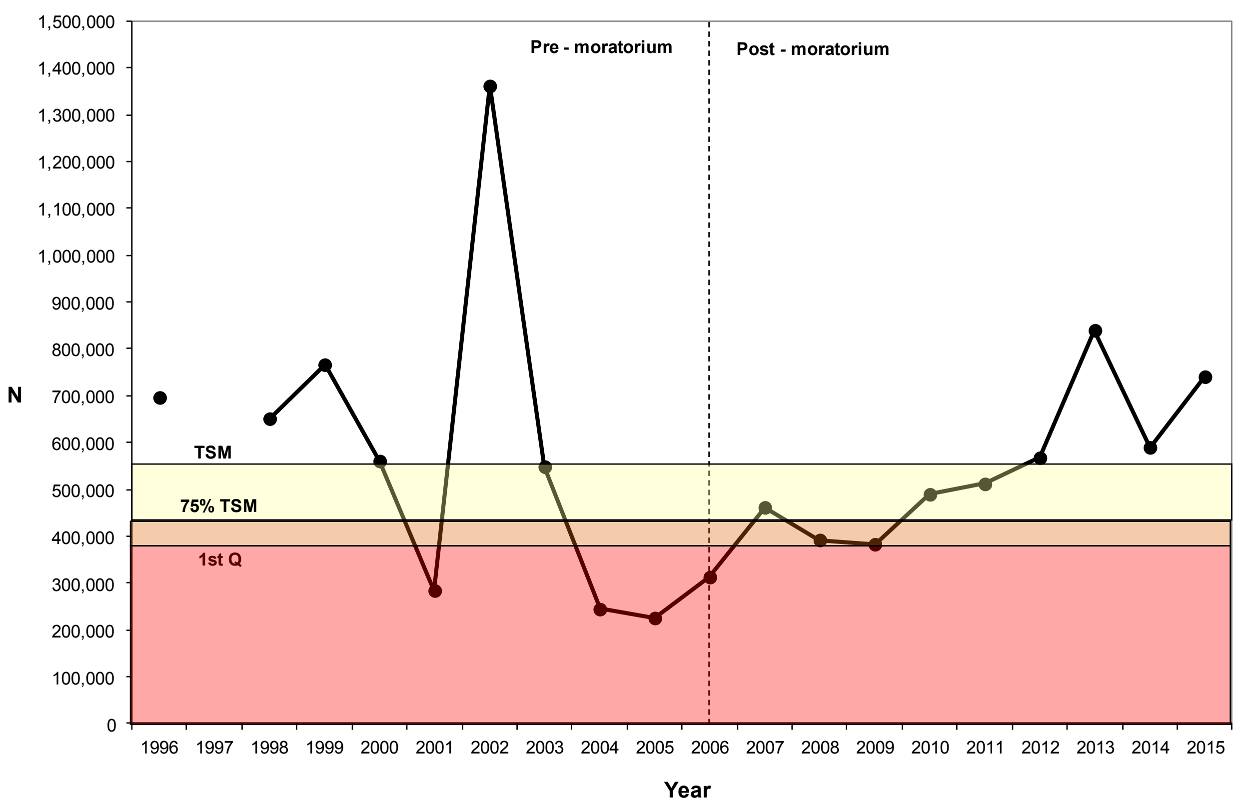
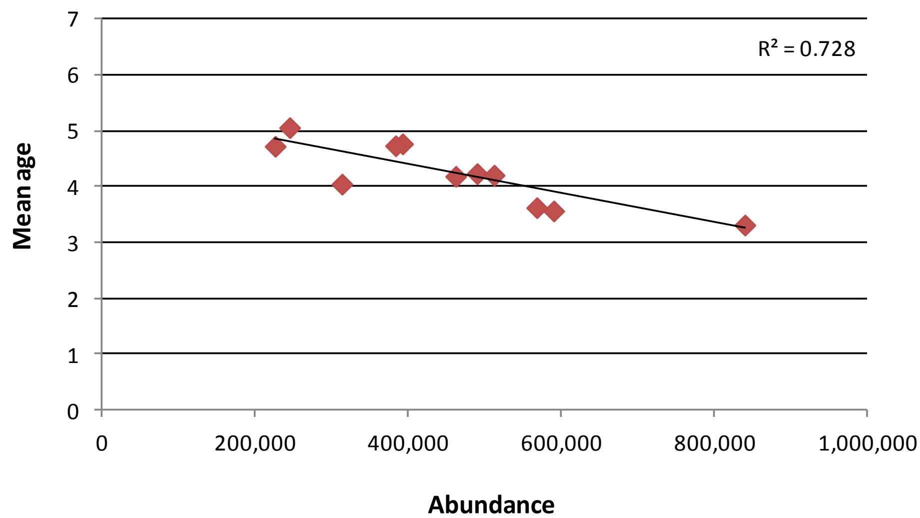


Figure 4. Scatterplot with linear trend and R^2 value of the mean age in years against abundance (run count) for alewife sampled at the Nemasket River, Wareham Street, during the period 2004-2014. The age data combines male and female alewife.



APPENDIX

A1. Massachusetts Legislature, Acts of 1853; Chapter 338, Section 5 of the Act incorporating the Town of Lakeville, Massachusetts.

> *"The alewife fisheries of the Nemasket River shall be and remain the property of said towns of Middleborough and Lakeville, and the manner of taking said fish, and the whole management of said fisheries, shall be regulated by the selectmen of said towns; and the proceeds thereof shall be divided between the said towns, in proportion to the number of ratable polls in each respectively, and the respective parts of such protocols shall be disposed of by said towns respectively, in such a manner and for such purposes as each town shall for itself determine and direct."*

A2. Middleborough-Lakeville Herring Fishery Commission: Herring Rules and Regulations, December 2004 (the last revisions prior to the state-wide ban in 2006).

Middleborough · Lakeville Herring Fishery Commission

Bank Building, 20 Centre Street, Middleborough, Massachusetts 02346

HERRING RULES AND REGULATIONS

A. No herring may be taken without a valid and signed permit. Herring may only be taken during posted hours with a Warden or Volunteer Observer on duty.

B. A **maximum** of 48 fish per week may be taken, in any combination of visits. The Warden or Observer on duty may limit the catch as conditions warrant.

C. Herring may **ONLY** be taken by hand-held hoop net **WITH A MESH OF 3/8 INCH OR SMALLER** or by hand. Herring that are "gilled" or otherwise injured must be harvested first.

D. Permits are sold at the Middleborough Town Clerk's Office, 20 Center Street, Monday through Friday from 8:45 AM to 5:00 PM. The Commission will determine the number of permits sold and the manner of sale each season.

E. Permit Fees: Valid identification will be required.

$5.00	Middleborough/Lakeville Residents	$25.00	Non-residents
$1.00	Middleborough/Lakeville Senior Citizens	$5.00	Non-resident Senior Citizen

Duplicate Permits $2.00 (with proof of identification).

F. Catching Days and Times:

Wednesday:	4:00 PM to 8:00 PM
Friday:	6:00 AM to 7:00 PM
Saturday:	5:00 AM to 7:00 PM
Sunday:	6:00 AM to 10:00 AM

The season opens on the last Wednesday in March and ends June 15, unless closed earlier as dictated by the availability of fish.

Exception: To accommodate sport fishermen and tide considerations; herring may be taken at other times of the day or night, from May 15 to June 15 (depending on the availability of fish). The Middleborough Town Manager must be notified at least 24 hours in advance. **Call (508) 947-0928** during business hours to set an appointment with a Warden or Volunteer Observer.

G. Catching Area:

1. The pool below the falls at the Wareham Street fish ladder in Middleborough is the **ONLY** legal catching area in Middleborough or Lakeville. **No herring may be taken without the direct permission of the Warden or Volunteer Observer on duty.**

2. No one is permitted to enter the fish ladder, including the concrete mouth of the ladder. No one is permitted to disturb, injure, hinder or obstruct the passage of herring in any fish ladder. Fishing in the pools above or below the fish ladders at Oliver Mill Park and Wareham Street with a rod and reel in a manner which disturbs the herring, or which could snag a herring is prohibited.

3. For safety reasons, to prevent disturbing herring eggs and to prevent hindering the passage of herring; no person is permitted to enter the river at any time.

H. Littering in the general park area or throwing rocks, sticks or other objects into the fish ladders or catching areas is prohibited. Visitors and catchers shall assume all risk and liability.

It is the Commission's intention to provide a safe recreational area. Disorderly conduct or public drunkenness will not be tolerated. Offenders will be ejected from park areas.

MGL Chapter 130 Sect. 95 applies throughout Middleborough and Lakeville:

Taking Fish From Fisheries Without Permission

"Whoever takes, kills or hauls onshore or disturbs, injures, hinders or obstructs the passage of any herring, alewives or other swimming marine food fish ... shall be punished by a fine of not less than five nor more than fifty dollars."

The Towns of Middleborough and Lakeville and the Mass. Environmental Police may prosecute violation of these rules. Violators are subject to arrest, fine, seizure of equipment, and loss of permit.

All Rules and Regulations are subject to the discretion of the Warden or Volunteer Observer on duty. Regulations may be modified as conditions warrant.

Revised: December 2004

Atlantic States Marine Fisheries Commission

Horseshoe Crab Management Board

October 26, 2016
8:00 – 10:00 a.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(J. Gilmore)*	8:00 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	8:00 a.m.
3.	Public Comment	8:05 a.m.
4.	Consider Comments from the ARM Subcommittee on Draft Addendum VIII (*K. Rootes-Murdy*) **Possible Action** • ARM Subcommittee Report (*K. Anstead)*	8:15 a.m.
5.	Horseshoe Crab Technical Committees Report (S. *Doctor)* **Possible Action** • Shorebird and Horseshoe Crab Survey Reports Summary • Adaptive Resource Management (ARM) Framework Harvest Output for 2017 • Recommendations on Bait Trials	9:00 a.m.
6.	Set 2017 Delaware Bay Horseshoe Crab Fishery Specifications (*K. Rootes-Murdy*) **Final Action**	9:30 a.m.
7.	Consider Approval of 2016 FMP Review and State Compliance (*K. Rootes-Murdy*) **Action**	9:45 a.m.
8.	Other Business/Adjourn	10:00 a.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

MEETING OVERVIEW

Horseshoe Crab Management Board Meeting
Wednesday October 26, 2016
8:00 – 10:00 a.m.
Alexandria, Virginia

Chair: Jim Gilmore (NY) Assumed Chairmanship: 10/14	Horseshoe Crab Technical Committee Chair: Steve Doctor (MD)	Law Enforcement Committee Representative: Doug Messeck (DE)
Vice Chair: Dr. Malcolm Rhodes (SC)	Horseshoe Crab Advisory Panel Chair: Dr. Jim Cooper (SC)	Previous Board Meeting: August 2, 2016
Shorebird Advisory Panel Chair: Dr. Sarah Karpanty (VA)	Delaware Bay Ecosystem Technical Committee Chair: Greg Breese (FWS)	
Voting Members: MA, RI, CT, NY, NJ, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (16 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 2, 2016 Board Meeting

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Consider Comments from the ARM Subcommittee on Draft Addendum VIII (8:15 – 9:00 a.m.) Possible Action
Background • At the 2016 Summer Meeting, the Board initiated a draft addendum that proposed changes to the Adaptive Resource Management (ARM) Framework that included accounting for mortality associated with biomedical bleeding activities as well as explore options that allow for the harvest of female horseshoe crabs. • The ARM Subcommittee met in September 2016 to review updated information on horseshoe crab and red knot abundance and consider ARM model harvest output for 2017. Additionally, the ARM Subcommittee provided feedback on a request to conduct

analysis to better understand the impact of biomedical mortality on the ARM model harvest output. (**Briefing Materials**)
Presentations • ARM Subcommittee Report by K. Anstead • Challenges with developing Draft Addendum VIII by K. Rootes-Murdy
Board actions for consideration at this meeting • Provide guidance on if and how draft addendum VIII should be developed at this time

5. Horseshoe Crab Technical Committees Report (9:00-9:30 a.m.) Possible Action
Background • The Delaware Bay Ecosystem and Horseshoe Crab Technical Committees (TCs) jointly met on October 5, 2016. • The TCs reviewed the updated horseshoe crab abundance information, considered the ARM harvest output, and discussed continuation of the alternative bait trials. (**Supplemental Materials**)
Presentations • TCs Report by S. Doctor
Board actions for consideration at this meeting • Provide guidance on if and how draft addendum VIII should be developed at this time

6. Set 2017 Delaware Bay Horseshoe Crab Fishery Specifications (9:30-9:45 a.m.) Final Action
Background • The ARM subcommittee met by conference call in September 2016. • In the absence of the Virginia Tech Trawl Survey data in recent years, the ARM Subcommittee considered a composite index to inform horseshoe crab abundance in the Delaware Bay region. Using updated abundance information on horseshoe crabs and Red Knots in the Delaware Bay region, the ARM Subcommittee made a recommendation on the 2017 harvest specifications for the Delaware Bay Region states. • The Horseshoe Crab TCs reviewed and endorsed the ARM subcommittee harvest recommendation at their meeting in October 2016. (**Briefing Materials**)
Presentations • Overview of the ARM harvest output by K. Rootes-Murdy
Board actions for consideration at this meeting • Consider ARM harvest recommendations and set specifications for the Delaware Bay states in 2017.

7. Consider Approval of the 2016 FMP Review and State Compliance (9:45-10:00 a.m.) Action
Background • State Compliance Reports are due March 1. • The Plan Review Team reviewed each state report and drafted the annual FMP Review. (**Supplemental Materials**) • The Potomac River Fisheries Commission, South Carolina, Georgia, and Florida have requested and meet the requirements of *de minimis* status.
Presentations • Overview of the FMP Review by K. Rootes-Murdy
Board actions for consideration at this meeting • Accept 2016 FMP Review and State Compliance Reports. • Approve *de minimis* requests from the Potomac River Fisheries Commission, South Carolina, Georgia, and Florida.

8. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

HORSESHOE CRAB MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
August 3, 2016

These minutes are draft and subject to approval by the Horseshoe Crab Management Board
The Board will review the minutes during its next meeting

TABLE OF CONTENTS

INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).

2. **Approval of Proceedings of May 2016** by Consent (Page 1).

3. **Move to approve all ARM Subcommittee and Technical Committee recommendations except for the biomedical harvest Subcommittee packages** (Page 13). Motion by Brandon Muffley; second by Robert Boyles. Motion Substituted.

   Motion to Amend
   Move to amend to initiate an addendum to the HSC management plan to address the ARM Subcommittee's recommendation to the ARM framework regarding 1) mortality associated with the biomedical industry; and 2) bait harvest packages which allow female horseshoe crab harvest as presented in Appendix C of the framework review. Motion made by Michael Luisi; second by Craig Pugh.

   Main Motion as Amended

4. **Move to initiate an addendum to the HSC management plan to address the ARM Subcommittee's recommendation to the ARM framework regarding 1) mortality associated with the biomedical industry; and 2) bait harvest packages which allow female horseshoe crab harvest as presented in Appendix C of the framework review.** Motion carried (Page 20).

5. **Move to task the Technical Committee with designing bait experiments to be completed in 2017 for those states that opt to participate—involving reduced amounts of horseshoe crab, relative to status quo, in the whelk and eel fisheries—to be developed for Board review and approval by October 2016** (Page 21). Motion made by Bob Ballou; second by Brandon Muffley. Motion carried (Page 21).

6. **Move to adjourn,** by Consent (Page 22).

ATTENDANCE

Board Members

Bill Adler, MA (GA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
Bob Ballou, RI, proxy for J. Coit (AA)
D. Simpson, CT (AA)
Rep. Craig Miner, CT (LA)
Rep. Melissa Ziobron, CT Legislative proxy
James Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Stewart Michels, DE, proxy for D. Saveikis (AA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Roy Miller, DE (GA)
David Blazer, MD (AA)
Rachel Dean, MD (GA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Michelle Duval, NC, proxy for B. Davis (AA)
Jerry Schill, NC, proxy for Rep. Steinburg (LA)
Robert Boyles, Jr., SC (AA)
Malcolm Rhodes, SC (GA)
Spud Woodward, GA (AA)
Pat Geer, GA, proxy for Rep. Nimmer (LA)
James Estes, FL, proxy for J. McCawley (AA)
Mike Millard, USFWS
Chris Wright, NMFS
Martin Gary, PRFC

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Steve Doctor, Technical Committee Chair
James Cooper, Advisory Panel Chair
Jim Lyons, ARM Subcommittee Chair

Staff

Robert Beal
Toni Kerns
Kristin Anstead
Kirby Rootes-Murdy

Guests

Dennis Abbott, NH Legislative proxy
Colleen Giannini, CT Administrative proxy
Sherry White, USFWS
Wilson Laney, USFWS
Debra Lambert, NOAA
Peter Aarrestad, CT DEEP
Justin David, CT DEEP
Cheri Patterson, NH F&H
Russ Allen, NJ DFW
Andrew Shiels, PA F&B Commission
Mike Luisi, MD DNR
Lewis Gillingham VA MRC
Jeff Deem, VMRC
Allen Burgenson, Lonza Walkersville, Inc.
Benjie Swan, Limuli Labs
Arnold Leo, E. Hampton, NY

The Horseshoe Crab Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2016, and was called to order at 2:40 o'clock p.m. by Chairman James J. Gilmore.

CALL TO ORDER

CHAIRMAN JAMES J. GILMORE: Good afternoon everyone. Welcome to the Horseshoe Crab Board meeting. I've been instructed by Bob and Toni that I have to get us back on schedule or I'm not getting paid. We've got to really be efficient in our deliberations today. My name is Jim Gilmore; I'm the administrative commissioner from New York, and I'll be chairing the meeting today.

Just a couple of introductions before we go, we've got obviously Kirby Rootes-Murdy; who everyone knows from the commission staff, is doing a fine job running this whole thing. Jim Lyons, who doesn't have a name tag today is going to be doing presentations. We've got Steve Doctor from the Technical Committee, and we've got Jim Cooper; who is on the Advisory Panel. With that, we'll just get right into the agenda.

APPROVAL OF AGENDA

CHAIRMAN GILMORE: The first order of business is approval of the agenda; it should be in your briefing materials. Are there any changes to the agenda? Seeing none; we'll adopt those by consensus.

APPROVAL OF PROCEEDINGS

CHAIRMAN GILMORE: Second, we have approval of the proceedings from the May, 2016 meeting. Michelle.

DR. DUVAL: In reviewing the proceedings, I just noted that Mr. Chris Batsavage's name is noted throughout the meeting, and he actually was not here that day. I was here that day representing North Carolina; so perhaps there was another Chris around the table who might have been speaking that day.

CHAIRMAN GILMORE: I believe that was from the federal government, so we apologize for that. We would never mistake you for Chris Batsavage, Michelle. Thanks a lot; we'll make that change. Any other changes to the meeting minutes? Okay, we'll take those as adopted. Our next agenda item is for public comment.

PUBLIC COMMENT

CHAIRMAN GILMORE: Before every meeting we have a period for public comment on items not on the agenda. I know there are a bunch of people that would like to talk later on when we get into motions. But this is just a time for issues not on the agenda. Is there any public comment? Seeing none, we'll move on to our next item.

REVIEW OF RECOMMENDATIONS FROM THE ADAPTIVE RESOURCE MANAGEMENT SUBCOMMITTEE, AND REVISIONS TO THE ARM FRAMEWORK

CHAIRMAN GILMORE: Our first business item is going to be a review and consideration recommendation from the Adaptive Resource Management Subcommittee, and revisions to the ARM Framework. We're going to have a presentation from Jim Lyons.

MR. JAMES LYONS: Good afternoon everyone, my name is Jim Lyons; I am with USGS Patuxent Wildlife Research Center, and I am the Chairman of the Adaptive Resource Management Subcommittee, and I'm here to provide some recommendations from recent work reviewing the ARM Framework of the Subcommittee. I will start with a little bit of background about the ARM Framework and how we got here. The ARM Framework was established by Addendum 7, and as far as I know, is the first of its kind in a multispecies management approach; especially between a fishery and bird conservation.

But we have a multispecies approach to predict the optimal strategy for horseshoe crab harvest. The two main monitoring programs in this framework are the Virginia Tech Trawl Survey for the horseshoe crab population monitoring, and a mark-resight approach to monitoring the stopover population of red knots.

The entire adaptive management framework, like all adaptive management frameworks, is a two-phase approach. We have an initial setup phase, where you identify the objectives of this decision, the options that are available to you, some models, some population models in this case of system dynamics and the monitoring that you need to make good decisions.

Once you have the setup phase complete, you can enter this iterative phase where you regularly make decisions; in this case an annual decision about the harvest decision. It is also customary in adaptive management frameworks to periodically revisit the setup phase and review those aspects of your decision framework that I just mentioned; the objectives, and your options and your models, and your monitoring, and see if you have those aspects specified correctly and if you require any changes.

That is what recent work has been about, is revisiting the setup phase and reviewing some of these aspects of the decision-making framework. In recent years the harvest recommendations have been 500,000 crabs; males only. I want to point out a couple of aspects of the mortality estimates in the horseshoe crab population dynamics model that will help us understand some of the options that I'm going to present.

In the population dynamics model, we have two sources of mortality. There is a natural mortality process, and then the harvest recommendation; the mortality associated with that harvest recommendation is subtracted from the crabs that have survived natural mortality. In this process of projecting the population, we have a natural mortality process; and then we subtract whatever the recommendation is.

It will be helpful to keep those two sources of mortality in mind. In the fall of 2015, the TCs and the ARM Subcommittee recommended revisiting the setup phase. In February of 2016, the ARM Subcommittee presented five potential review items to the board; some of them were considered short term review items that could be completed in six to eight months, some of them were longer term things that would require one to two years to complete. At the February meeting, the board tasked our subcommittee with completing the three short term review items.

Those are listed here at the bottom of this slide, and the things I am going to report on today. We're going to talk about the monitoring program and our evaluation of the current monitoring that is; is our monitoring effective and accurate, do we have the right data involved, are we using the best available data, and can we make some improvements to the monitoring program. We're also going to talk about the harvest packages and a review of those packages, and do we have them specified correctly. Are there new options we would like to consider or more options we would like to consider? Then finally, we have this objective function, which has several parts; and we evaluated different parts of the objective function to see if it was specifying our objectives correctly. I'm going to report on those three aspects of the ARM Framework. The first short term review item is evaluating the monitoring programs that we have.

The first aspect of that is an evaluation of the Virginia Tech Trawl Survey. The adaptive management framework was designed essentially around the Virginia Tech Trawl Survey. It is the most direct monitoring of the Delaware Bay horseshoe crab population and is the most appropriate monitoring of the horseshoe crab population for this decision making framework.

However, funding for the trawl survey, as you know, has been inconsistent and has lapsed in some years. But given our review of the benefits of the Virginia Tech Trawl Survey, our recommendation is to continue this Virginia Tech

Trawl Survey in future years; since it supports the adaptive resource management model and provides substantial and important data for this assessment.

Additionally, we also recommend or support the recommendations to estimate the proportion of the Delaware Bay population that is available in time and space in this monitoring, and also assess the selectivity of gear used in the survey. These are two aspects of the Virginia Tech Trawl Survey that these two assessments might be improvements to this monitoring program, and would be therefore improvements to the ARM Framework; and so we support that.

The second aspect of the monitoring review was to evaluate abundance indices from other surveys. You can see four surveys listed here that in the years when the Virginia Tech Trawl Survey wasn't available, we developed a composite index using all four of these surveys and correlating these surveys with the Virginia Tech Trawl Survey; essentially to predict what the Virginia Tech Trawl Survey would estimate if it had been run.

There was fairly good correspondence between this composite index, based on these other surveys, and the Virginia Tech Trawl Survey. In some ways, this was an effective work around when the Virginia Tech Trawl Survey was not available, and so our recommendation is that if the Virginia Tech Trawl Survey is not funded, a practical alternative is to continue to use this composite index of abundance based on data from these other surveys; although it is somewhat of an ad hoc approach and an indirect monitoring of the Delaware Bay population.

The third aspect of the monitoring review is to evaluate mark/recapture approaches to estimating the horseshoe crab population; and there have been two mark/recapture studies in evaluating or trying to develop ways to use mark/recapture to monitor horseshoe crabs in Delaware Bay. That is Smith et al in 2006 and Merritt on 2015.

Both of these studies were considered maybe partly successful, because of the large amount of tagging that seems to be required for mark/recapture approaches to be a viable way to monitor the horseshoe crab population around the Delaware Bay region. While there is some potential for these kinds of approaches, there is more work to be done here before this is ready for management decision making.

Our recommendation at this time is that mark/recapture is not a viable option for estimating the horseshoe crab abundance within the ARM Framework; therefore, it should not be incorporated into the model but should continue to be developed for future consideration. The fourth aspect of the monitoring review was to look at the red knot population monitoring program. This evaluation essentially consisted of developing or documenting the study design and a mark/resight sampling plan for this mark/resight estimation; that is essentially, how do we go around to all the beaches around the Delaware Bay and collect this mark/resighting data in an effective way. We did not develop any new protocols, but implemented.

We took this documentation of the study design and the sampling plan, and we met with the shorebird monitoring teams from Delaware and New Jersey; and renewed our efforts to collect the data in a way that is consistent with the model. The mark/resight estimates are always larger than estimates that come from the aerial surveys that are conducted, and there is some disagreement among the subcommittee members of the source of these discrepancies, and those things are described in the report that we provided.

Our recommendation is to continue the mark/resight data collection program with renewed effort to collect the data according to the sampling plan; and in a way that is consistent with the modeling that's done. Our final aspect of evaluating the monitoring program was to evaluate, incorporation of biomedical data into the ARM Framework.

As you know, the biomedical data and biomedical mortality was not previously included in the ARM Framework, but current estimates suggest that biomedical mortality is 8 to 12 percent of coastwide mortality; and so it would be an improvement in the ARM Framework if we can include this known source of mortality in the decision making process.

Given the consideration of the biomedical data, and maintaining confidentiality, but using that data as part of the stock assessment, we also evaluated the potential to include biomedical data in the ARM Framework. We developed and evaluated five different options or five different ways that we could evaluate that use of biomedical data.

Our first general recommendation, and the subcommittee was in large and strong agreement about this, is that biomedical mortality should be accounted for in the ARM Framework. We did come to a consensus option; but I am going to present today a majority option and a minority option for your consideration.

This is a description of the majority option, which is; adjust the harvest packages to account for biomedical mortality of females. The harvest packages would be adjusted for mortality, but the subcommittee understands the importance of maintaining confidentiality and also the importance of not placing a cap on biomedical mortality.

What this option does with this change to the packages is create an allocation decision for the board between the biomedical mortality and the bait harvest. In this majority option, the packages would be changed every four to six years; and at that time we would calculate a running average, a three-to-five year average, a recent year average of the biomedical mortality and adjust the packages to reflect this biomedical mortality.

We created an example here in the table with the current harvest packages on the left hand side of this table; and you see the five packages there. Those are the packages that we have been using since the framework was adopted. On the right hand side of the table to the right of the dark heavy line, we see an example that was created using recent data; and it would show the total harvest under this example for the majority option. I've put them there close to each other so that you can see, and I would like to emphasize, the minimal amount of change that is occurring with the packages, given this option.

The biomedical mortality for females is included, and the packages change in a small way. To the right of the total harvest columns, for example, we see the biomedical data. These are example numbers that come from recent data. But this is an example of the amount of biomedical mortality and how those numbers are added to create the new packages.

Finally, on the right hand side of this table, we see the example bait harvest that would result. Under this option, if biomedical mortality increases over time, and horseshoe crab populations do not increase; then bait harvest does decline. But this is the preferred option, because first of all, it maintains confidentiality.

The way that the biomedical data are used would maintain confidentiality of that information. It does not place a cap on biomedical mortality. It minimizes the changes to the packages; the new packages would be fairly similar to the current packages. Then finally, it is the most transparent option; that is the harvest packages are an accessible, visible part of the ARM Framework, and it is very explicit and transparent here how the biomedical data would be incorporated.

The minority option is to account for biomedical harvest in the population dynamics equations only of the ARM Framework. Under this option we do not create any new packages or change any allocation. We continue with the same current packages, but we incorporate the biomedical mortality into the population dynamics equation.

That is, we do similar calculations periodically to estimate the running average of the biomedical mortality. In our population projections in making these decisions, we subtract not only the current packages mortality, but also the biomedical after natural mortality. The total harvest under this option is actually greater than the majority option.

There is one issue that the subcommittee would like to point out is that the mortality associated with crabs is variable and not fixed; but we could potentially update this value every four to six years. The other thing that I should point out is that because of the way biomedical mortality would be added to the current harvest packages, the total overall harvest is actually greater under this option; and there is the potential that this option could lead to more conservative harvest recommendations in the future if populations don't increase.

That concludes the first short term monitoring review item. The second review item was to evaluate alternative harvest packages, and in recent years, Package 3 has been selected consistently at 500,000 male crabs and no female crabs. In considering the potential to add new packages or add more packages, or create new packages, we evaluated several alternatives.

But the subcommittee came to the conclusion that adding new packages is not likely to change any recommendations, because of the way there are utility thresholds for the horseshoe crab population and the red knot population. While we are below those abundance thresholds, the recommendations are unlikely to change no matter how many packages you have available. They are still unlikely to be picked. Our recommendation is that we do not recommend adding new harvest packages to the ARM Framework as part of this review item; although the packages should be altered to address biomedical harvest. Our third short term review item is to evaluate the objective function here; and there are four aspects of this. The first one, the suggestion was made that we should change the order of red knots and horseshoe crabs in this objective function.

You can see the objective function here in the box. This is how it is dated, where essentially the objective statement says to maximize the harvest of horseshoe crabs while being constrained by red knot populations; and that is how we achieve these two objectives. There was a suggestion that we should reverse these two things and have the objective be, maximize red knot recovery constrained by having a horseshoe crab harvest.

But this is clearly not a decision framework or an approach to decision making that ASMFC is the decision maker, and so this is really not an appropriate change for us. Our recommendation then is changing the order of red knots and horseshoe crabs, and the objective statement is not recommended.

The second part of the objective function was to evaluate this two times multiplier on the utility of female crab harvest that we have in the reward function. This was put into the ARM Framework to reflect the market value with females being twice as valuable as males. We considered whether this multiplier should be part of the objective function, and is it still accurate?

Our conclusion is that it is accurate, and so our recommendation is that because the multiplier of utility of female crab harvest and the reward function reflects market value, it is recommended that it is left in the model. The third part of the objective function involved a sex ratio constraint on the utility of male crabs. This is an aspect of the objective function that actually is redundant with part of our population dynamics model for horseshoe crabs.

We evaluated removing it, and it resulted in only minor changes to the output of the model. Given its redundancy, our recommendation is that we remove the sex ratio constraint; because it is conceptually redundant with aspects of the horseshoe crab population dynamics model. Then finally, with revisiting the objective function, we evaluated the utility functions for female harvest and their shape.

Currently, we have a knife-edged-step function for utility, and we evaluated an alternative, which is a sloped utility function. We reviewed some simulation work by Smith et al, and found that the slope function did not demonstrate a significant difference than the current knife-edged function.

There was very little change in population trajectories, and no biological reasoning for changing the utility function here; so our recommendation is given the lack of change between the two approaches, and a lack of reasons to change the current approach, we recommend no change from the current knife-edged function. With that, I will turn it over to Kirby.

MR. KIRBY ROOTES-MURDY: Just for the board's clarity on the preferred option that the ARM Subcommittee put forward for including biomedical mortality into the ARM Framework, this would result in needing a new addendum to the FMP. What I have on this slide is just a breakdown of how that would proceed. If the board were to go forward with -- the best way to look at it would be two prongs -- the recommendations of the ARM Subcommittee and wanting to go with the preferred option. Then leaving this meeting, we would have to have an addendum initiated. At which point staff would go back, work on this likely with the ARM Subcommittee and the Technical Committee; pull together that document, bring it before the board, likely via conference call at some point either at the end of August or the beginning of September.

Then the board would need to approve that document to go out to public comment, so that there would be 30-day public comment period where there would be public hearings. The AP, the TC would be able to chime in again, and then the board would consider the document for final approval at the annual meeting in October.

That is just one way this would go forward if the board's preference is to include biomedical mortality with the preferred option the ARM Subcommittee put forward. The other thing to just note is that the ARM Subcommittee is able to make all these other recommended changes to the ARM model for the 2017 fishing year.

Our normal specification process is still -- we're keeping that timetable, so at the annual meeting the board would consider 2017 harvest specs; either with options that come out of that addendum, or kind of a status quo approach. Just to clarify that for the board at this point. Are there are any questions or comments specifically on the ARM Framework recommendations that the subcommittee has put forward? If not, we can move on to the Technical Committee's report and then the APs report; whatever is the pleasure of the board.

CHAIRMAN GILMORE: Mike Luisi.

MR. MICHAEL LUISI: I am interested in the harvest package statement that was made during the presentation regarding the consideration for harvest packages that include some female harvest in the bait industry. This board tasked the work of the ARM Subcommittee to evaluate that and put forth to the board options for potential consideration on small levels of female harvest to help revitalize some of what the bait industry has lost.

I'm interested in your comments regarding why, by taking that one step further and perhaps including that in an addendum; it sounded like to me that we would be wasting our time, and that we would still find ourselves in the position only to have one option to select from when we were talking about the packages that have been selected over the last few years. I don't know if you can just elaborate a little bit on that.

MR. ROOTES-MURDY: Yes, just for the board's clarity. Again, I believe it was November when we first started talking about this. We heard from the board an interest in having female harvest options outside of what is already in the addendum. The ARM Subcommittee went back, looked at a number of possibilities. ARM Subcommittee members drew up a bunch of options, which are included in the report; they are in the appendix.

But the bottom line was that even if you wanted to add in these additional harvest packages, the thresholds that are set up in the ARM model currently, need to be exceeded; in terms of increasing the population above them, in order for any package to be selected that includes female harvest. That is why we're currently still at that 500 male crabs preferred pot package. Without any changes to the abundance estimate, then even adding a bunch more harvest packages wouldn't necessarily move the needle to select them.

CHAIRMAN GILMORE: Follow up, Mike?

MR. LUISI: Yes, please. Okay, I get it. Just another question, when would be the next time that we might get a peek at abundance; and then how were the thresholds ultimately established? Were they based on the assessment, or were they just selected as a number of horseshoe crabs that we ultimately want in the population?

MR. ROOTES-MURDY: I'll answer the process issue or question, and then I'll turn it over to Jim Lyons to talk about the threshold. The process would be, you know, this is this initial setup phase revisiting that we're doing right now. If the board were to move forward with the recommendations of the ARM Subcommittee, the next time would be four to six years from now; kind of the same timetable that was laid out in Addendum VII. Four to six years from now is when they would be revisited.

MR. LYONS: Yes, and with respect to how these thresholds were developed, these were created during the setup phase that I mentioned and were developed in stakeholder meetings. There were several meetings back in the early years to identify these utility thresholds and set these population thresholds. I believe the current figure is 80 percent of estimated carrying capacity, and there was some literature and some research on estimating carrying capacity; and the stakeholder meetings chose that threshold.

MR. ROY MILLER: It appears that any accommodation for biomedical mortality will result in a decrease in the present 500,000 male crab harvest scenario. Am I correct in that assumption? In other words, if biomedical mortality is incorporated into the ARM model that 500,000 number of male crabs is going to decrease; am I right?

MR. LYONS: Yes, let me try to address this question. Yes, the biomedical -- the allocation to bait harvest is reduced as biomedical is incorporated under the preferred option. The important thing to point out is that under the preferred option, we've changed the packages very minimally, and so if the populations stay the same the ARM Framework should continue to operate as it currently is right now.

With the minority option, we don't change the packages and the implicit allocation to bait harvest remains the same. But in changing the population dynamics model the way that we will, under the minority option, you actually have a greater total harvest; and so a greater subtraction after natural mortality.

That has the potential to lead to more conservative packages. We don't have any simulations or any evidence of that; but I say that simply out of first principals and a population dynamics model. If you're subtracting more harvest mortality, it seems reasonable to think there is a potential to move to more conservative packages from say 500,000 males only to Package 2, or even Package 1.

MR. MILLER: If I may follow up, Mr. Chairman.

CHAIRMAN GILMORE: Go ahead, Roy.

MR. MILLER: Is there any compelling evidence that the present harvest rates are constraining the population recovery of horseshoe crabs? In other words, it seems to me if we're going to contemplate reducing say, the 500,000 male only horseshoe crab harvest, we would have to have compelling evidence that in fact that given level of harvest today is still constraining the recovery of this population. Is there evidence to that effect?

MR. ROOTES-MURDY: I'll take a stab at this and then maybe turn it over to either Jim or our Technical Committee staff to provide further comment. We are still operating without a stock assessment to give us a stock status for the Delaware Bay region, so when we're looking at the ARM Framework, we're not considering the stock assessment right now. Our data inputs are the Virginia Tech Trawl Survey and in the absence of that, we have the composite index.

We have information on harvest rates over the last few years, and last year, in particular on the regional level, the Delaware Bay region states had lower bait harvest than they had in previous years; but there are a couple of factors that may be contributing to that in terms of stockpiling some crabs, carrying over from one year to the next. There are a couple of factors that may be influencing the Delaware Bay population currently, but we don't have an overall indicator of how the population is doing.

MR. LYONS: I might just add that the population monitoring that we have for crabs suggests maybe a stable or slightly increasing population, and so it may be that over time the population will continue to grow and then it is likely that the ARM Framework recommendation would change. But our evidence right now is that the smartest thing to do, given the objectives that we have and the monitoring information that we have, has been the 500,000 crabs.

MR. BRANDON MUFFLEY: I have a couple questions. One, a hopefully easy question. Jim, you had presented in the index the composite index that you all have created, the indices that you used in that index. You talk about the New Jersey/Delaware Bay Trawl Survey, and up on the slide you had indicated the Surf Clam Dredge Survey that we use.

But in the memo it says our New Jersey Ocean Trawl Survey is used in that index. I was just looking to see what indices are actually used; mostly because funding for one of them is more subject than the other one, so if we're relying on the Surf Clam Survey, which is more variable in terms of funding, versus our Ocean Trawl. I just wanted to clarify which surveys are actually used for the composite index first.

MR. LYONS: Yes, I believe it is the Ocean Trawl and not the Dredge, so there was a misprint there somewhere.

MR. MUFFLEY: Okay, thank you, and then on these sort of harvest packages. Can you give me a little bit more information in terms of -- you said that if we allocate under these harvest packages, some harvest to the biomedical industry, we're not putting a limit on that biomedical industry; although we're assigning a specific quota it seems like to them.

I'm trying to understand how we're not impacting the biomedical industry harvest by actually having a quota assigned to them; and how are we giving under Option 3, some mortality assigned to females when the option is for a 500,000 male-only harvest, so two questions on that?

MR. LYONS: The reason I say it is not a cap is that the new harvest packages are created from the biomedical data. What we're doing is simply accounting for the known mortality that we have from the biomedical industry. Periodically, we create this running average, and then we add that mortality to the current packages.

I say it is not a cap, because this is a limit; this is only what you can take; it is acknowledging what has been taken and the harvest that has been going on. With the current set of packages, I should add that for it to be considered a cap, the biomedical mortality would have to increase by an order of magnitude.

With a small amount of time we can come up with the numbers of crabs that would have to be bled, before we would exceed the total package; and all of it going to biomedical. But it is an order of magnitude increase in the biomedical that would be required before this would actually be any kind of cap or limit. I've forgotten the second part of your question. I'm sorry, can you repeat that?

MR. MUFFLEY: It was just how are we allowing for mortality to females under the one scenario, which was a 500,000 male-only harvest and you're allocating some of that mortality to females?

MR. LYONS: Right, okay, thank you. One thing that we should point out with this preferred option is that it does create this allocation decision for the board; and those packages list a certain amount of female harvest, but the board would designate that that is female harvest for the biomedical industry only; and if we were to look at the table, you would see that the allocation debate would be zero females. The female harvest in the new packages is for biomedical only.

MR. ROB O'REILLY: I've been concentrating as I went through the materials on how challenging it is going to be and has been for an index of abundance. I guess I'm wondering two things; one, for the composite index when the trawl survey was not available, and using other surveys and going through a correlation and regression and a number of sort of permutations there. What kind of rigorous review has that methodology received? That is one question.

The second question is tied in. It indicates that the efficiency of the trawl survey was looked at in 2011, and certainly was not 100 percent; and so the composite index also suffers from underestimation of abundance. I'm just wondering, has that been addressed in any way, or is that something that is still just as left unknown?

MR. LYONS: I will take a stab at this. The composite index in that work was done by our subcommittee in response to the lack of funding for the trawl survey. I think we did go with the status quo for one year, but then we tried to develop an alternative approach based on other surveys.

We produced this approach, and I believe presented it to the board. But that as far as I know, has not undergone a peer review process beyond the subcommittee. With respect to the efficiency of the trawl survey, the subcommittee recognizes it is not 100 percent and that if we understood the catchability of that survey better, that would be an improvement to the monitoring program.

CHAIRMAN GILMORE: All right Rob, make it quick, because we've got two more presentations to go through, and we are going to run out of time.

MR. O'REILLY: Quick as lightning, Mr. Chairman. The question is; is that something that will be looked at this year, the catchability? Will that be further addressed?

MR. ROOTES-MURDY: Yes, we asked Eric Hellerman to consider this that gear selectivity in doing the survey this fall. These recommendations were made known to Eric Hellerman and he is receptive to conducting this study in the fall.

CHAIRMAN GILMORE: Okay, I have Stew Michels and then I've got Mike Millard; and then we're going to move on.

STEWART MICHELS: Thanks very much, Jim. This is a lot of work by the committee, and it is certainly appreciated by this board. Can you help me understand this biomedical mortality component a little bit better? I don't quite understand how it shouldn't be additive; instead of incorporating it into the overall mortality and essentially spitting out a quasi-quota for the biomedical fishery.

Was there any consideration that we just consider this biomedical aspect as additive incorporated into the model? I guess kind of the secondary option? Then just treat it as an additive component to mortality and as not a portion in any further manner?

MR. LYONS: Yes, I'll take a stab at it, Stew and Kristen can perhaps help. Yes, I think what you are describing is close to the minority option. It is the additive in that sense. I mean, it is a little more clear that it is additive there under the minority option. But there is a feedback from the harvest recommendation to the population dynamics model in all cases.

Even with the majority opinion, the new packages and the total mortality associated with them is additive to natural mortality. Because there is feedback in all cases between what we recommend for harvest, and the population dynamics; the two approaches are similar in that way. It is the amount of change in the packages and the actual total harvest where the results are different.

CHAIRMAN GILMORE: Okay, Stew, go.

MR. MICHELS: But you also contend that the change is so slight, right; that the biomedical portion is so slight that it would take basically a doubling of the amount of biomedical harvest to really make a difference. Is that what I understood that you said earlier?

MR. LYONS: With respect to the cap part?

MR. MICHELS: Yes.

MR. LYONS: No. It is much more than doubling. The biomedical mortality would have to increase by an order of magnitude ten times what it is now, before the whole harvest package would be allocated to biomedical.

DR. MIKE MILLARD: I'll try and be quick. I did want to circle back to Roy's question about the inevitability of a reduction to the bait harvesters under either of these options. I'm going to ask, I guess, Jim. Tell me if I have this right. Under the preferred option the model remains ignorant of the biomed harvest; and that adjustment is made after the model gives us its answer.

That is clearly a reduction to the bait harvesters. Under the minority option then the biomed mortality is added into the front of the model. The model now sees more mortality, and goes through its optimization routine; and as you said, that compounds and ends up in a larger mortality seen at the end of the run and gives us the chance of it picking a more conservative harvest package.

Now I know, and Dr. Smith's simulations weren't exactly designed to get at this question, but he did run simulations with this model package to see how it behaves; how it performs. In his simulations the model optimization scheme never landed on Option 2, it always went from 3 to 1, which is total moratorium. I guess I'm asking you, if we were to do the minority option, you cannot discount that we would land on Package Number 1. That is a possibility if we go down that road, it seems to me; total moratorium.

MR. LYONS: I would agree with your assessment, Mike. I think everything you've said there is correct. Because of the way the minority option is implemented, and the tendency of the optimization routine, when it is seeking a more conservative recommendation, tends to skip over Package 2 and select Package 1 at times when reducing harvest is the optimal solution.

Yes, I think it is accurate to say, without knowing the answer right now ,that just on first principals of this modeling approach, when you have a greater total mortality there is a greater change that you would end up with a more conservative package; and in this case, perhaps a moratorium.

DR. MILLARD: A quick follow up if I may, Mr. Chair.

CHAIRMAN GILMORE: Go ahead.

DR. MILLARD: If it doesn't change, if it still lands on Package Number 3, then we are left right where we are now. We have the same harvest package, the bait people get it all, and with a known up to 10 percent removal by the biomedical people that again is essentially ignored, or not accounted for by us; it seems to me under that minority option.

TECHNICAL COMMITTEE REPORT

CHAIRMAN GILMORE: Okay, we're going to go on to Steve Doctor, who is going to give us a report from the Technical Committee.

MR. STEVE DOCTOR: Hi, I'm Steve Doctor from Maryland Fisheries Service; and today I'll be acting in the capacity of the Chairman of the Horseshoe Crab Technical Committee, and also representing the Delaware Bay Ecosystem Technical Committee. The Technical Committee was given this information just as you have, and we've come up with some recommendations. We met by conference call on July 28. The ASMFC staff presented the ARM Subcommittee review and recommendations. We evaluated the subcommittee recommendations and considered the biomedical mortality estimate inclusion, and discussed biomedical mortality threshold exceedance; which is another word for the standards for the biomedical companies.
The Technical Committee was in agreement that the ARM Subcommittee review is acceptable. Some of the comments that came from the committee were further exploration of alternative harvest packages with the female harvest. There was kind of disappointment that that wasn't pursued further.

They also had a recommendation that further work be done to reconcile the red knot mark/recapture abundance estimate with the aerial estimate. There seems to be some things that need to be worked out between those two. As far as including the biomedical mortality in the ARM Framework, the Technical Committees agreed that the ARM Framework, to be properly run, should incorporate biomedical mortality.

The majority of both technical committees were in favor of the ARM Subcommittees preferred option; the reason cited that by using an average, it does not violate confidentiality rules, it is transparent and explicit of mortality estimates, and it treats harvest types similarly as removals. There was also minority support for the ARM Subcommittee secondary opinion.

The reason cited that it accounts for biomedical mortality without changing harvest packages, would not require an addendum, and is a transparent inclusion in the ARM Framework. Biomedical mortality in the ARM Framework continued. If the addendum is developed, sensitivity analysis should be done to see how both options would be implemented.

That means like we're discussing that if you did the method where the mortality was taken out of the model, it would be nice to do some sensitivity analysis to see actually if it would choose 1, 2, 3 or 4, whether that would actually change; because the mortality has already been experienced and we would like to see if it changes the reaction of the model.

Also, try the preferred alternative too, to see if it would change the outputs. Also, those in the Option 4 that is presented, the preferred alternative, they have recommendations on the amount of female and male removals. Because this process is going to happen every four years and there is growth in the biomedical industry, it was a recommendation that there be a buffer; maybe 10, 20 percent on the amount that is given to the biomedical industry for growth, so that we wouldn't maybe hit a trigger that overruns the biomedical allocation.

Then there was also some confusion over jurisdiction and ability of the board to limit biomedical harvest. Both technical committees requested that the board determine jurisdiction for possibility of limiting biomedical collection and harvest. Then the biomedical threshold exceedance recommendations were basically our recommendations for the biomedical industry.

Some of the Technical Committee members requested requiring biomedical companies to contribute to funding to the Virginia Tech Trawl Survey and other studies of biomedical mortality. There was not a lot of public support for the ARM Model; and I think that is all I've got. Are there any questions?

ADVISORY PANEL REPORT

CHAIRMAN GILMORE: Questions for Steve. Well good, we'll move right along then. We're going to go to the Advisory Panel report. Just give us a second here to get set up. Okay, Jim Cooper is going to give us a report from the advisory panel.

DR. JAMES COOPER: Yes, the advisory panel received the discussions of the ARM proposals, as you've just heard; and I won't elaborate on that. Going directly to the Advisory Panel report, let's go to the comments with a panel that begin on the bottom of Page 1; where we point out that the AP members were not in favor of the ARM proposal to include any biomedical mortality.

We felt that this was inadequately supported at this time and perhaps premature; we were only given ten days to even study this matter. Some of the problems that they did have that started with the fact that the preferred option would potentially bring the bait and biomedical harvest industries in conflict with one another, and actually we don't think that is in the best interest of everyone.

Obviously, we're very different industries, but we would rather try to accommodate each other whenever possible. The mortality estimates from bleeding, we think, are insignificant with respect to bait fishery harvest; in fact, we think really insignificant with respect to the number of horseshoe crabs that are in the ocean, so that including the ARM models would actually, we think, go against the intention of the ARM Framework as previously identified.

There was concern that neither of the options has been tested through simulations and perhaps premature for the board to consider at this time. Also we're concerned that the biomedical data being introduced at this point would be the first step in creating limits to collecting horseshoe crabs for the biomedical production of LAL reagent.

We think that limiting LAL would have significant impacts, certainly on the biomedical community; and I will point out a little bit later that that the FDA of course has no impact in this area, other than to require biomed companies to return them to the sea. They have nothing to do with collection.

However, they will be very interested should there be any threat to the availability of reagent for the industry. We feel like we weren't given much time, and also the fact that these committees, once they got around to biomedical discussions, would have benefitted from the presence of a biomedical expert to help them deal with some issues; misinformation and things like that.

We certainly felt that we had not been consulted by subcommittee in the development of these options. The AP did indeed take exception to most of the ARM recommendations. We feel that this could be revisited over the next two years. I'll take questions at this point. I don't want to belabor this issue; time is running short.

CHAIRMAN GILMORE: Do we have any questions for Jim Cooper? Okay, seeing none; I think what we're going to try to do is maybe break this into two pieces. We essentially need a motion to adopt some of these recommendations. The biomedical package seems to be the one that is going to get a lot more discussion.

With the pleasure of the board, if somebody put up a motion, actually, for the other points or whatever, it would be helpful to move this along. Well, the other option is we put this all in one package one way or the other, and we could get bogged down. Brandon.

MR. MUFFLEY: Following that vein, delay this putting this all together; I agree let's try to separate it out. **Move to approve all ARM Subcommittee and Technical Committee recommendations except for the biomedical harvest Subcommittee packages.**

CHAIRMAN GILMORE: I have a second from Robert Boyles. Do we have discussion on the motion? Seeing none; is there any public comment on the motion? Seeing none from the public; Mike Luisi.

MR. LUISI: I was prepared to take a little bit of a different approach and also include in this addendum some analysis on the alternative harvest packages, which include female harvest; as part of the bait industry. Going back to what Brandon said earlier about the harvest package as it is selected now with 500 male crabs, and then the allowance of female harvest at the biomedical facilities.

I just think it is a difficult explanation to make as to why a small level of 25,000 or 30,000 crab harvest can't happen. I don't understand why it can't. I can't explain it to my public, who have asked me to support them, and asked our commission to support them on their interests. I absolutely agree that this biomedical industry issue on mortality needs to go out to the public; and we need to get feedback. **But I would like to incorporate another piece to this, so if I may, Mr. Chairman I have a motion to substitute.**

CHAIRMAN GILMORE: Go ahead, Mike.

MR. LUISI: **Move to initiate an addendum to the horseshoe crab fishery management plan; to address the Adaptive Resources Management Subcommittee's recommendations to the ARM Framework regarding one, mortality associated with the biomedical industry and two, bait harvest packages which allow female horseshoe crab harvest as presented in Appendix C of the framework review.**

CHAIRMAN GILMORE: While we're getting it up there, do we have a second to this motion; or do you want to see it first? Craig, are you seconding the motion? Okay. While we're getting it up, do we have questions, comments, or discussion on the motion? Mike, do you want to take first comment crack at this?

MR. LUISI: Sure I'll say it again, and I've said it before. These are the two big issues that came out of the subcommittees recommendations. I absolutely appreciate all the hard work and effort that goes into those recommendations. The work that has happened since last year, I've been getting feedback from staff.

It is a tremendous amount of work, and I do appreciate it. However, I think there needs to be more public involvement in the understanding and the decision making that happens as a result of these two issues. I feel that the addendum process through the commission is just that process, and that by us selecting here today one of the recommendations; we heard a minority and a majority opinion on the biomedical industry. We also heard that with the female harvest packages in the bait industry that it is very likely that the model will select the current package. But I would like to see what happened as a result of running the model through those different options, and then be able to make the decision at the end of the day as to the path we take. I think it brings the two big issues that we've been talking about for years to the table; and it brings it to the board so that we could ultimately make those policy decisions, and that is the purpose for me moving forward in this direction.

CHAIRMAN GILMORE: Other questions or comments?

MR. ROBERT BOYLES: Clearly, South Carolina has got strong interest in horseshoe crabs, and even horseshoe crabs in the Delaware Bay region. I just wanted to point out that we had an opportunity to brief our board a couple weeks ago about this fishery, the unique fishery that we've got in South Carolina.

Thanks to some good work by a number of our forbearers, I think we've got a really good program in South Carolina. I recall that some time ago there were conversations about, well maybe some options would include, let's turn every crab that is bled into bait. I think I made some strong comments against that at the time, because that is not consistent with the way we manage this fishery in South Carolina.

I was talking to my colleague from New Jersey about their fishery, and I would just, for my edification, for the board to know that we do get good data from industry on reported mortality. We think it is a well-managed fishery, we think it is very, very important. We place a high value on that biomedical fishery; to the extent that we don't allow horseshoe crabs to be used for bait. I just wanted to make those comments for the benefit of the board as we move into this discussion and try to sort out how we best manage this fishery.

MR. DAN McKIERNAN: Yes, I would be more comfortable with this motion if I had a Law Enforcement representative telling me that opening the female harvest was something they could control effectively.

CHAIRMAN GILMORE: Other comments. Do we have any comments from the public on this? No, okay seeing none; oh, Brandon.

MR. MUFFLEY: I'm still struggling with it from the biomedical industry; not even to my friend over in Maryland's perspective. I'm interested in evaluating what their options may be for female horseshoe crab harvest. I'm still struggling whether or not we really need; I think we need to account for the biomedical industry mortality, so that we have a complete picture of what is going on.

I don't think it is that significant, but I think we need to account for it; and I think we can do that with the alternative option that was presented that would not require us to go out to an addendum to evaluate that. When we talk about increasing in mortality, you know, when you're showing an increasing mortality, we may result in more restrictive measures.

That may be, but now you're accounting for new mortality; which isn't necessarily new, but it's new in terms of accounting for it through the modeling process. What may also happen is if we're showing increasing trends and to some regards in the Delaware Bay population, this mortality is already taking place.

What may happen by accounting for it, you just may scale up the amount of horseshoe crabs that are available in the population. It may not be a negative response to the bait industry by accounting for this mortality. We don't know what the response is going to be just yet, but again, I'm still apprehensive to go down that road of assigning quotas to the biomedical industry and reducing it on the bait side of things, where I think we can account for the mortality under the alternative package; which would not require an addendum.

CHAIRMAN GILMORE: Go ahead, Mike.

MR. LUISI: I'm just, Brandon I didn't intend in this motion to change from what I read your motion to be. I believe that what we would end up with here are alternatives in the addendum that would expand upon the work that has been done by the subcommittee and give the public that information.

If what I heard from Mike earlier indicated that by selecting the minority opinion, we could potential find ourselves at a moratorium. I think that information needs to be well vetted. I would expect that by going forward with the amended motion that we would be looking at both opinions as well as the additional bait packages as a further expansion from what we've already heard from the subcommittee.

MR. O'REILLY: I also think that the mortality from the biomedical can be accounted for in the alternative approach, and I heard Steve Doctor representing both technical committees, indicating that a sensitivity analysis or something along those lines could be done to see what happens with these two alternatives; and I don't think anyone wants to just come to another meeting and find out, well the conservative nature of the model ended up on Package 1.

I think that needs to be short circuited, and we need to know about that; but all in all, I expect based on the comments earlier that this is a small amount of mortality relative to the whole stock, so I, too, think the second alternative is probably the way to look at this, get it in the model itself, and go from there.

CHAIRMAN GILMORE: Any other comments? Emerson.

MR. EMERSON C. HASBROUCK: In reviewing the main motion and the substitute motion, I'm not clear really what we would be approving in the main motion. It says to approve all adaptive resource management and subcommittee and technical committee recommendations except for biomedical. What are all the other recommendations?

CHAIRMAN GILMORE: Well, they were the ones that were gone over in the first place, but there were five of them or whatever, so essentially what we're going to do is trying to approve the four and handle the biomedical issue separately. I think Mike has now combined them back together, and that might be a better solution to it.

Those earlier pieces, I think, would be part of this process. Are there any other questions before we caucus? Do we need a minute to caucus? All right, take a minute and we'll call the question. All right, the meter is running and Toni is giving me the high sign. All those in favor of the motion, well, first off, remember this is a motion to amend; so first we have to vote this one up and then we'll put it up as the main motion. **All those in favor of the motion to amend, please raise your hand, all those opposed; null votes, abstentions; motion passes 10 to 5 to 0 to 0. This becomes the main motion now.** Are there any comments on this from the board before we vote?

PUBLIC COMMENT

CHAIRMAN GILMORE: Okay, anything from the public? Okay we'll take some brief public comments on this. Benji, do you want to go to the public microphone?

Benji, I'm going to let Jim Cooper go first. Jim is the AP Chair, but he actually wants to make some comments, not as the AP Chair, which he would normally go back to the public microphone but because it is so far away, we're going to let him do it from here. This is individual comments from Jim.

DR. COOPER: I think you have a document that has my comments, and it is misleading in the sense that I signed it off as Chair of the AP, but these comments are not representative of AP comment; although many would agree with me. I am going to try to cut this as much as I can. I think the ARM proposal starts out by reminding everyone that about 2011 or 2010 the so called mortality threshold was exceeded and the board was supposed to do something. It suggests that nothing was done; and that actually is not true.

In 2011, the board asked that the commission enable a study of best management practices to try to harmonize the way that crabs are protected in the biomedical facilities; and recognizing that the FDAs good manufacturing practices really dominate what goes on in our industry. We thought well, we'll set up procedures that mimic that and help us with our training of waterman, training of handlers, and of course writing appropriate procedures to protect the crabs would be a good way to do that.

This was accepted by the board and not any other action was taken. Danielle Brzezinski was running things at that time, and actually I don't know that the board actually voted on anything at that time; in fact I don't think they did. But nevertheless, in discussing some of the ARM issues, we think they may have been influenced by misleading information while preparing the documents that we've discussed.

For example, it has been discussed that there is concern that the collapsing TAL industry in China will eventually pressure U.S. LAL market if we have to supply them with reagent. Actually, I've looked at the marketing analyses, and it shows that Chinese firms do less than 20 percent of the worlds endotoxins tests; therefore, we could absorb that should it be necessary.

In considering the growth of endotoxin testing, there is an only modest increase anticipated over the next few years. Now what happened in the first decade, the previous decade was that there was a big increase that occurred, because FDA suddenly required the drug industry to greatly expand testing of in-process samples and starting materials to make sure that they never got to the final product with any potential contamination, so you see this was FDAs regulatory expectation that caused a jump in LAL consumption at that time.

But it has pretty much leveled off now, and indeed, the FDA would react to anything that looked like a curtailment of the reagent. There is also the notion that LAL can be immediately replaced by a recombinant product. That is not true. The R factor C only contains one of the enzymes as part of this system; LAL reagent has a three enzyme reagent. It is certainly more robust, but the big issue is that using the recombinant will require expensive fluorescent readers, rather than the standard inexpensive right readers. That is a cost issue that would profoundly limit this matter. I am sure there are other issues that might have come up like this. I think the presence of a biomedical expert at the time of these discussions could have avoided some of these things. Now our interest in the biomedical research regarding post release mortality, we've been discussing this to some extent, even today.

Now mortality estimates in the biomed industry is really difficult to study, because horseshoe crabs aren't laboratory animals, they are arthropods. It is really almost impossible to adequately reproduce post release environments for these kinds of studies, and that is the reason we see publications suggesting that the post release mortality may be very high; 30 or 40 percent.

It is the inability to study these in a laboratory situation that brings about these kinds of overestimates. I would like to remind you that horseshoe crabs are hardy; they've survived for millions of years and they are resilient. I was associated with Cavanaugh Laboratories about 40 years ago, and they maintained a big tank of horseshoe crabs in order to study their coagulation systems.

One night salt water leaked from the tank. They filled it up with tap water, just fresh water; and the next morning the staff found 50 or so horseshoe crabs floating lifelessly on top of the water. They picked them up and carted them off to disposal area very reluctantly, all despondently. Then the following Monday morning they get a call that says, would you come down here and pick up these crabs, they're crawling all over the place.

This is just a story that helps you understand that the crabs are resilient enough to even recover from a fresh water shock that made all of them look dead. This exemplifies the uncertainty of trying to reproduce a return-to-sea environment. Elegant research continues in South Carolina. DNR scientists there have been doing some elegant studies on the genetic diversity of the crabs in that state.

Their study concluded that genetic diversity was high. There was little to no evidence of inbreeding, evidence of a huge population offshore, she couldn't tell how big it was, but it is very, very large; certainly a positive indicator for adaptive potential, and this is Walsh and so forth. The fellers from South Carolina can tell you how to access that document.

By the way, a marketing specialist told me that there are approximately 60 million endotoxins tests done annually, and if we assume a loss of 60,000 crabs; that means that we're getting about a thousand tests for each crab that might be lost, and I think this is a tremendous bargain. Loss of a small proportion through the biomedical industry really is inconsequential and justified by immense value of the reagent.

If the board members believe that local marine resources are properly managing biomedical firms, and that the BMP document minimizes harm to the crabs, and that there is no value added to creating a third level of bureaucracy, certainly one that leads to limiting the horseshoe crabs in the biomedical area.

We think that the expenditures could be used more widely. Rather than pay for an addendum; we could probably pay for a Virginia Tech Trawl. I strongly urge the board to categorically reject the proposal ARM document with respect to the biomedical community. I think we could take a two year moratorium on this issue and allow us to update the BMP document, continue review and research to better understand post release mortality; and hopefully have a better working relationship with any technical committee or whatever that would be considering biomedical issues. Thank you very much.

CHAIRMAN GILMORE: Thanks Jim, we've got Benji and Dr. Schuster. Benji, do you want Dr. Schuster to go first? Is that okay? Okay, go ahead, doctor. Please keep your comments to about three minutes. We're really running short on time.

DR. CARL SHUSTER: I received a telephone call last night alerting me to the fact that I might be interested in attending this session; primarily because there was some concern about lumping together bait and LAL resources or mortalities. True that the bait is 100 percent mortality, and LAL, as Dr. Cooper has explained, is not as well understood.

For this reason I would not lump the two together, but actually if you wanted to learn something more scientifically, I would learn more about the reproductive system of the female horseshoe crab. As far as I know, there is no one today who knows much about the functional anatomy of the crab, the physiological aspects.

If you were going to form a baseline against which to compare what you're observing in experiments today on the impact of bleeding on horseshoe crabs, you would certainly want to know something about the physiology of the normal. The natural horseshoe crab female; is lacking. If I were going to do this thing, I would think in terms basically about the biology of reproduction in the females.

The second point I have, which is outlined here is that hearing that bait and LA were going to be lumped together, I thought, well, I can think of many other ways that you could lump things together; and certainly if you do that, you can come up with a list as I have, and there are many more things that should be added that indicate the scope of the mortalities that we're dealing with in understanding the horseshoe crab.

I went through and listed them, and then I drew a line and ascribed certain numbers to them. If I am anywhere near the ballpark, the loss of horseshoe crabs from both LAL and bait would be less than probably 2 percent of the total population. If you expanded that to 10 percent, you would lose 2.68 million crabs, and that doesn't seem like an overly heavy impact upon the population since that occurs sometimes in some of the natural phenomena; where crabs are destroyed.

That, I think, summarizes in effect the scope of what I just thought about in that short period from last night to now. My recommendation that you have someone who sincerely looks at the ecosystem approach to horseshoe crabs, and think in terms of the impact on crabs on, for instance, the surf clam industry, things of this nature; that you're not dealing just with horseshoe crabs, you're dealing with ecosystems, and there doesn't seem to be much concern about that, which I feel is probably the key to much of what you should be learning. Thank you.

CHAIRMAN GILMORE: Thank you, Dr. Shuster. Benji.

MS. BENJI SWANN: Okay, I'll try to be quick. I don't know if I can do that. My comments are --

CHAIRMAN GILMORE: Benji, could you just identify yourself.

MS. BENJI SWANN: Benji Swann, Lysate manufacturer in the state of New Jersey, and I have been since actually 1985. Adhering to the Atlantic States Marine Fishery Commission Interstate Horseshoe Crab Management Plan, the collection of horseshoe crabs for Limulus Amoeboctye Lysate is monitored by state agencies in the Atlantic States Marine Fishery Commission, but not part of the ARM Harvest Package.

This is due to one fact. LAL is a life-saving, critical, essential vital product for human health without any present alternative. Some suggest that a synthetic product can replace LAL. However, the synthetic product is not there yet, and perhaps never will be completely or at all. We cannot drive the market by constraining the biomedical companies. The market will drive itself.

A perfect example is the new LAL application developed by a biomedical company that uses 120th of the raw lysate. Point two, biomedical collection is separate from bait harvest and should be, as its activities are essential to human health and pose no threat to the horseshoe crab population. On average, eight to nine horseshoe crabs out of ten survive the process and can be found spawning years after bleeding.

The Delaware Bay horseshoe crab population has remained stable, slightly increasing for years, and estimated to be 20 million horseshoe crabs. If the entire mortality of 60,000 crabs associated with biomedical use is attributed to the Delaware Bay region, the impact is 0.3 percent. A quote from the ARM Subcommittee report July 16, 2016, refers to biomedical companies killing the horseshoe crabs.

Any small mortality is unintentional, and may be out of our control. I find it offensive that any member would accuse us of intentionally killing horseshoe crabs. Number three, when considering the adoption of the ARM modeling and the harvest package in 2010, the biomedical numbers were not included, and no substantial change in the biomedical numbers have occurred to warrant inclusion.

The biomedical numbers reported in 2014 are similar to the numbers from the year 2010; prior to the ARM adoption. As an aside, when I prepared a table for illustration, the 2014 numbers regarding biomedical collection were reported incorrectly. More biomedical crabs were bled than collected; this isn't possible.

This emphasizes a point; that numbers are good to refer to, but sometimes logic has to prevail. Point four, a reason given for the inclusion in the ARM was to make biomedical mortality more explicit. Right now the biomedical numbers are explicit, and listed in their own table. When I view the proposed ARM table with biomedical mortality included, the table begs more questions than it answers.

It is also misleading, giving one the impression that biomedical collection is limited. This is not the case, nor should it ever be. Another quote I read was, two stakeholders exploiting the resource; and again I find this offensive. We are managing the horseshoe crab population to be sustainable, and to prevent exploitation. Number five, comments on the proposed addition, first and foremost the introduction contains mortality from the biomedical harvest to date hit a high of 90,440 crabs in 2012, an increase of nearly 100 percent since reporting begin in 2004. Similar to the 2014 numbers, the 2012 numbers were erroneous as well. More crabs were bled than were collected. Okay quickly reviewing the biomedical tables.

The number of horseshoe crabs brought to the biomedical companies, Row A, jumped between the years 2006 to 2007. One reason could be more males began to be used for bleeding, and more males are needed to be equivalent to a female. Furthermore, this use of males may have been perpetuated by the adoption of Addendum IV in 2006.

I didn't have time to review this. Since then biomedical numbers remained in the low 500,000s, with the exception of the years 2011 and 2012; increasing to the low 600,000s. Specifically, when I looked at the recommendations and conclusions for the proposed addition, Number 1, I disagree with for the above reasons. Biomedical numbers should not be incorporated into the ARM model.

Number 2, since 2005, 11 years ago, confidential data is submitted detailing mortality at each stage. This information can be located within the biomedical table, Line D, reported mortality of biomedical only crabs from harvest to release. Numbers 3 and 5, years go by too fast. A three-to- five year review of BMPs would be sufficient.

Number 4, many of the companies have funded and are currently funding research to enrich the knowledge and understanding of the horseshoe crabs in the LAL product. To continually study the mortality of bled horseshoe crabs to get that perfect number that everyone will agree on, will never happen.

Each study has its own imperfections, but one consistent thread is found. The horseshoe crab's survival can be assured at a high level if the horseshoe crabs are handled with care and concern. Number 6, my last point, timing is fishy. The ARM Subcommittee's task was to review the ARM model, which is specific to bait harvest, review its assumptions and utilities and its usefulness in managing and advancing the horseshoe crab population.

Instead, it focused on biomedical activities and shorebird studies. The ARM Subcommittee document was 47 percent shorebird activities and shorebird studies, 15.5 pages of 33, 32 percent of biomedical related, which was 10.5 pages of the 33 pages; 6 percent was two pages of references and introduction, and 15 percent was a review of the ARM model and tagging, which was 5 pages.

Combined with its arrival in the ninth hour, something is very fishy. I urge you to vote not to include or list the biomedical numbers in the ARM package, and continue your good work in managing the horseshoe crab populations. I'll take any questions if anybody has any.

CHAIRMAN GILMORE: Thank you, Benji. We're going to come back to Kirby, and we're going to go a little bit over the schedule first; so before we call the question.

MR. ROOTES-MURDY: I just wanted to outline to the board, I outlined earlier a timetable moving forward with an addendum that was based on the ARM Subcommittees recommendations. Under this motion, I just wanted to make sure folks were aware that this addendum initiated at this meeting would then likely be taken up to go out for public comment at the annual meeting; and then final action would be taken on it at the February 2017 meeting. In terms of the 2017 specification process, this addendum from what staff understands, would be separate to the 2017 specification process.

Then the last point is that this motion outlines specifically that the second item, there are two parts to this addendum, lists options that are included from the ARM Subcommittee's review. I just want to make clear that the first part is that also biomedical mortality; in terms of the decision point there. Would that be drawing from the ARM Subcommittee's review items, or additional work? Those are just some points to consider and clarify for staff.

MR. LUISI: On your last point, Kirby. It was my intention when making the motion that the first issue on biomedical mortality, there would be a range of alternatives to include the status quo; and then the two minority and majority opinions from the ARM presentation.

MS. KERNS: I just wanted to clarify. I think best case scenario is we can get you a document for review to go out for public comment at the meeting in October. But there is also a chance that it might not be available until February. It depends on how much work it will entail for the TC, because don't forget they still have to pull together the ARM packages for the board approval in October.

CHAIRMAN GILMORE: Good point, thanks Toni. All right, back to the board. Bill Adler.

MR. ADLER: Can I make a motion to postpone until the next meeting, this whole motion.

CHAIRMAN GILMORE: You can, but you need a second.

MR. ADLER: Guess not.

CHAIRMAN GILMORE: Motion fails for lack of a second, so back to the board. Are there any comments on the motion? Okay, do you need any time to caucus? Okay, I give one minute to caucus. Everybody ready for the question? **All those in favor of the motion, please raise your hand; all those opposed, null votes, abstentions; motion passes 13, 2, 0 and 0.**

DISCUSSION OF ADDITIONAL BAIT TRIALS

CHAIRMAN GILMORE: Thanks, everyone. We have one more order of business, which is on the bait trials, and I think we're going to turn this over to Bob Ballou; who is going to just make this so efficient and intro it, and get a motion and just get this thing going. Bob.

MR. BOB BALLOU: Yes, I am prepared to collapse a 30 minute agenda item into what might be just a two or three minute item; of course, that depends on the board's response. But I'll just say in brief, we've had some good discussion at our last few board meetings regarding alternative bait; which to clarify involves a composite or some other variation that uses less horseshoe crab relative to current levels, while continuing to meet the needs of whelk and eel fishermen.

With a view to maintaining momentum on the issues, I would like to suggest moving ahead with another round of alternative bait trials involving those states interested in participating, whoever they may be. But instead of trying to pull this off this fall, which I think was an initial idea. It now seems evident that a better approach would be to suggest doing this next year in 2017. That would give the board time to design the study, really through the TC of course. Design the study, determine participation, determine cost and available funding sources; and bring the whole package back before the board for review and approval prior to implementation.

In chatting to Kirby about it he brought up the very good point that this might actually sync well with the assessment, so that it would be reported out in 2018, which is when the assessment is going to be undertaken as well. With that I did prepare a motion to just sort of move forward along the lines of what I just indicated; and I think staff will bring that up.

Again the point being to try to move forward, but not to do it until 2017, the key caveat as I think you'll see reflected is that Toni reminded me that this would need to be folded in. If the board agrees to do this, to task the TC, it would need to be folded into the action plan for next year; that is an October, 2016 issue. I would therefore, and I will read this motion now into the record.

Move to task the Technical Committee with designing bait experiments to be completed in 2017, for those states that opt to participate, involving reduced amounts of horseshoe crab relative to status quo in the whelk and eel fisheries, to be developed for board review and approval by October, 2016.

CHAIRMAN GILMORE: Second to the motion; Brandon Muffley. Discussions on the motion. Adam Nowalsky.

MR. ADAM NOWALSKY: I am guessing that with this motion we have a firm commitment from at least Rhode Island to go through with those trials, asking the TC to design something for those states that opt to participate, would it be helpful to the TC to know how many states they're looking at. I would think that would be part of the design process. That would be the one concern I have with this is giving them some direction here in who those states might be.

CHAIRMAN GILMORE: That is a good point, Adam. Assuming Rhode Island would be interested; how about by a show of hands how many states would consider this. We've got at least five states that are interested in doing this. I think that would be a worthwhile endeavor. Do you agree, Adam?

MR. NOWALSKY: It's up to the board.

CHAIRMAN GILMORE: Any other questions before we vote on this motion, or comments? Go ahead, Toni.

MS. KERNS: You know, I think that the main reason for wanting to know the states is that way it will help us develop a budget a little bit better, in order to include that into the action plan; depending on location, et cetera, will help us get information from the bait supplier and how much it would cost to get bait down to the different states.

CHAIRMAN GILMORE: You want to get the specific states, go that way?

MS. KERNS: We'll reach out in an e-mail to determine to the full board, and get at least commitment that you are interested in participating, so that we can develop a budget based on that.

CHAIRMAN GILMORE: Any other comments? **Okay, all those in favor of the motion please raise your hand; opposed, null votes, abstentions; passes unanimously.** That is the last item we have. Is there any other business to come before the Horseshoe Crab Board?

ADJOURNMENT

CHAIRMAN GILMORE: Seeing none; I will exercise my right as a chair to adjourn us. We are adjourned.

(Whereupon, the meeting was adjourned at 4:25 o'clock p.m., August 2, 2016.)

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

October 6, 2016

To: **Horseshoe Crab Management Board**

From: **Kirby Rootes-Murdy, FMP Coordinator**

RE: **Recommendations on 2017 Harvest Specifications for the Delaware Bay Region**

This memo summarizes the annual harvest recommendations made by the Adaptive Resource Management (ARM) Subcommittee, Horseshoe Crab Technical Committee, and Delaware Bay Ecosystem Technical Committee.

The ARM Subcommittee met by conference call on September 16th, 2016 to discuss data inputs to the ARM Framework for 2017 specifications. Since the ARM Framework was approved for management through Addendum VII in 2012, data from the Virginia Tech Trawl Survey (VT Trawl) was specified to provide abundance estimates for horseshoe crab in the model. However, due to a lack of funding, the VT Trawl Survey has not been conducted since 2013, so no data exist from 2012 to present. Last year, the ARM Subcommittee decided to use a composite index comprised of information from 3 other trawl surveys (Delaware DNREC 30 ft trawl survey, the New Jersey DFW Delaware Bay trawl survey, and NJ DFW Ocean trawl survey) that take place in the Delaware Bay Region and was used again this year. This composite index was then compared to the VT trawl survey time-series data, and a linear regression analysis was conducted to make sure that composite index tracked the same trend and scale of the VT trawl survey. For the Red Knot stopover population estimate in the Delaware Bay Region, a mark-resight sampling approach was used to evaluate data collected in Delaware and New Jersey from May through June each year. This approach has been used since 2011.

Monitoring Data

Sources of data for horseshoe crab abundance and mark-resight estimates for red knot abundance are described above. Male and female horseshoe abundance in 2015 were 16.4 million and 8.1 million crab, respectively. Red knot abundance is estimated at 47,254 birds for 2016 (95% Confidence Interval for the stopover population is 44,873-50,574).

Table 1: Horseshoe crab and Red Knot abundance estimates for the Delaware Bay Region.

Horseshoe crab abundance (millions)			Red knot abundance (×1,000)	
Year	Male	Female	Year	Male and female
2015 (Fall)	16.4	8.1	2016 (Spring)	47.25

Harvest Recommendations

The monitoring data listed above was inputted into the ARM model and the optimized harvest package selected for 2017 was harvest package #3 (500,000 male horseshoe crab only). The ARM Subcommittee recommended harvest package #3 be used for 2017 harvest specifications. The harvest packages used in the ARM framework are shown in Table 2.

Table 2: Harvest packages and associated harvest numbers. 2017 recommended package (#3) is in bold.

Harvest package	Male harvest (×1,000)	Female harvest (×1,000)
1	0	0
2	250	0
3	**500**	**0**
4	280	140
5	420	210

On October 5th, 2016 the Horseshoe Crab Technical Committee and Delaware Bay Ecosystem Technical Committees (TCs) reviewed and endorsed the ARM Subcommittee's recommendation on harvest specifications for 2017. Based on the recommended harvest package from all three groups, the 2017 Quotas for the Delaware Bay Region states are outlined in Table 3.

Table 3: 2017 Quotas for Delaware Bay Region States based on ARM Subcommittee and TCs recommendation

	Delaware Bay Origin HSC Quota		**Total Quota**	
State	**Male**	**Female**	**Male**	**Female**
New Jersey	162,136	0	162,136	0
Delaware	162,136	0	162,136	0
Maryland	141,112	0	255,980	0
Virginia*	34,615	0	81,331	0

*Virginia harvest refers to harvest east of the COLREGS line only

Please contact myself or Mike Schmidtke, FMP Coordinator for Horseshoe Crab (mschmidtke@asmfc.org ; 703-842-0740) with any questions about the ARM framework or specifications-setting process.

Atlantic States Marine Fisheries Commission

Horseshoe Crab Adaptive Resource Management Subcommittee

Call Summary

Friday September 16, 2016
1:30 - 3:30 p.m.

Attendees

John Sweka (USFWS), Jim Lyons (USGS), Audrey DeRose-Wilson (DE DNREC), Dave Smith (USGS), Ed Hale (DE DNREC), Conor McGowan (USGS/Auburn University), Joe Smith for Larry Niles, Wendy Walsh (USFWS), Jeff Brust (NJ DFW), Steve Doctor (MD DNR)

ASMFC Staff: Mike Schmidtke, Kristen Anstead, Kirby Rootes-Murdy

1) **Update from the ASMFC Board Meeting (August 2016) and follow up tasks**

- Kirby went over the Board meeting and highlighted for that 2017 harvest specifications, the group will simply do a 'turn of the crank' of the 'old' ARM model (not incorporating any biomedical information or alternative harvest packages.)

- Kirby introduces Mike Schmidtke as the new FMP Coordinator for Horseshoe Crab and that the two of them will be working together over the next couple of months as Mike is on-boarded

2) **Consider Survey data updates for Horseshoe Crab Composite Index & Discussion**

- John Sweka presented his update of the composite index work- he points out that there have been some changes from the document he circulated.
  - Last year, there was no new Virginia Tech (VT) trawl survey data so the ARM Subcommittee came up with this method of taking 3 other trawl surveys (DE 30' ft, NJ Ocean, NJ Delaware Bay) and created a composite index of relative abundance. This composite index was then compared to the VT trawl survey time-series data, and a linear regression analysis was conducted to make sure they were tracking the same trend and scale. Additionally, the composite index was calibrated to the years of overlapping data to extrapolate to a total population estimate.
  - As stated earlier in the meeting, this year is a turn of the crank of the ARM model regarding model inputs – Jeff Brust & Jordy Zimmerman gave him the trawl data and he ran the model.
    - Male and Female crab abundance went up in composite index for both species went up a little bit, 16.4 M and 8.1 F (million crabs)
    - All 3 surveys are weighted equally in the model, John is willing to send the R code around

- John isn't concerned that it has been a few years since we had the VT survey to compare the composite index numbers to since we are in the same scale.
- John points out that after this year, worst-case scenario is we have one more data point from the VT Trawl Survey for updating the composite index and continue to use the composite index into the future.

- Kirby asks that in the event we don't have continual funding for the VT trawl survey beyond 2016, could New Jersey and Delaware adjust their surveys to collect more bio-samples on Horseshoe Crabs- specifically the pre & post spawning marks, etc.?
  - Jeff Brust says it would be doable to take more HSC data in their trawl surveys, they've added additional sampling before and if it doesn't take that long it is probably possible, but he makes no promises. Ed Hale agrees for the DE survey-possible, but no guarantees yet
  - Wendy Walsh agrees with using the composite index this year and is happy about further calibration with the VT survey running this year and she likes that NJ DFW and DE DNREC are willing to add additional biosampling for horseshoe crabs into their surveys. But she points out that if the composite index is going to be the more permanent data source for horseshoe crab abundance moving into the future, she'd like to revisit it (i.e. if VT trawl doesn't continue in the future) more thoroughly and have a further review by the ARM Subcommittee
    - Conor McGowan agrees with a more formal assessment of the composite index but says they did a pretty thorough assessment for HSC and it is going to really hard- the number of crabs you need to tag is around millions so what we have here is a really useful approach for now

- Dave Smith – what are you asking what the biosampling request is for the state surveys just discussed- Pre-recruits? Because than that would allow for the Catch Survey Analysis (CSA) to get at catchability.
    - Yes, that is what Kirby was speaking to.

- Additionally, Dave asks whether John Sweka looked at the sex ratio on the composite index? Because as the harvest is skewed to male, one indirect result would be a change in the sex ratio that we really haven't seen.
  - John said he hasn't formally looked at it but he could look at it further and put it in the report – sex ratio from the composite index over time. Conor McGowan asks for clarification about what has been observed in the sex ratio in the composite index
    - John says just looking at the raw numbers they appear similar. Except for 2012.

- Kirby asks a clarifying question about what the 'terminal' year is that goes into the ARM Model that the HSC abundance index is a year behind the shore birds, i.e. 2015 for HSC and 2016 for birds.
  - John outlines that was because a difference in timing for when the surveys were conducted, that this was examined when the model was set up, and that the thinking was, given when the harvest occurs for HSC after they spawn in the summer, the VT

survey occurs in the fall and that was indicative of what would be left to produce eggs for the next year

- ➢ Conor adds that some of the simulation work that Dave Smith led in 2013 applied ecology paper didn't directly deal with the time lag issue but that simulated work showed that the time delay was ok for our decision making

3) **Consider Survey data updates for Red Knot super population estimate & Discussion**

- ❖ Jim Lyons goes over table 4 in the report he sent out to the group, that outlines population estimates, but won't go over the summary of the migration. In summary, fewer flagged birds detected this (2016) year; the 2016 estimates is closer to 2014 & 2013 than 2015 when it was much bigger.
  - ➢ Jim also tried to address some of the conversations the ARM Subcommittee and Delaware Bay Ecosystem Technical Committee have had about the fluctuations in estimates between the aerial survey and the ground survey. In general, the aerial survey went down a little bit so the ratio for these two things is a little higher than average.
  - ➢ 2015 did seem to be a good year for birds with independent evidence, more birds reaching the high body weights than other years, an early moon (full) in migration period, water temps were warm, so there may have been earlier and more spawning in 2015 that led to good foraging conditions – not the ultimate reason the approximate thing is that more of the fly population stops in Delaware Bay – the number of birds we see in the passage population but it is largely determined by the proportion that stop in Delaware Bay in his opinion, and 2015 was a good year.
    - ▪ Conor McGowan – so that is an interesting point, is there any effort to talk to the Virginia bird survey people (Brian Watts in VA); Jim said he has not talked to them, but we could reach out and see if there is something they can share
    - ▪ Wendy Walsh– her recollection is that there is some movement between Georgia and Virginia and Delaware Bay in years but not a whole lot, they tend to pick one or another
    - ▪ Kirby asks if the birds stopover in Virginia and they do so instead of the Delaware Bay (at least where the volunteers are sampling in DE & NJ) why don't we account of those estimates from this since it is part of the ARM model?
      - Jim doesn't think we need to combine the Delaware Bay and Virginia estimate, not going to get a real formal estimate for those two places, but the idea of looking at data from outside of the bay in the other places and incorporate into super-population estimates. Additionally, there doesn't appear to be any birds missed-at worst, you may be double counting birds if you combine estimates from both areas.
      - Conor says the red knots that use the Delaware Bay is the core objective of ecosystem integrity for the ARM model.
    - ▪ Steve Doctor asks whether the number of birds tagged each year are consistent or increasing or decreasing.
      - Jim says it may have gone down in recent years and but that they shoot for something around 800-1000 birds a year.

- Audrey DeRose-Wilson says it was down but the number of birds was down too, so relative to the number of individuals we see in a day, we were happy with the size of catches we were making but it was less and more difficult

  - Regarding the previous question, Kristen asks about the horseshoe crab composite index accounts for crabs caught off of New Jersey, Delaware, and Maryland, but that the Red Knots are only counted from New Jersey and Delaware.
    - ♦ Conor & John offer that the horseshoe crab spawning population overwinters offshore in those states, so the area of the trawl survey that spawns mostly in the Delaware Bay
- Kirby asks about the peak count index – it went down this year, but the previous 4 were higher and steady
  - ♦ Jim says that this is from an aerial survey on one day and it is supposed to be the peak, this number also reflects turnover in the pop and the peak number doesn't account for that, the number of birds detected in one day
- Lastly, Kirby asks about the Confidence Interval changes for the population estimates- in 2015 to 2016, which were very different
  - ♦ Jim says it's an uncertainty of all the numbers-when there is a lot of uncertainty in detection rates that translates right into uncertainty about the population sizes, probability of detection changes the most from year to year.

<u>Conor presents results from the ARM model:</u>

❖ Conor used the information sent around (by Jim and John) ahead of the call to input into the ARM Model to see what the optimized harvest package is for 2017
  - Based on the latest year's data, the optimized **<u>harvest package is #3 (500,000 male crab only)</u>**
- ➢ The group discusses the data and whether other members of the ARM Subcommittee would be able to review the harvest output through the Model
  - Conor points out the data file it draws from is huge, so it can't be emailed or put in dropbox but could send the code or look into FTP
  - John points out that the R script and data file isn't running the optimization- that is being run on ASPD
- ➢ ***The ARM Subcommittee is in agreement with the optimized harvest package 3 (500,000 male crabs) for 2017 in the Delaware Bay Region (for the States of New Jersey, Delaware, Maryland, and Virginia)***

4) **Consider Board motion and developing draft Addendum VIII options**

❖ Kirby goes over a draft decision tree for the draft addendum regarding mortality associated with biomedical activities- ASMFC Staff currently understands the motion made at last month's Board meeting is to have the addendum set up as a set of decision points, that builds off of an initial decision on how to treat biomedical mortality….The current challenge with moving forward and developing the addendum, is that there is concern in taking the document out to the public without understanding how biomedical mortality- let alone alternative harvest packages- would affect the optimized harvest package in the ARM Model. Specifically, we may create a lot of confusion if the public provides comments and indicates preference for a new set of ways for accounting for biomedical mortality and harvest package options-with the assumption that it will lead to a certain harvest output- but that we don't really know how the ARM Model will treat these changes.

- So to address this concern, ASMFC staff is trying to get a sense of how quickly the group could go through 'sensitivity analysis' of at least two scenarios- the (1st would be using the ARM Subcommittee's preferred method for treating biomedical mortality (subtracting it from the current harvest packages) going back through the last 5-10 years and plugging the terminal year data in and seeing what the optimized harvest package would be; the (2nd would be doing the same thing with the secondary/minority option for accounting biomedical mortality (applying it as an additional population level mortality in the population dynamics model) and seeing what the optimized harvest package would be. For the timetable, ASMFC Staff wants to see how reason it would be do this 'sensitivity analyses' before the Annual Meeting, or before the Winter Meeting in February 2017, etc.
- Conor and John offer that the model is run using ASDP software, C+++, R script, and that it would take a bit of work to try and complete this in the short term.

- John says basically the Board wants to see how this will affect the harvest packages
  - Kirby says yes, but the Technical Committees, including the ARM Subcommittee serve at the will of the Board, the group can offer the opinion though

- Many members of the ARM Subcommittee raise concerns about the timeline and the runs, etc. Additionally, folks wants to be clear what the comparisons be against
  - Kirby offers up the comparisons should be against what the optimized harvest package would be without biomedical mortality taken into account. In pushing on the timetable, <u>Conor offers that the #1st scenario could be completed fairly quickly (just a couple pf weeks) the #2nd scenario would take longer, likely not able to be done by February 2017 Meeting</u>. The reasoning for the delay on the #2nd scenario is that there are multiple iterations that could be run under different assumptions.

- Kirby offers up what the example biomedical mortality (approximately 34K crabs- 15K females, 22K males) would be in Delaware Bay region for adjusting harvest packages and for inputting in the population dynamics model
  - Without any analysis, anecdotally ARM Subcommittee members think that with numbers around 34k (a 'negligible number'), it probably won't change optimized harvest package. The reason why the magnitude of biomedical take is is very small compared to the magnitude of the abundance bins.
  - On a separate but related point, John offers that harvesting of female crabs when you are below the abundance threshold will just delaying the time until you can have more Female harvest

    - Under what conditions females are valued, we are under the threshold, taking the Female crabs out takes away her contribution and it would be one less female to grow to 11.2 Females (current female abundance threshold) where you can have value on the female crabs

- ASMFC Staff points out that this raises questions and creates confusion on why a comparable level of female bait harvest would not be allowed under the ARM Model, as that has been an active goal for Board members.
  - ARM Subcommittee members bring up the point that again, the thresholds are directing the model to select a harvest package that doesn't put additional stress on the female crab population….because they are below the thresholds.

- Steve Doctor offers that the draft addendum maybe shouldn't go forward given these considerations. Additionally he offers up the follow questions:
  - When we do our harvest packages, we add additional crabs for MD and VA and why isn't it important to include them?
    - The level of harvest is not significant and are assumed to be non-Delaware Bay horseshoe crabs.
  - Can they take some of that and make it Female harvest? What if we took them South of Ocean City (MD) inlet?
    - Possibly, but it would be on Maryland to demonstrate how they would likely not be Delaware Bay origin crabs
  - Does the red knot and the female horseshoe crab threshold both have to be exceeded for Female horseshoe crab harvest packages to be the optimized harvest package output?
    - No, it's either/or.

5) **Next Steps** (*K. Rootes-Murdy*) 3:15-3:30 p.m.

- Wendy provides the group with a general update on where US FWS is with developing consultation for sections of the ESA. Kirby asks if she could provide this overview to the Horseshoe Crab TC and DETC next month
  - She can & will

- The draft call summary will be sent around for the group to provide comment on

- Kirby will look into the FTP site size/space for sharing ARM Model components & share with the group

- The draft call summary and ARM Subcommittee recommendation for 2017 harvest specifications will be sent to the TCs for their consideration

- Kirby, Mike & Kristen will follow up with the group to formalize what the timetable is for completing the sensitivity analysis to report to the Board at the Annual Meeting

Adult Horseshoe Crab Abundance in the Delaware Bay

Delaware Bay ARM Workgroup

Report to the Delaware Bay Ecosystem Technical Committee

September 16, 2016

Introduction

In 2015, the Adaptive Resource Management (ARM) workgroup developed a horseshoe crab abundance index based on three trawl surveys in the Delaware Bay region: Delaware 30 foot trawl survey, the New Jersey Delaware Bay trawl survey, and the New Jersey Ocean trawl survey. This composite index was developed because the Virginia Tech trawl survey, which was used to estimate horseshoe crab abundance, lost funding and did not occur. The ARM workgroup showed that the composite index from the three other trawl surveys correlated well with the Virginia Tech Trawl survey for years in which data overlapped and could be used as a substitute for the Virginia Tech Trawl survey when estimating the abundance of male and female horseshoe crabs. This report adds data collected in 2015, updates the composite index, and extrapolates the composite index to horseshoe crab abundance for harvest recommendations to be implemented in 2017.

Methods

Relative abundance data from the Delaware 30 foot trawl survey, the New Jersey Delaware Bay trawl survey, and the New Jersey Ocean trawl survey were used as input to a linear mixed random effects model to generate the composite index for each year from 1998 – 2015. In this model, each individual survey within a year represented the random effect. The model was fit using the "lme" function from the package "nlme" in R 3.0.2 and was specified as a non-intercept model to allow for year specific estimates of abundance rather than differences for each year from the intercept. Index values from each survey were ln + 0.01 transformed prior to model fitting and final yearly indices of abundance from the model were back-transformed.

Linear regression models relating the composite indices of abundance for each sex to the total abundance estimates from the Virginia Tech trawl survey were used to extrapolate total abundance of male and female horseshoe crabs in 2015. Regression model parameters are presented in Table 1.

Results

The relative abundance indices for both males and females from the New Jersey Ocean Trawl and the New Jersey Delaware Bay trawl both increased in 2015 over what was observed in 2014 for both sexes. However, relative abundance from the Delaware Bay 30 foot trawl decreased from 2014 to 2015 for both sexes. When combined into the composite index of abundance, the result was a slight increase from 2014 to 2015 (Figure 1).

Sex ratios (males:females) from the compsosite index have varied through the time series and were lowest in the first two years (1998 – 1999). Since 2000, the sex ratio has ranged between 1.06 and 1.69 (Table 3).

Final estimates of total abundance for each sex are shown in Table 3 and Figure 2. The estimated abundance increased slightly for both sexes from 2014 to 2015 and remained among the highest values seen in the time series. Estimated adult abundance of horseshoe crabs in the Delaware Bay region was 16.4 million males and 8.1 million females in 2015.

Table 1. Regression parameters relating the composite index of abundance to the estimated abundance from the Virginia Tech trawl survey (2002 – 2011).

Regression parameter	Males	Females
Intercept	3498342 (S.D. = 3353432)	2120198 (S.D. = 2285174)
Slope	26277569 (S.D. = 9520073)	15443844 (S.D. = 9346638)
p-value (Slope)	0.025	0.137
R^2	0.488	0.254

Table 2. Relative abundance index values from three trawl surveys in the Delaware Bay region and the composite abundance index derived from the three trawl surveys.

Sex	Year	Delaware 30 ft. trawl	NJ DE Bay trawl	NJ ocean trawl	Composite Index
Male	1998	0.34	0.29		**0.32**
	1999	0.42	0.17	0.50	**0.33**
	2000	0.75	0.33	0.45	**0.48**
	2001	0.57	0.18	0.27	**0.31**
	2002	0.07	0.25	0.32	**0.18**
	2003	0.82	0.18	0.44	**0.41**
	2004	0.02	0.19	0.47	**0.13**
	2005	0.06	0.46	0.56	**0.26**
	2006	0.68	0.30	0.47	**0.46**
	2007	1.04	0.58	0.27	**0.55**
	2008	0.20	0.42	0.24	**0.27**
	2009	0.41	0.21	0.28	**0.29**
	2010	0.36	0.53	0.21	**0.34**
	2011	0.43	0.42	0.39	**0.41**
	2012	0.23	0.34	0.32	**0.29**
	2013	0.09	0.47	0.53	**0.29**
	2014	1.19	0.17	0.44	**0.45**
	2015	0.68	0.32	0.55	**0.49**
Female	1998	0.47	0.21		**0.40**
	1999	0.63	0.11	0.52	**0.33**
	2000	0.65	0.19	0.47	**0.39**
	2001	0.89	0.10	0.25	**0.28**
	2002	0.08	0.11	0.43	**0.16**
	2003	0.71	0.05	0.48	**0.26**
	2004	0.04	0.07	0.59	**0.12**
	2005	0.10	0.24	0.51	**0.23**
	2006	0.75	0.08	0.51	**0.32**
	2007	0.83	0.24	0.29	**0.39**
	2008	0.18	0.09	0.31	**0.17**
	2009	0.27	0.10	0.30	**0.21**
	2010	0.12	0.26	0.26	**0.20**
	2011	0.19	0.18	0.52	**0.26**
	2012	0.23	0.16	0.41	**0.25**
	2013	0.02	0.27	0.67	**0.17**
	2014	0.83	0.13	0.44	**0.37**
	2015	0.47	0.18	0.55	**0.39**

Table 3. Sex ratios (male:female) of horseshoe crabs from the composite index in the Delaware Bay region.

Year	Male Index	Female Index	Sex Ratio
1998	0.32	0.40	0.80
1999	0.33	0.33	0.99
2000	0.48	0.39	1.23
2001	0.31	0.28	1.08
2002	0.18	0.16	1.11
2003	0.41	0.26	1.55
2004	0.13	0.12	1.06
2005	0.26	0.23	1.09
2006	0.46	0.32	1.45
2007	0.55	0.39	1.41
2008	0.27	0.17	1.57
2009	0.29	0.21	1.41
2010	0.34	0.20	1.69
2011	0.41	0.26	1.59
2012	0.29	0.25	1.17
2013	0.29	0.17	1.68
2014	0.45	0.37	1.20
2015	0.49	0.39	1.27

Table 4. Estimates of total abundance of horseshoe crabs in the Delaware Bay region derived from the composite index (1998 – 2015) of abundance and the Virginia Tech trawl survey (2002 – 2011).

Sex	Year	Composite Index	Virginia Tech
Male	1998	11,807,094	
	1999	12,089,616	
	2000	16,169,464	
	2001	11,555,142	
	2002	8,170,110	10,580,000
	2003	14,143,996	7,070,000
	2004	6,933,445	6,500,000
	2005	10,229,999	9,250,000
	2006	15,622,016	17,490,000
	2007	17,924,041	20,490,000
	2008	10,693,529	15,770,000
	2009	11,112,324	7,060,000
	2010	12,497,038	12,470,000
	2011	14,393,501	15,040,000
	2012	11,128,639	
	2013	11,004,110	
	2014	15,195,798	
	2015	16,408,173	
Female	1998	8,240,393	
	1999	7,217,570	
	2000	8,150,712	
	2001	6,501,516	
	2002	4,594,430	5,450,000
	2003	6,148,223	3,580,000
	2004	4,016,565	2,990,000
	2005	5,745,271	4,400,000
	2006	7,046,331	7,900,000
	2007	8,116,324	9,530,000
	2008	4,812,232	9,480,000
	2009	5,290,044	3,750,000
	2010	5,241,762	5,280,000
	2011	6,148,819	4,800,000
	2012	5,950,225	
	2013	4,741,787	
	2014	7,853,763	
	2015	8,088,111	

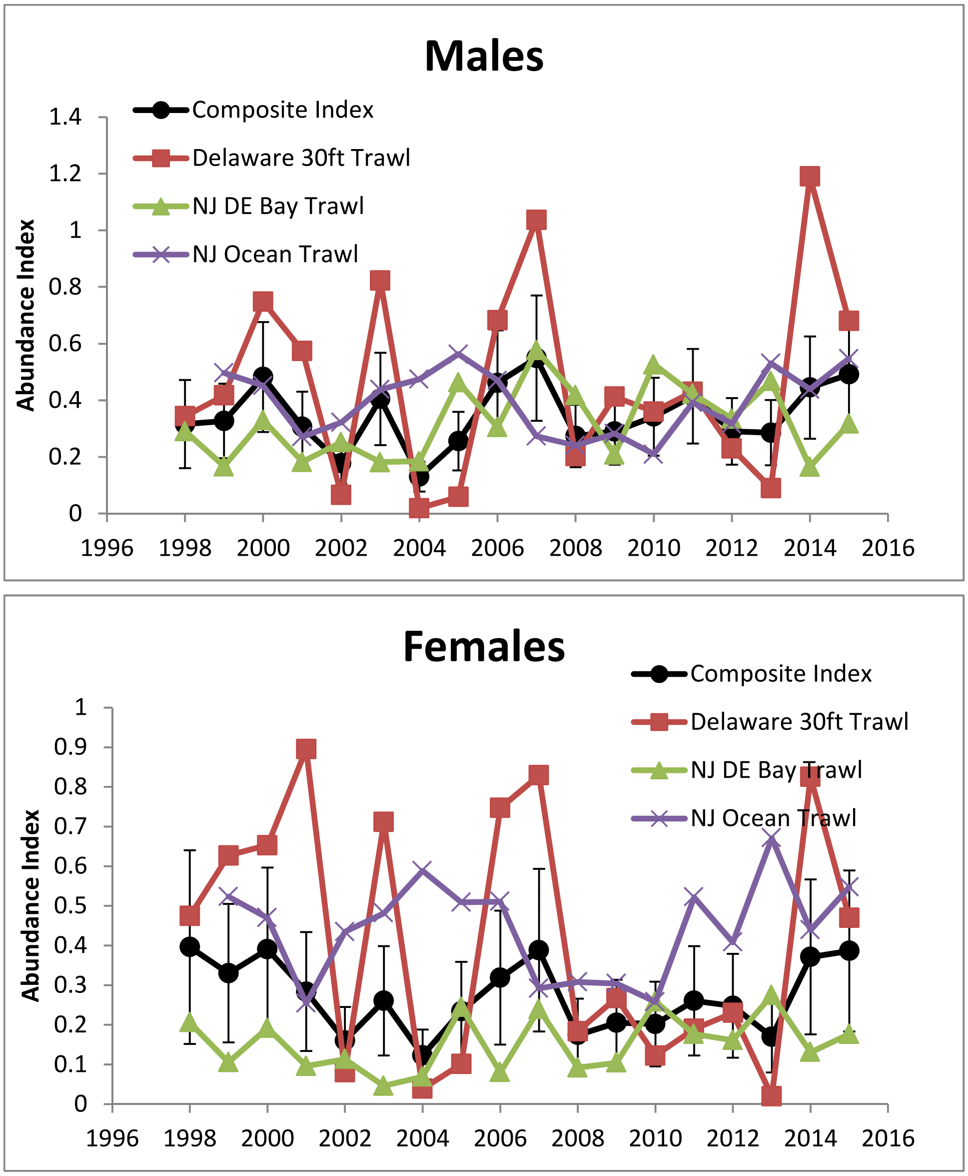


Figure 1. Comparison of the composite index of abundance from the linear mixed random effects model and the individual trawl surveys used to derive the composite index of abundance.

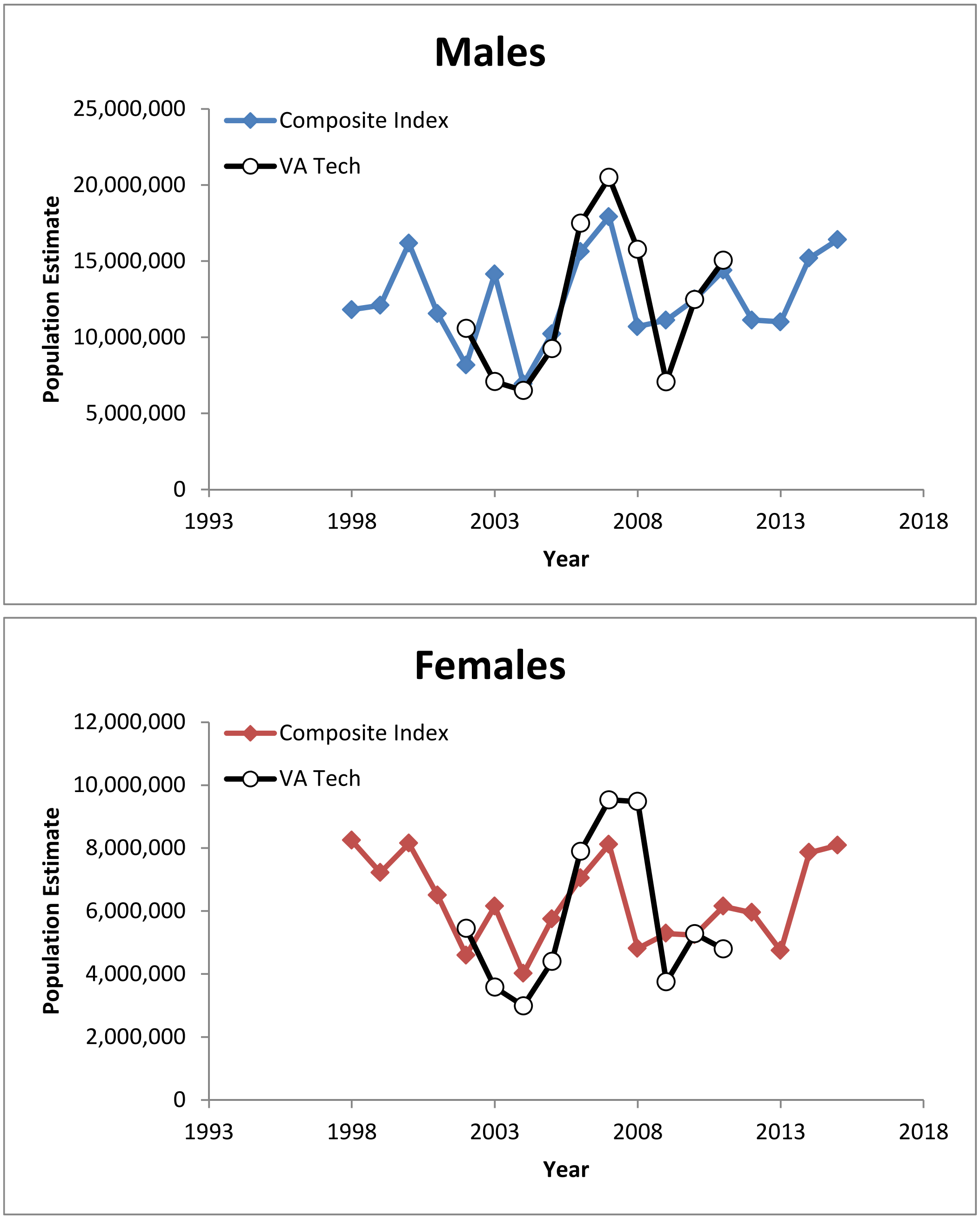


Figure 2. Time series of horseshoe crab population estimates derived from the composite index (1998 – 2015) and the Virginia Tech trawl survey (2002 – 2011).

MEMO

To: Delaware Bay ARM Working Group
From: Jim Lyons, USGS Patuxent Wildlife Research Center, Laurel, MD
Re: Red Knot Stopover Population Estimate for 2016
Date: 26 August 2016

1 Acknowledgments

We thank the many volunteers in Delaware and New Jersey who collected mark-resight data in 2016. We are grateful to A. DeRose-Wilson (Delaware DFW) and A. Dey (New Jersey ENSP), and volunteers in Delaware and New Jersey for data entry and data management, and L. Usyk (bandedbirds.org) for data management.

2 Methods

Mark-resight data and counts of marked and unmarked birds were conducted according to the methods for mark-resight investigations of Red Knots in Delaware Bay (Lyons 2016). Red knots have been individually marked with engraved leg flags in Delaware Bay and other locations for many years; each leg flag is engraved with a unique 3-character alphanumeric code (Clark et al. 2005). Surveys to locate flagged birds were conducted on each beach every three days according to the sampling plan (Table 1). During these resighting surveys, agency staff and volunteers recorded the alphanumeric combinations on leg flags for birds that were detected. While searching for birds marked with engraved leg flags, observers also periodically use a scan sampling technique to count marked and unmarked birds in randomly selected portions of Red Knot flocks (Lyons 2016).

Table 1. Dates for mark-resight sampling occasions (3-day periods) in Delaware Bay.

Sample	Dates	Sample	Dates
1	≤10 May	6	23-25 May
2	11-13 May	7	26-28 May
3	14-16 May	8	29-31 May
4	17-19 May	9	1-3 June
5	20-22 May	10	≥4 June

As in previous years, all flag codes that were detected were validated with banding data available in the data repository bandedbirds.org, except for orange engraved flags (Argentina). As in previous years, all resightings of orange engraved flags were included in the analysis because banding data from Argentina are generally not available in bandedbirds.org.

We used the mark-resight data and data from the scan samples of the marked-ratio to estimate stopover population size using the methods of Lyons et al. (2016). In this “superpopulation” approach, passage population size is estimated using the Jolly-Seber model for open populations to account for the flow-through nature of migration areas and probability of detection during surveys.

In the analyses for Delaware Bay, the days of the season were aggregated into 3-day sampling periods, the same sampling periods used in prior analyses (a total of 10 sample periods possible each season, Table 1). Data are aggregated to 3-day periods because this is the amount of time necessary to complete mark-resight surveys on all beaches in the study. In 2016, few observations were available for period 10 (i.e., ≥4 June) so the 2016 analysis was restricted to 9 sampling periods (data summary provided in Appendix 3).

In the mark-resight superpopulation approach we estimate the number of birds that are carrying leg flags, and then adjust this number using the estimated proportion of the population with flags to account for unmarked birds. The estimated proportion with leg flags is thus an important statistic. We estimated the proportion of the population that is marked from the scan sample data (counts of marked birds and the number checked for marks) and a binomial model. To account for the random nature of arrival of marked birds to the bay and the addition of new marks during the season, we implemented the binomial model as a generalized linear mixed model with a random effect for the sampling period. More detailed methods are provided in Lyons et al. (2016) and Appendix 4.

3 Summary of Mark-resight and Count Data Collected in 2016

Mark-resight encounter data.—The Red Knot mark-resight database for 2016 contained a total of 3,510 individual birds that were seen in Delaware Bay at least once in 2016. This number is approximately 20% fewer individual birds than were seen in 2015 (4,353 birds; Appendix 1). Birds from five countries were detected in Delaware Bay in 2016 (Table 2).

Table 2. Number of flags detected by banding location (flag color).

Banding location (flag color)	No. flagged individuals detected
U.S. (lime green)	2,341 (67%)
U.S. (dark green)	617 (18%)
Argentina (orange)	323 (9%)
Canada (white)	166 (5%)
Brazil (dark blue)	32 (<1%)
Chile (red)	31 (<1%)
Total	3,510

Marked-ratio data.—Seven hundred and seventy-seven (777) marked-ratio scan samples were collected in 2016: 299 samples in Delaware and 478 in New Jersey (Appendix 3). Marked-ratio data were collected between 7 May and 5 June 2016, with much more even sampling across the season than in 2015 (Appendix 2). Field crews collected 260% more scan samples in 2016 than in 2015, when 298 marked-ratio samples were collected.

Aerial and ground count data.—Aerial surveys were conducted on 23 and 26 May. A. Dey compiled the aerial and ground survey data (Table 3). Complete ground counts were made on the same days that aerial surveys were conducted (Table 3).

4 Summary of 2016 Migration

Arrivals to the bay peaked on or about 18 May, when approximately 28% of the stopover population arrived. Smaller numbers arrived in each of the sampling occasions leading up to 18 May: approximately 18% of the population arrived on or about 12 May and another 15% on or about 15 May (Fig 1a). Unlike 2014 and 2015, relatively few birds arrived in the later stages of the migration season in 2016. In 2014, for example, a relatively large proportion of the stopover population (about 25%) arrived during 23-25 May, i.e., late in the season given typical departure dates. Similarly, in 2015 a late wave of arrivals between 23 and 28 May accounted for approximately 26% of the population. In 2016, there was not a late wave of arrivals; most birds arrived before or during the 18 May sampling occasion.

Stopover persistence is the probability that a bird present in the bay during sampling occasion i is present in the bay at sampling occasion $i+1$. Estimated stopover persistence was relatively high (>0.85) until approximately 22 May (reflecting small amounts of turnover), and then declined steadily from 22 May until the end of the season. Following Lyons et al. (2016) we estimated stopover duration in 2016 was 12.3 days (95% CI 11.8–13.2 days), an estimate that accounts for probability of detection. The time between first and last sighting has been called "minimum length-of-stay." Minimum length-of-stay, which does not account for probability of detection, would suggest a much shorter length of stay (Appendix 5). Minimum length-of-stay has a negative bias because it does not account for the time present before first, and after last, day the bird was seen.

In 2016, mean probability of resighting across all 3-day sampling periods was 39% (95% CI 18-66%). Estimated resighting probability started off relatively high (50–60%) in early May but declined slightly as the season continued (Fig 1c). Resighting probability was below 40% for much of mid- to late-May 2016 (Fig 1c). In many previous years (2011–2014), estimated resighting probability often ranged from 40–70% throughout much of May in Delaware Bay.

The estimated proportion of the 2016 stopover population with marks (leg flags) was 0.099 (95% CI 0.092–0.106, Fig. 2), which is slightly greater than the 2015 estimate. As expected, the proportion marked was fairly steady throughout the season and did not fluctuate dramatically (Fig. 2). The estimated marked proportion in 2016 was similar to the years 2011-2014, when approximately 10-11% of the birds stopping in the bay carried leg flags.

5 Stopover Population Estimation

Fewer birds stopped in Delaware Bay in 2016 than in 2015. The stopover population for 2016 was estimated at 47,254 (95% CI 44,873 – 50,374). This superpopulation estimate accounts for turnover in the population and probability of detection. The 2016 superpopulation estimate is 22% lower than the estimate for 2015 (60,727; 95% CI 55,568 – 68,732) and similar to the 2014 estimate (44,010; 95% CI 41,900–46,310; Table 4).

The time-specific stopover population estimates in 2016 increased steadily during early May and peaked during 21-24 May at approximately 34,600 birds (Fig. 1d).

Annual fluctuations in stopover population size.—The annual fluctuations in the stopover population between 2014 and 2016 were the largest since mark-resight analyses began in 2011 (Table 4). Some ARM Subcommittee and Ecosystem TC members are concerned about the recent fluctuations in the estimates. While some of the change from year to year in the stopover population is a result of births and deaths (i.e., changes in the total population), these fluctuations in the stopover population are too large to be the result of births and deaths alone. Niles et al. (2008) noted similar fluctuations in the aerial surveys in Delaware Bay:

> "Until the late 1990s, the peak aerial counts in Delaware Bay were quite erratic from year to year (Fig. 32). Many of these changes are so big that they cannot have reflected changes in the total population because they are demographically impossible. Moreover, they are also far too large to be due to counting error. At this stage we can only speculate about the reasons. Possibly high availability of horseshoe crab eggs led to rapid turnover, leading to a reduction in the count; conversely bad weather may have prevented birds from departing leading to a build-up. It is also possible that in some years many birds exploited food resources, such as *Donax* or mussel spat, elsewhere along the Atlantic coast and did not visit Delaware Bay." – *Niles et al. 2008*

The changes in the stopover population between 2014 and 2016 were large but not unprecedented. Since 1989, aerial surveys in Delaware Bay have experienced a similar, or greater, year-to-year change in magnitude in five different years (see USFWS 2003, Dey et al. 2011). Niles et al. (2008) suggest that large annual fluctuations could be due to changes in stopover duration or changes in the proportion of the total population that visit Delaware Bay in any given year. Stopover duration did not vary substantially during the years 2014–2016, ranging from 10–12 days. The changes in the stopover population are more likely to be the result of fluctuations in the proportion of the total population that visits the bay each year.

Aerial surveys in 2016.—The aerial survey conducted on 23 May 2016 detected 21,128 birds, approximately 61% of the mark-resight estimate for the sample period 23-25 (Table 3, Fig. 1). The second aerial survey on 26 May 2016 detected 21,021 birds, which was within the 95% credible interval for the mark-resight estimate for the sample period 26-28 May (approximately 19,200–26,200 birds; Fig. 1).

Comparing mark-resight estimates and aerial surveys.—Some members of the ARM Subcommittee and the Ecosystem TC are concerned about the differences between mark-resight estimates and the aerial survey index. Here we review the types of estimates that result from the mark-resight superpopulation approach, briefly review the assumptions of the superpopulation approach (more details are available in Lyons et al., 2016 and Lyons 2016), and review the assumptions and concerns about the aerial survey data.

The mark-resight model estimates the number of birds that use the sampled beaches in Delaware Bay each year (i.e., the "stopover population size" or "superpopulation", N^*). This estimate accounts for turnover in the population during the migration season and probability of detection of marked birds during resighting surveys. Therefore, estimated superpopulation size will always be greater than counts ("snapshots") from an aerial survey on any given day. The primary reason for the discrepancy between the superpopulation estimate (N^*) and the peak count from aerial surveys (C) is population turnover.

The mark-resight model also produces time-specific population estimates (N_t) at 8-10 points during the season (depending on the amount of data available), and while not directly comparable to aerial surveys, it may be instructive to explore the discrepancy between these time-specific estimates and aerial survey indices.

The mark-resight data are aggregated before analysis into 3-day sampling occasions; three days is the length of time required to survey all beaches in the bay (Lyons 2016). Therefore, the time-specific estimates (N_t) are for the number of knots in the bay during a 3-day period, whereas the aerial surveys are completed in one day and represent the number of birds present on the day of the survey.

Nevertheless, the difference (D) between peak mark-resight estimate (N_t) and peak aerial count (C) each year, expressed as a fraction of the time-specific mark-resight estimate has ranged from 12% (in 2012) to 50% (in 2011) ($D = [\{N\_t - C\}/N\_t]*100$). The large discrepancy in 2011 may have been due to extenuating circumstances (observer illness during the survey); the second largest discrepancy was 39% (2016). The median discrepancy (D) during 2011-2016 was 30%.

The assumptions of the mark-resight superpopulation approach are described in detail in the Lyons (2016) and Lyons et al. (2016). One set of assumptions is that the rates of arrival, stopover persistence, and resighting are the same for all marked and unmarked individuals. Heterogeneity in resighting probability can cause bias in parameter estimates (Williams et al. 2002). The study design and sampling plan (Lyons 2016) has many elements that attempt to meet the assumption of homogeneity in resighting probability (e.g., regular, even sampling of the study area). Effects on parameter estimates of heterogeneity in stopover persistence are not well known. Some heterogeneity of stopover persistence may occur from data aggregation into 3-day periods for analysis. The average stopover duration in Delaware Bay is much longer than three days, however, so heterogeneity in stopover persistence from data aggregation should be small. Heterogeneity in stopover persistence may also occur from population structure and stopover-age effects, where stopover age is the amount of time since arrival to the stopover. There is some evidence that age-related variation in persistence does not affect parameter estimates when the amount of variation is small to moderate. Nevertheless, effects of heterogeneity in rate parameters from stopover age and population structure require additional research. See Lyons (2016) and Lyons et al. (2016) for a complete description of these and other assumptions of the mark-resight model.

The aerial surveys in Delaware Bay do not include corrections for bias of any sort. The surveyed area is not drawn from a sampling frame and the estimate is not extrapolated to any unsurveyed area. To the extent possible, pilots and aerial observers attempt to be consistent in the methodology and timing of the aerial survey to reduce errors of estimation. Nevertheless estimation errors may occur as a result of 1) counting errors, 2) imperfect detection of birds, and 3) availability of birds to be counted (Smith and Francis 2010).

Counting error is a type of estimation error in aerial surveys. Counting errors may be over- or under-estimates but there is ample evidence in the literature that observers tend to under-estimate the size of large flocks of birds (Smith and Francis 2010). Observers also tend to under-estimate flocks of small birds more often than flocks of large birds.

Smith and Francis (2010) conducted simulation experiments with experienced observers and concluded that counting errors may result in population estimates that are approximately 25% too low, and that the magnitude of under-counts increased with flock size. Bigger flocks were under-estimated to a greater degree than small flocks. Undercounts of 12-32% were common (Smith and Francis 2010). It is perhaps coincidence that the median discrepancy between aerial surveys and mark-resight estimates (30%) was similar to these empirical measurements of counting errors. Nevertheless, there is ample evidence that undercounts are common even among experienced observers. The implications of under-counting errors should be acknowledged in a comparison of aerial surveys and mark-resight estimates.

Imperfect detection is another source of estimation error in aerial surveys. Counting large flocks of birds from the air is a difficult task and imperfect detection may result from poor visibility, inclement weather, identification, bird behavior, etc. Aerial surveys are generally conducted only in good weather conditions, but the Delaware Bay aerial survey protocol does not estimate probability of detection. Therefore it is difficult to assess the magnitude of detection errors, but it is important to remember that detection errors result in the counts being too low by some unknown amount.

Another error of estimation is related to "availability" to be counted; birds that are not in view of the aircraft are not available to be detected. The aerial survey covers most bay beaches used by knots but does not include the Atlantic coast of New Jersey (Niles et al. 2009), managed wetlands, and intertidal marshes; some birds use managed wetlands in Delaware (Niles et al. 2008) and marshes at high tide (Burger et al. 1997). Pilots and aerial observers make efforts to cover as much suitable habitat as possible during the aerial survey and be consistent from year to year, but it is impossible to survey all habitats and it seems that some fraction of birds in the bay are not available to be counted. The mark-resight estimate accounts for these birds if they visit the mark-resight beaches at some point during the season. The aerial survey estimate may be biased low due to availability but it is difficult to determine the magnitude of this error.

When all three sources of estimation error that are possible with aerial surveys – counting error, imperfect detection, and availability bias – are considered, almost all of which result in counts that are too low, the discrepancy between aerial survey data and mark-resight estimates may not be difficult to reconcile.

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Table 3. Number of Red Knot detected during aerial and ground surveys of Delaware Bay in 2016. These data were provided by A. Dey, New Jersey Division of Fish and Wildlife, Nongame and Endangered Species Program.

	New Jersey	Delaware	Total
23 May 2016			
Aerial survey	20,360	768	21,128
Ground survey	18,104	1,857	19,961
26 May 2016			
Aerial survey	19,811	1,210	21,021
Ground survey	20,092	82	20,174

Table 4. Stopover (total) population estimate using mark-resight methods compared to peak-count index using aerial- or ground-survey methods. The mark-resight estimate of stopover population accounts for population turnover during migration; peak-count index does not account for turnover.

Year	Stopover population[a] (mark-resight N^*)	95% CI Stopover population N^*	Peak-count index [aerial (A) or ground (G)]	Ratio (N^*/Peak-count index)
2011	43,570	(40,880–46,570)	12,804 (A)[b]	3.40
2012	44,100	(41,860–46,790)	25,458 (G)[c]	1.73
2013	48,955	(39,119–63,130)	25,596 (A)[d]	1.91
2014	44,010	(41,900–46,310)	24,980 (A)[c]	1.76
2015	60,727	(55,568–68,732)	24,890 (A)[c]	2.44
2016	47,254	(44,873–50,574)	21,128 (A)[b]	2.23

[a] estimate for entire season, including population turnover
[b] 23 May
[c] 24 May
[d] 28 May

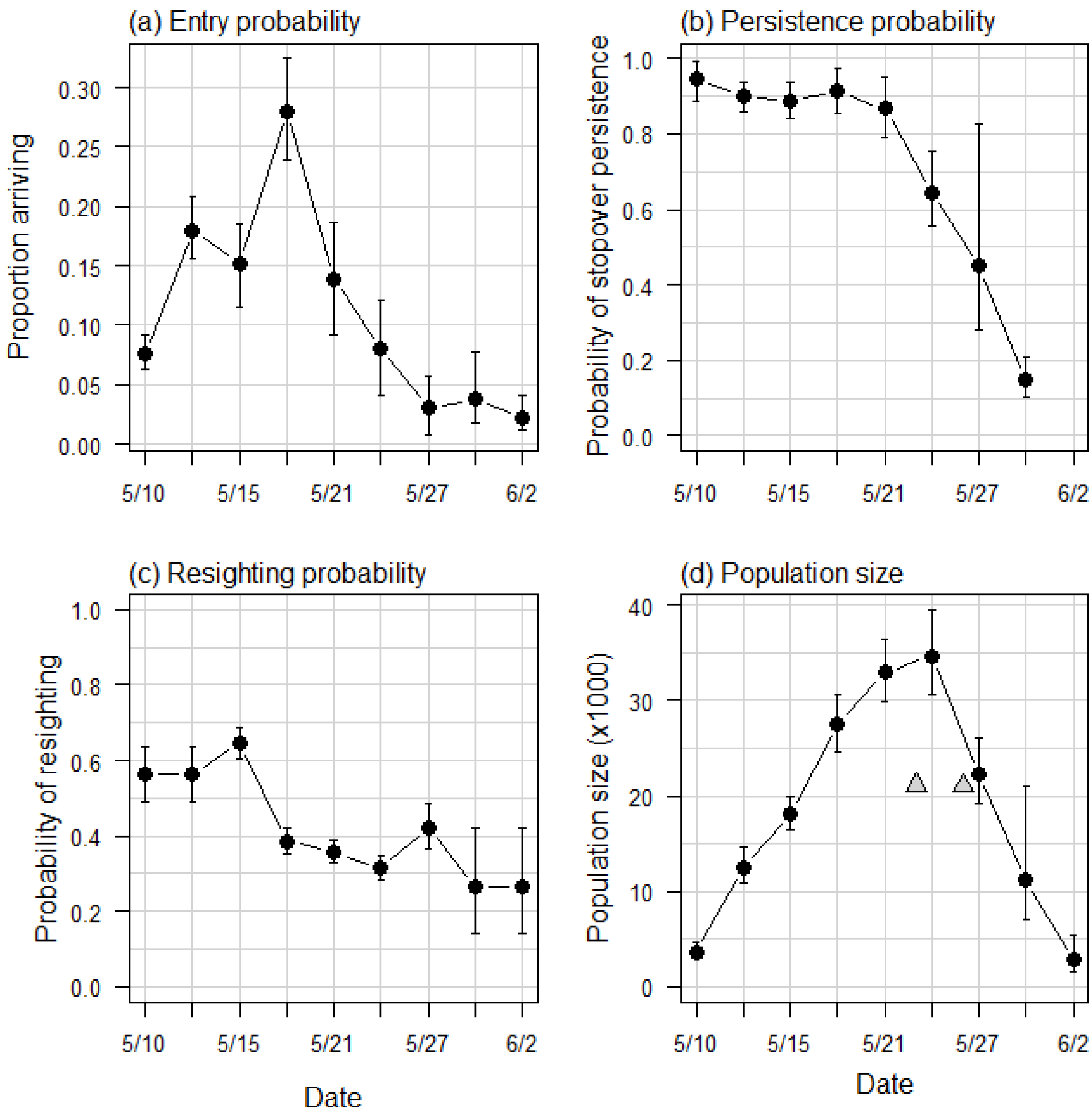


Figure 1. Estimated proportion of stopover population arriving in Delaware Bay at sampling points throughout the 2016 season (a), stopover persistence (b), probability of resighting (c), and time-specific stopover population size (d) from mark-resight analysis. Triangles in (d) are counts made by aerial survey (23 and 26 May).

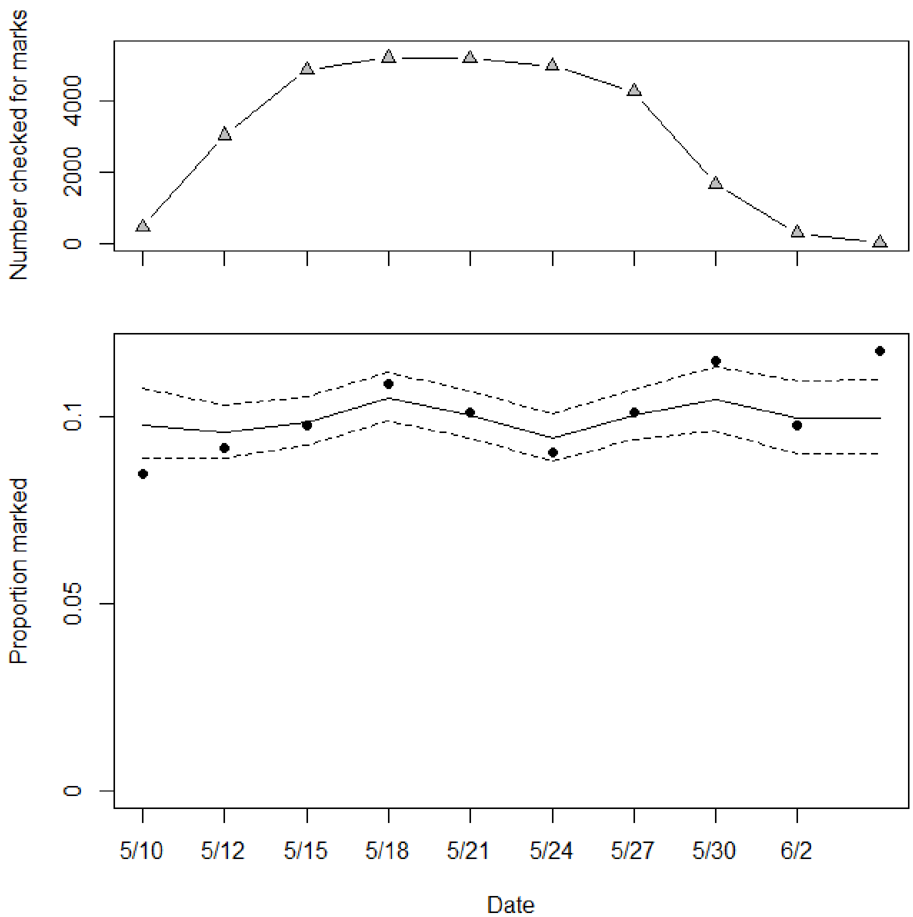


Figure 2. Estimated proportion of the Delaware Bay stopover population that has leg flags in 2016. Marked proportion was estimated from marked-ratio scan samples for each 3-day sampling period. The dates for the sampling periods are shown in Appendix 3. Sample size (number scanned, i.e., checked for marks) for each sample period is shown in the upper panel. The estimated proportion marked at each sample occasion (bottom panel) was estimated with the generalized linear mixed model described in Appendix 4. Solid and dashed lines are median proportion marked and 95% CI; filled circles show number with marks/number scanned.

Appendix 1. Number of flagged Red Knots detected each year since 2005.

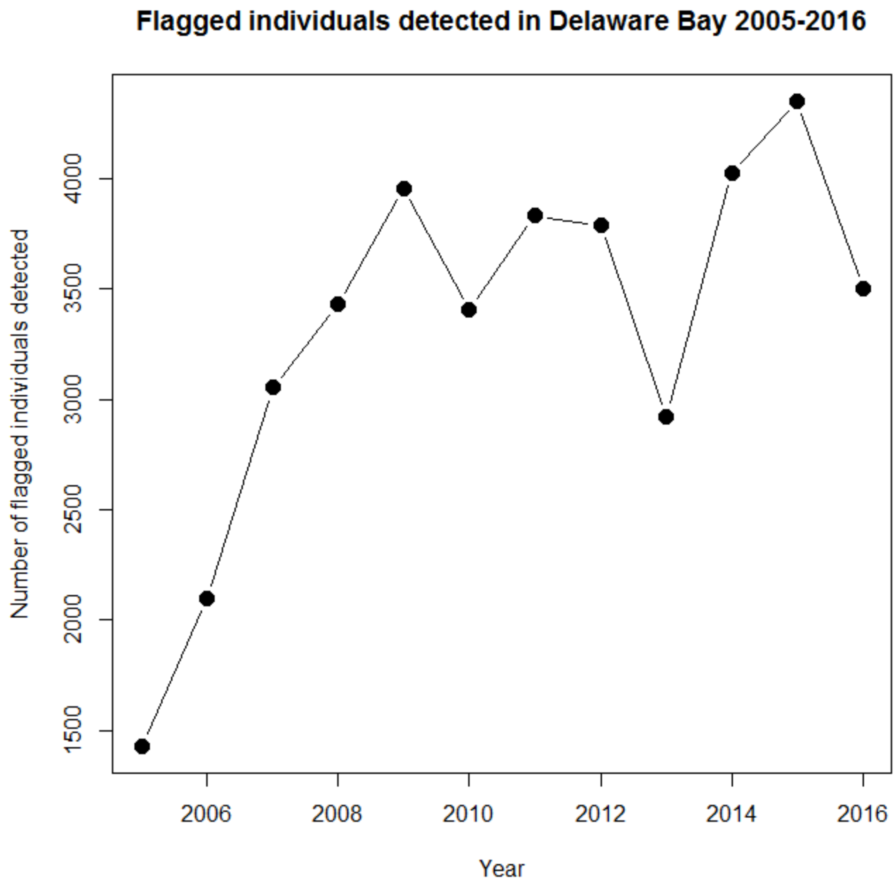


Figure A1. Number of flagged birds detected in Delaware Bay by Delaware and New Jersey crews since 2005. The number of flags detected in 2016 (n = 3510) is the second-lowest since 2010 (n = 3404).

Appendix 2. Number of marked-ratio scan samples.

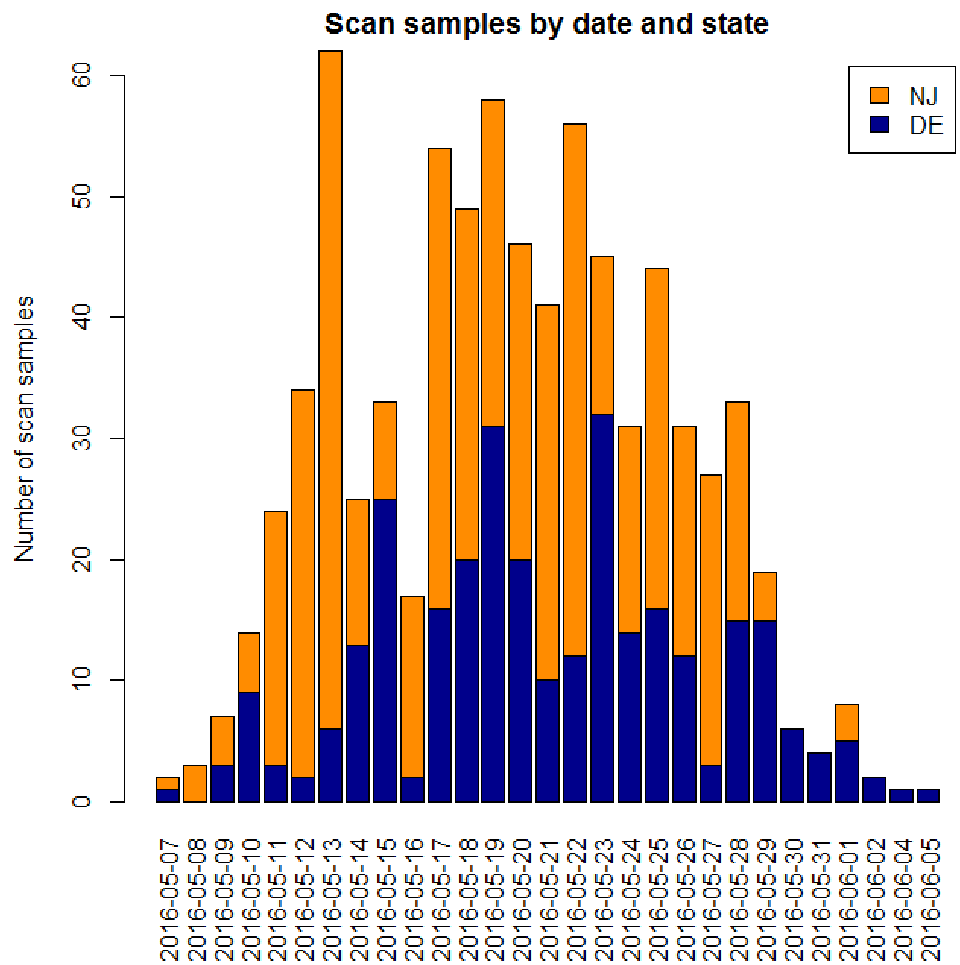


Figure A2. Number of marked-ratio scan samples collected in Delaware Bay in 2016 by field crews in Delaware (blue) and New Jersey (orange).

Appendix 3. Summary of 2016 mark-resight data ("m-array"). NR = never resighted.

			Next resighted at sample									
Sample	Dates	Resighted	2	3	4	5	6	7	8	9	10	NR
1	7-10 May	200	108	37	8	3	8	6	3	0	0	27
2	11-13 May	667		401	62	28	15	23	2	0	0	136
3	14-16 May	1153			409	168	108	78	7	3	0	380
4	17-19 May	1123				415	143	98	15	3	0	449
5	20-22 May	1180					350	162	33	3	0	632
6	23-25 May	1019						283	44	3	0	689
7	26-28 May	946							116	9	0	821
8	29-31 May	315								14	0	301
9	1-3 June	72									1	71

Appendix 4. Statistical Methods to Estimate Stopover Population Size Using Mark-Resight Data and Counts of Marked Birds

We converted the observations of marked birds into encounter histories, one for each bird, and analyzed the encounter histories with a Jolly-Seber (JS) model (Jolly 1965, Seber 1965, Crosbie and Manly 1985, Schwarz and Arnason 1996). The JS model includes parameters for recruitment (β), survival (φ), and capture (*p*) probabilities; in the context of a mark-resight study at a migration stopover site, these parameters are interpreted as probability of arrival to the study area, stopover persistence, and resighting, respectively. Stopover persistence is defined as the probability that a bird present at time *t* remains at the study area until time *t* + 1. The Crosbie and Manley (1985) and Schwarz and Arnason (1996) formulation of the JS model also includes a parameter for superpopulation size, which in our approach to mark-resight inferences for stopover populations is an estimate of the marked (leg-flagged) population size.

We chose to use 3-day periods rather than days as the sampling interval for the JS model given logistical constraints on complete sampling of the study area; multiple observations of the same individual in a given 3-day period were combined for analysis. A summary (m-array) of the mark-resight data is presented in an appendix.

We made inference from a fully-time dependent model; arrival, persistence, and resight probabilities were allowed to vary with sampling period [β_t φ_t p_t]. In this model, we set $p_1 = p_2$ and $p_{K-1} = p_K$ (where *K* is the number of samples) because not all parameters are estimable in the fully-time dependent model (Jolly 1965, Seber 1965, Crosbie and Manly 1985, Schwarz and Arnason 1996).

We followed the methods of Royle and Dorazio (2008) and Kéry and Schaub (2012, Chapter 10) to fit the JS model using the restricted occupancy formulation. Royle and Dorazio (2008) use a state-space formulation of the JS model with parameter-expanded data augmentation. For parameter-expanded data augmentation, we augmented the observed encounter histories with all-zero encounter histories (n = 2000) representing potential recruits that were not detected (Royle and Dorazio 2012). We followed Lyons et al. (2016) to combine the JS model with a binomial model for the counts of marked and unmarked birds in an integrated Bayesian analysis. Briefly, the counts of marked birds (m_s) in the scan samples are modeled as a binomial random variable:

$$m_s \sim Bin(C_s, \pi), \qquad (1)$$

where m_s is the number of marked birds in scan sample *s*, C_s is the number of birds checked for marks in scan sample *s*, and π is the proportion of the population that is marked. Total stopover population size $\widehat{N^*}$ is estimated by

$$\widehat{N^*} = \widehat{M^*}/\hat{\pi} \qquad (2)$$

where $\widehat{M^*}$ is the estimate of marked birds from the J-S model and $\hat{\pi}$ is the proportion of the population that is marked (from Eq. 1). Estimates of marked subpopulation sizes at each resighting occasion t $\left(\widehat{M_t^*}\right)$ are available as derived parameters in the analysis. We calculated an estimate of population size at each mark-resight sampling occasion $\widehat{N_t^*}$ using $\widehat{M_t^*}$ and $\hat{\pi}$ as in equation 2.

To better account for the random nature of the arrival of marked birds and addition of new marks during the season, we used a time-specific model for proportion with marks in place of equation 1 above:

$$m_{s,t} \sim Binomial\left(C_{s,t}, \pi_t\right) \qquad (3)$$

$$for\ s\ in\ 1, \dots, n_{samples}\ and\ t\ in\ 1, \dots, n_{occasions}$$
$$logit(\pi_t) = \alpha + \delta_t$$
$$\delta_t \sim Normal(0, \sigma^2_{occasions})$$

where m_s is the number of marked birds in scan sample s, C_s is the number of birds checked for marks in scan sample s, δ_t is a random effect time of sample s, and π_t is the time-specific proportion of the population that is marked. Total stopover population size $\widehat{N^*}$ was estimated by summing time-specific arrivals of marked birds to the stopover (B_t) and expanding to include unmarked birds using estimates of proportion marked:

$$\widehat{N^*} = \sum \widehat{B_t}/\pi_t$$

Time-specific arrivals of marked birds are estimated from the Jolly-Seber model using $\widehat{B_t} = \widehat{\beta}_t \widehat{M^*}$ where $\widehat{M^*}$ is the estimate of the number of marked birds and $\widehat{\beta}_t$ is the fraction of the population arriving at time t.

Appendix 5 Minimum length-of-stay

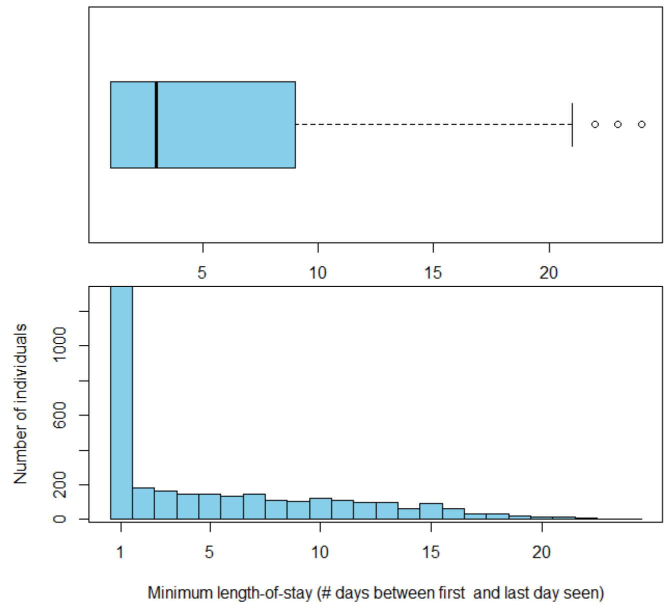


Figure A5. Minimum length-of-stay (MINLOS) in 2016 (n = 3,510 birds). This is a plot of raw data and is not a model-based estimate. MINLOS does not account for time present before first, or after last, detection and therefore is negatively biased. The mean and median MINLOS in 2016 were 5.3 days and 3 days, respectively. Model-based estimates of stopover duration suggest that stopover in 2016 was approximately 12 days.

Associates of Cape Cod, Inc.
124 Bernard E St. Jean Drive
East Falmouth Massachusetts 02536

05 OCT 2016

Atlantic States Marine Fisheries Commission
1050 N. Highland St.
Ste. 200
Arlington, Virginia 22201

RE: Response to proposed changes to ARM, Addendum VIII

Dear Commissioners,

Associates of Cape Cod, Inc. (ACC) has participated in a catch and release fishery of horseshoe crabs (HSC) in the New England region for well over 40 years. Although ACC does not participate in the Delaware Bay biomedical collection, we do have a strong contingent interest in management of this proximal east coast fishery. We share the desire for a healthy and sustainable population of HSC's, however, we cannot support proposals in proposed Addendum VIII that includes 1. The possibility of a limit on the availability of HSCs particularly when biomedical collection is not detrimental to the maintenance of a strong HSC fishery; and 2. The requirement to remove the protection of confidentiality of company data that helps insures a level playing field.

These animals are the key resource required to produce endotoxin reagents, which are a critical element in protecting the public from contaminated pharmaceuticals and medical devices as well as clinical diagnostic products that help physicians manage patients suffering from invasive fungal infections. An unexpected increase in demand for the reagents should not be delayed or constrained due to the limited availability of HSC's. The proposed addendum contains potential unintended negative consequences. Similarly, we cannot support any proposals that could compromise the confidentiality of the biomedical industries private information without significant benefit to the conservation of the HSC fishery.

Conservation efforts surrounding the bait industry have reduced overall harvest of the animal but mortality remains at 100% and is orders of magnitude greater than the biomedical mortality. The biomedical industry has a greater than 40 year history of being a catch and release fishery. Current research indicates that the impact of a biomedical fishery is minimal to the animals, and data from the ASMFC clearly demonstrates that the biomedical catch and release fishery has a very small impact on overall mortality. ACC cannot see the advantage to the HSC fishery that placing limits on the biomedical catch and release would provide. We appreciate the interest in supporting the fishery, but limiting catch and release harvest - which leaves such a very small mark on the fishery – introduces new risk to those who utilize this resource with no offsetting advantage to effectively protect the fishery.

I do appreciate your attention to this most important matter and ask that this material be made available for the annual meeting in October.

Best regards,

Brett Hoffmeister
Asst. Production Manager

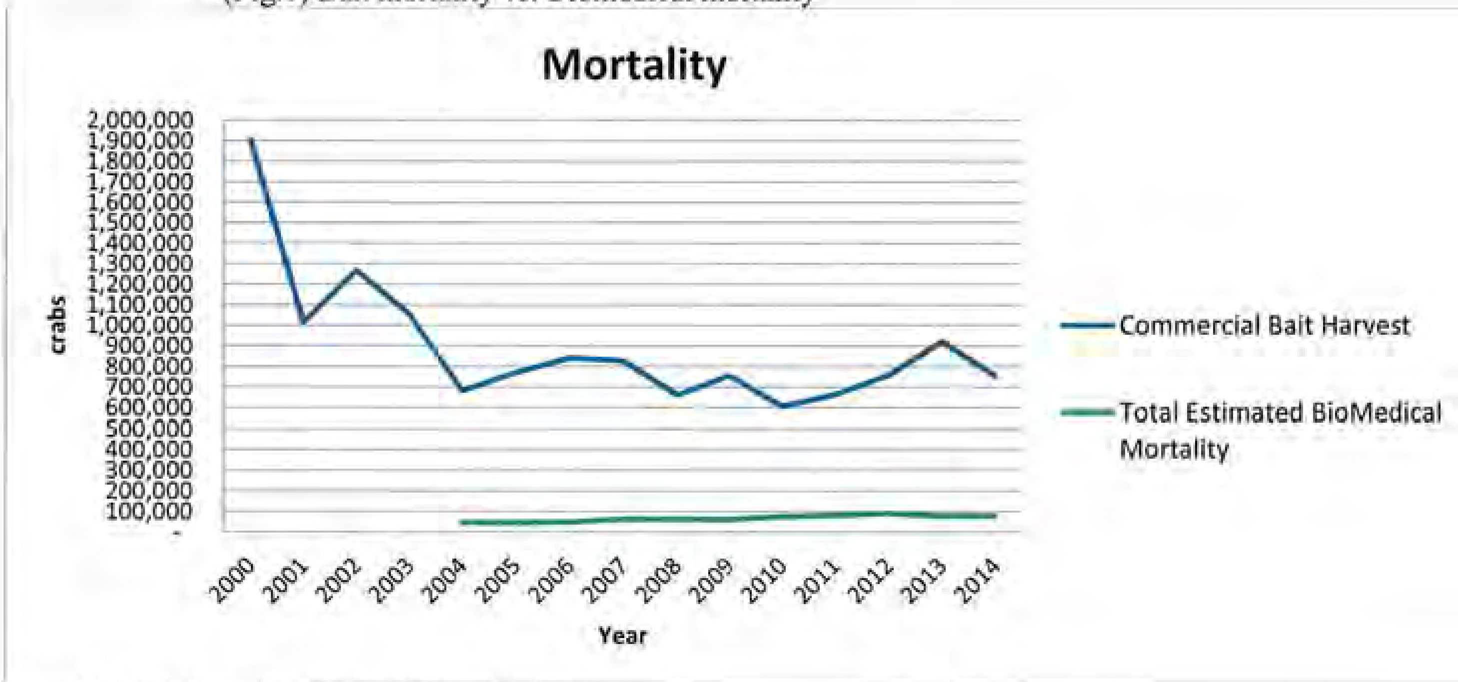
Enclosure:

Associates of Cape Cod, Inc. does not support the following recommendations of the ARM subcommittee for the following reasons:

ItemI. *Incorporate biomedical mortality into the Adaptive Resource Management (ARM) process and methods that are used to set harvest quotas in the Delaware Bay Region.*

1. The reason to implement a change is misleading. Originally, a 57,500 threshold was set to trigger a review of the biomedical fishery, but it is unclear how this number was derived. This threshold was never intended to indicate the species was in a decline, but rather trigger an evaluation of the fishery if biomedical estimated mortality exceeded this threshold. While the biomedical mortality estimate may have increased over time, when compared to the amount of crabs harvested for bait, it is almost insignificant. The number of crabs adversely affected by the biomedical harvest process is not impactful to the population when compared to the mortality of crabs harvested for bait.

(Fig.1) Bait mortality vs. Biomedical mortality



Mortality data source ASMFC FMPs (see reference)

A periodic review of the biomedical mortality is supported, but the data does not support that a change in strategy is needed at this time. The bait industry is the leading cause of mortality and should be regulated accordingly as is currently done. To require the biomedical mortality data to be included in the ARM when it is such a small percentage of the number of crabs harvested will not add real value to the ARM. While this may seem inconsequential at first glance, the risks do not outweigh the benefit. The risks involved in including the biomedical data in the ARM process is as follows:

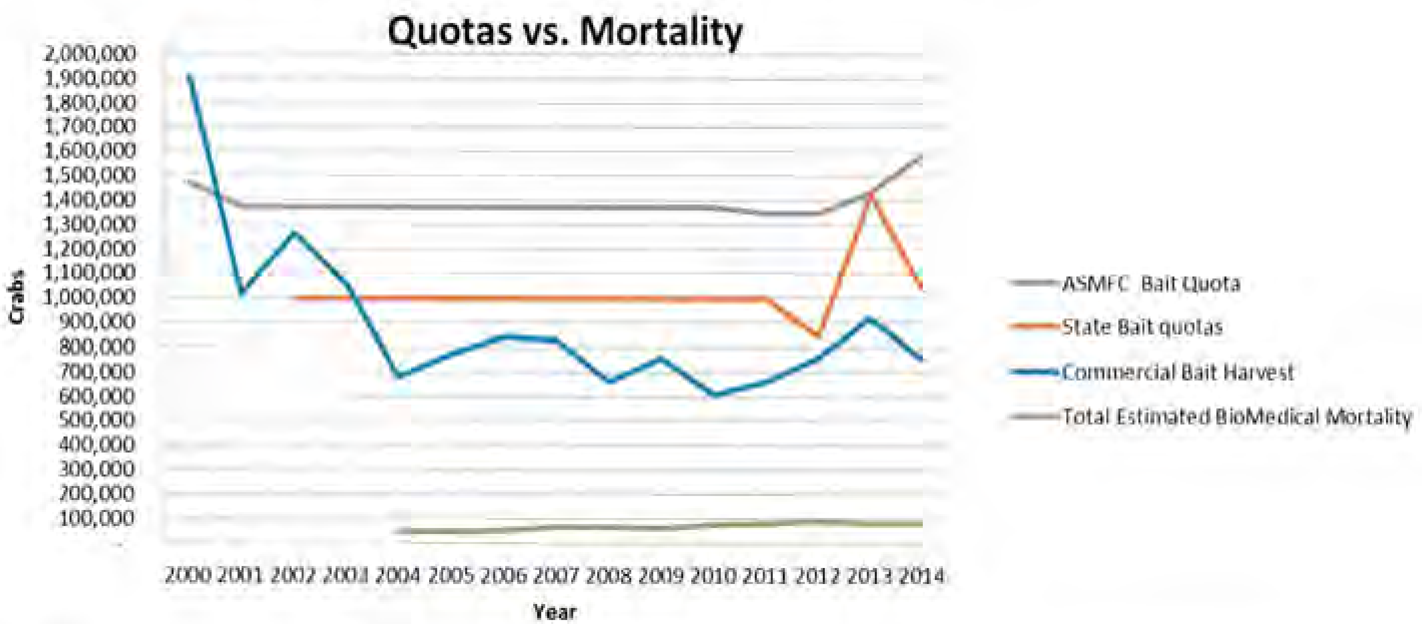
A. The variable data could require quotas for the biomedical industry based on output from unreliable estimates of red knot populations. If biomedical harvest were to be limited, this poses a direct impact to human health. The horseshoe crab blood is used specifically to make LAL, which is a product used to detect life threatening bacteria in any vaccine, medicine, or medical device that enters a human body. There is no alternative that is as reliable or accurate, and to prevent this product from being manufactured could directly affect the availability of vaccines, drugs, diagnostics or medical devices. There are times when an unanticipated increase in LAL production is needed, such as during pandemics and outbreaks like those in our recent past.

Examples are bird flu, swine flu and measles. To establish quotas on the biomedical harvest when the mortality estimates are so minimal is irresponsible.

B. The release of biomedical data in the Delaware Bay region as an aggregate may not in theory compromise the confidentiality of those biomedical facilities, but in reality it would do just that. The companies in that region are not created equal and the data, even as an aggregate, would give telling data from the main source company in the Delaware Bay region. This would by default, make the data available to the other companies as each company could mathematically determine the competitor's information based on what came out of the Delaware Bay region and vice versa.

2. A review of harvest data over the past 14 years indicates that conservation efforts have reduced overall harvest rates and that overall harvest and related mortality is well below the thresholds set by the ASMFC and individual states that often opt for a more conservative approach to quota management.

(Fig.2) Biomedical mortality insignificant to harvest quotas.



Quota and Mortality data source ASMFC FMPs (see reference)

Item 2; *Require each company to submit confidential data on its own levels of mortality at each stage (capture, transport, holding, bleeding, and condition at release)*

We would like to take this opportunity to remind the members of the ASMFC that the process of creating LAL is a highly regulated activity that already includes monthly reporting to state authorities the numbers, sex, mortality, and origin of horseshoe crabs we utilize by both the biomedical company and the supplier(s). This information is summarized by the state authorities and reported to the ASMFC annually. This proposal is redundant, provides no apparent benefit and burdens the companies and fisherman with unrealistic expectations such as assessing and recording the sex and state of health of each crab at release. The biomedical companies and biomedical fisherman have been supplying reliable and accurate information to the regulating authorities for many years.

Item 3: *Require each company to submit an annual report regarding its specific measures, practices, and safeguards to implement the 2011 Biomedical handling BMPs, and documentation that crabs are being returned to the same waters from which they were collected.*

The majority of BMPs formalized in 2011, including live release, had been in practice for decades. Our operations are widely scrutinized by local, state and federal authorities, as well as US and international regulators, customers, and internal quality control. We take our current reporting responsibilities very seriously and have performed to expectations. Additional reporting and documentation adds no value, and presents an undue burden on an industry that is already highly regulated, documented and audited.

Conclusion:

Associates of Cape Cod, Inc. commends the efforts of the horseshoe crab ARM subcommittee and the fine work done in an effort to stabilize populations of both the horseshoe crab (HSC) and red knot in the Delaware Bay region. The relationship between the biomedical facilities and fisheries managers is longstanding and productive. Over 40 years of conservation efforts have proven to be effective. The proposed changes (Addendum VIII) to the ARM are based on a requirement that a review take place after achieving a biomedical mortality threshold (57,500 crabs) of unknown impact. Given the data, it would be reasonable to conclude that the biomedical fisheries are of little, if any, impact. Therefore, a change to the ARM that includes increased supply risk and possible negative impact to an industry that provides such a vital and important product is unwarranted.

References:

Atlantic States Marine Fisheries Commission. (n.d.). Retrieved September 30, 2016, from http://www.asmfc.org/species/horseshoe-crab

Marine Fisheries
ENVIRONMENTAL QUALITY

PAT McCRORY
Governor

DONALD R. VAN DER VAART
Secretary

BRAXTON C. DAVIS
Director

Sept. 12, 2016

Kirby Rootes-Murdy, FMP Coordinator
Atlantic States Marine Fisheries Commission
1050 N. Highland Street
Suite 200 A-N
Arlington, VA 22201

Dear Mr. Rootes-Murdy,

This past summer North Carolina reached its Atlantic States Marine Fisheries Commission (ASMFC) directed quota of 24,036 individual horseshoe crabs. While we were aware that the horseshoe crab quota could be reached within a calendar year we were not concerned because there are no directed fisheries and the daily harvest limit was set at only 50 horseshoe crabs per vessel per trip. Rule changes in 2011 have broadened the N.C. Division of Marine Fisheries (NCDMF) Fisheries Director's proclamation authority to include seasons, areas, quantity, means and methods, and size limits that can be implemented within 48 hours. This provides more flexibility to stay in compliance with the ASMFC Interstate Fishery Management Plan (FMP) for Horseshoe Crabs. Through proclamation, the open harvest season was reduced by one month for 2016 to reduce harvest and help prevent a quota overage from occurring.

The North Carolina Trip Ticket Program captures all seafood harvested and sold within North Carolina but there is a two-month time lag for the verification process to capture this information. Harvest of horseshoe crabs was allowed during a seasonal open harvest window from January 1 through April 30, 2016 to provide time for the verification process to offer a more accurate estimate of landings. It was identified in August that there was a quota overage for 2016, estimated at 999 horseshoe crabs. All landings estimates in 2016 are preliminary at this time.

Addendum II of the ASMFC FMP indicates that voluntary quota transfers are allowed between states so long as the transfer is biologically sound. To be biologically responsible, the quota transfer should occur within a population and must be predicated on stock delineation and estimates of stock size. Population data from North Carolina is limited and the closest state for a transfer would be Georgia. Georgia has recorded no commercial horseshoe crab landings since 1999. The required transfer is low and commercial harvest in both states is either minimal or non-existent in recent years compared to the overall coast-wide harvest allowance.

The NCDMF contacted the Georgia Department of Natural Resources to determine if they would be willing to assist us in addressing our overage through a quota transfer. The Georgia Department of Natural Resources has agreed to transfer 1,250 horseshoe crabs from Georgia to North Carolina, increasing North Carolina's 2016 quota to 25,236 individuals. This transfer will cover the 2016 overage in North Carolina. Four previous quota transfers occurred between Georgia and North Carolina in 2009, 2011, 2013 and 2015.

Horseshoe crab landings in North Carolina have remained below the harvest quota, ten of seventeen years since its inception in 2000 (Figure 1). A quota overage of 331 individuals occurred in 2003; 2,155 individuals in 2008; 8,989 individuals in 2009; 3,091 individuals in 2011; 803 individuals in 2015; and 999 individuals in 2016 (Figure 1). The overages in 2003 and 2008 occurred in December due to large landings in the blue crab trawl fishery, and a daily harvest limit of 500 horseshoe crabs per vessel per trip. The quota overages in 2009 and 2011 occurred in May and June respectively, and the majority of the landings (63% and 52%) again came from the blue crab trawl fishery when the trip harvest limit could be set no lower than 500 horseshoe crabs per vessel per day by rule. The 2013 quota overage occurred in the month of July, while 85% of the landings occurred in May and June, mostly from gill nets. The overage in 2015 occurred in May, and was due to strong catches from gillnets, crab trawls, and pound nets. In 2016, landings stayed within the quota during the open harvest season. Unfortunately, late harvest in May, primarily from gill nets, caused the 2016 overage.

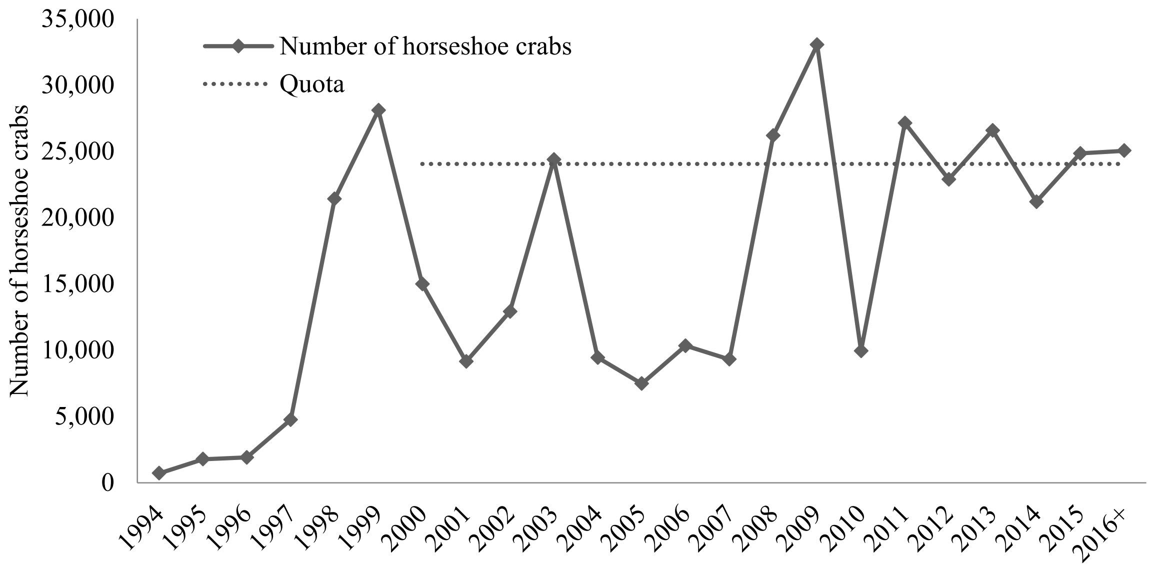


Figure 1. North Carolina horseshoe crab landings (number, 1994 – 2016), including the harvest quota in 2000. +Landings for 2016 are preliminary at this time and subject to change.

Horseshoe crab landings will continue to be monitored through the trip ticket program, and if landings reach the quota, North Carolina will continue to adjust management measures via proclamation authority. For 2017, we plan to continue a January 1 through April 30 open harvest period at a trip limit of 50 horseshoe crabs. Should verification of landings determine that a short re-opening could occur, North Carolina may consider that option. It is important to note that the current management measures were effective in constraining harvest to the quota, but illegal post-closure harvest resulted in an overage.

Further concerns include impacts of the quota transfer on shorebird populations and biomedical industry. No biomedical permits have been issued in North Carolina in over a decade. Whether Georgia or North Carolina is considered a critical stopover for migratory shorebirds, including red knots, is undetermined. Restrictions on harvest of horseshoe crabs from the Delaware Bay region, the epicenter of horseshoe crab production on along the east coast, has been the prime area of focus in regards to the impacts on egg availability to shorebirds migration.

If you need additional information concerning this request, please contact me via e-mail at Braxton.Davis@ncdenr.gov or by phone at 252-808-8013. Thank you for your assistance on this matter.

Sincerely,

Braxton C. Davis, Director
Division of Marine Fisheries

cc: Spud Woodward
Stephanie McInerny
Grace Kemp
Jeff Dobbs

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

MARK WILLIAMS
COMMISSIONER

A.G. 'SPUD' WOODWARD
DIRECTOR

September 7, 2016

Braxton C. Davis, Director
North Carolina Division of Marine Fisheries
P.O. Box 769
3441 Arendell Street
Morehead City, North Carolina 28557

Dear Mr. Davis,

I received your correspondence dated August 29, 2016 in which you requested that the State of Georgia transfer 1,250 horseshoe crabs from its available quota for calendar year 2016 to the State of North Carolina as allowed in the ASMFC Interstate Fishery Management Plan for Horseshoe Crab.

There has been no reported harvest of horseshoe crabs in Georgia thus far during 2016, and we do not anticipate there being any reported harvest. Thus, we have adequate unused quota to transfer per your request. Therefore, it is my pleasure to respond in the affirmative. Please have ASMFC staff contact me, if they have any questions.

Sincerely,

A.G. "Spud" Woodward
Director

cc: Patrick Geer
Michelle Duval

ONE CONSERVATION WAY | BRUNSWICK, GEORGIA 31520-8686
912.264.7218 | FAX 912.262.3143 | WWW.COASTALGADNR.ORG

Aug. 29, 2016

Spud Woodward, Director
Coastal Resources Division
Georgia Department of Natural Resources
One Conservation Way
Brunswick, GA 31520

Dear Mr. Woodward,

This past summer North Carolina reached its Atlantic States Marine Fisheries Commission (ASMFC) directed quota of 24,036 individual horseshoe crabs. While we were aware that the horseshoe crab quota could be reached within a calendar year we were not concerned because there are no directed fisheries and the daily harvest limit was set at only 50 horseshoe crabs per vessel per trip. Rule changes in 2011 have broadened the N.C. Division of Marine Fisheries (NCDMF) Fisheries Director's proclamation authority to provide more flexibility to stay in compliance with the ASMFC Interstate Fishery Management Plan (FMP) for Horseshoe Crabs. Through a proclamation, the open harvest season was reduced by one month to January 1 through April 30 in 2016 to reduce harvest and help prevent another quota overage.

The North Carolina Trip Ticket Program captures all seafood harvested and sold within North Carolina, but there is a two-month time lag for the verification process to capture this information. Harvest of horseshoe crabs was allowed during a seasonal open harvest window from January 1 through April, 2016 to provide time for the verification process to offer a more accurate estimate of landings. It was identified in August that there was a quota overage for 2016 estimated at 999 horseshoe crabs. All landings estimates in 2016 are preliminary at this time.

Addendum II of the ASMFC FMP indicates that voluntary quota transfers are allowed between states so long as the transfer is biologically sound. To be biologically responsible, the quota transfer should occur within a population and must be predicated on stock delineation and estimates of stock size. Horseshoe crabs found in North Carolina are considered a small subpopulation in the southeast. A quota transfer occurred for the 2009, 2011, 2013, and 2015 seasons between North Carolina and Georgia because the technical Committee's recommendation of the closest state at those times was Georgia.

We would like to request the Georgia Department of Natural Resources assistance in addressing our horseshoe crab overage through a quota transfer as authorized by the ASMFC FMP. We request a transfer of 1,250 horseshoe crabs for calendar year 2016. If the Georgia

Department of Natural Resources agrees with the proposed transfer, we will request the ASMFC to adjust our respective quotas to reflect the changes.

I look forward to hearing from you on our proposal for quota transfer.

Sincerely,

Braxton C. Davis, Director
Division of Marine Fisheries

cc. Stephanie McInerny, Grace Kemp, Jeff Dobbs, Michelle Duval

Nothing Compares

State of North Carolina | Environmental Quality | Marine Fisheries
PO Box 769 | 3441 Arendell Street | Morehead City, NC 28557
252 726 7021 T

Atlantic States Marine Fisheries Commission

Business Session

October 26, 2016
11:30 a.m. – 12:30 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Introductions (*D. Grout*)	11:30 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	11:35 a.m.
3.	Public Comment	11:40 a.m.
4.	Election of Commission Chair and Vice Chair (*R. Beal*) **Action**	11:45 a.m.
5.	Review and Consider Approval of the 2017 ASMFC Action Plan **Action**	12:15 p.m.
6.	Other Business/Adjourn	12:30 p.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

Vision: Sustainably Managing Atlantic Coastal Fisheries

ATLANTIC STATES MARINE FISHERIES COMMISSION

DRAFT 2017 Action Plan

Approved by the Administrative Oversight Committee on October 11, 2016
for Consideration by the Business Session on October 26, 2016

Goal 1 - Rebuild, maintain and fairly allocate Atlantic coastal fisheries

Goal 1 focuses on the responsibility of the states to conserve and manage Atlantic coastal fishery resources for sustainable use. Commission members will advocate decisions to achieve the long-term benefits of conservation, while balancing the socio-economic interests of coastal communities. Inherent in this is the recognition that healthy and vibrant resources mean more jobs and more opportunity for those that live along the coast. The states are committed to proactive management, with a focus on integrating ecosystem services, socio-economic impacts, habitat issues, bycatch and discard reduction measures, and protected species interactions into well-defined fishery management plans. Fishery management plans will also address fair (equitable) allocation of fishery resources among the states. Understanding global climate change and its impact on fishery productivity and distribution is an elevated priority. Improving cooperation and coordination with federal partners and stakeholders can streamline efficiency, transparency, and, ultimately, success. In the next five years, the Commission is committed to making significant progress on rebuilding overfished or depleted Atlantic fish stocks.

Strategies to Achieve Goal

1.1 Manage interstate resources that provide for productive, sustainable fisheries using sound science.

American Eel
Task 1.1.1 – Monitor Addendum IV commercial landings. Assist states in implementing and monitoring yellow eel quotas in 2017 if triggered.

Task 1.1.2 – Complete the 2017 stock assessment update and consider management response to the assessment findings.

Task 1.1.3 – Continue to work with Law Enforcement Committee (LEC) on monitoring poaching and illegal sale of glass eels (see Task 3.3.1).

Task 1.1.4 – Continue to collaborate on management and scientific activities with Great Lakes Fishery Commission, U.S Fish and Wildlife Service (USFWS), NOAA Fisheries, and Canada Department of Fisheries and Oceans (DFO). Explore collaboration with DFO on the next Benchmark Stock Assessment.

Task 1.1.5 –Monitor and respond if necessary to the classification of eel under the Convention on the International Trade of Endangered Species (CITES) and the International Union of Conservation of Nature (IUCN) Red List.

Task 1.1.6 – Work with the Technical Committee to finalize and implement a life cycle survey in the State of Maine to estimate incremental survival across life stages. Review any additional life cycle survey proposals if submitted. Update the young of the year survey data.

Task 1.1.7 – Work with the Technical Committee and the Fish Passage Work Group to annually update the board on fish passage improvements and current issues including hydropower dam issues. States can use this information when leveraging partnerships to reduce passage impacts on eel and other anadromous species. (See Task 4.3.4)

Task 1.1.8 – Monitor fishery for consistency with management program and state compliance.

American Lobster and Jonah Crab

American Lobster

Task 1.1.9 – Finalize and implement Addendum XXV for the Southern New England (SNE) fishery to respond to the results of the 2015 benchmark stock assessment in Lobster Conservation Management Areas (LCMAs) 2, 3, 4, 5, and 6.

Task 1.1.10 – Develop and implement an addendum to improve catch and biological reporting in the lobster fishery.

Task 1.1.11 –Monitor trap reductions in SNE lobster fishery and implementation of addenda (XXII, XXIII, and XXV) to determine need and extent of further management action in the region.

Task 1.1.12 –Review analysis by Technical Committee on Gulf of Maine stock and determine need and extent of management action in the region.

Task 1.1.13 – Monitor Regional Fishery Management Councils actions on habitat area closures and implementation of the Atlantic national monument for impacts to the lobster fishery, respond if necessary.

Task 1.1.14 – Address lobster trap design, focusing on improvement to escapement of lobster from derelict traps. (See Task 2.4.5)

Task 1.1.15 – Monitor the use of the lobster trap database to track trap tag transfers.

Task 1.1.16 – Update the Atlantic Coastal Cooperative Statistics Program (ACCSP) Data Warehouse with landings information and monitor landings patterns in both the trap and non-trap fisheries.

Task 1.1.17 – Monitor trap tag production and distribution.

Task 1.1.18 – Continue to work with Offshore Lobster Law Enforcement Subcommittee to improve enforcement of offshore management measures, especially trap reductions.

Task 1.1.19 – Monitor fishery for consistency with management program and state compliance. Continue to work with the federal government to ensure consistency between regulations in state and federal waters, including trap banking measures in LCMAs 2 and 3 as outlined in Addenda XXI and XXII.

Jonah Crab

Task 1.1.20 – Monitor Regional Fishery Management Councils actions on habitat area closures and implementation of the Atlantic national monument for impacts to the crab fishery, respond if necessary.

Task 1.1.21 – Finalize and implement Addendum II to the Jonah Crab FMP to ensure consistent regulations in the claw fishery in both state and federal waters.

Task 1.1.22 – Monitor fishery for consistency with management program and state compliance. Continue to work with the federal government to ensure consistency between regulations in state and federal waters.

Atlantic Herring

Task 1.1.23 – Review existing specifications for 2017-2018. Set Area 1A specifications for 2017.

Task 1.1.24 – Monitor activities of the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) regarding complementary FMP actions, including but not limited to ecosystem-based fisheries management (EBFM), Amendment 8 issues and, river herring bycatch avoidance program. Consider complementary action where necessary (See Task 1.2.5).

Task 1.1.25 – Hold meetings as necessary to establish state effort control (days-out) programs for Areas 1A and 1B.

Task 1.1.26 – Review performance of the GSI_{30}-Based Spawning Monitoring Pilot Program and consider use in future years.

Task 1.1.27 – Consider management action to meet the goals and objectives of the Area 1A fishery.

Task 1.1.28 Participate on the NEFMC EBFM Plan Development Team to draft a Fishery Ecosystem Plan.

Task 1.1.29 – Monitor fishery for consistency with management program and state compliance.

Atlantic Menhaden

Task 1.1.30 – Continue work with the Technical Committee and Ecological Reference Points Working Group to develop ecosystem reference points based on Board-defined goals and objectives. (See Task 2.4.1). **[Hold a workshop to discuss and review potential ERPs to include in Draft Amendment 3.]**

Task 1.1.31 – Finalize and implement Amendment 3 to revisit quota allocation and address ERPs.

Task 1.1.32 – Complete the 2017 stock assessment update and consider management response to the assessment findings.

Task 1.1.33 – Monitor the 2017 episodic events set aside quota and set the 2018 fishery specifications.

Task 1.1.34 – Monitor fishery for consistency with management program and state compliance.

Atlantic Striped Bass

Task 1.1.35 – Consider management response to 2016 stock assessment update, if necessary.

Task 1.1.36 – Initiate the development of the 2018 benchmark stock assessment to include fleet- and sex-specific analyses, as well as regional models.

Task 1.1.37 – Monitor fishery for consistency with management program and state compliance.

Atlantic Sturgeon

Task 1.1.38 – Finalize the 2017 benchmark stock assessment and consider management response, if necessary.

Task 1.1.39 – Transmit benchmark assessment findings to NOAA Fisheries for consideration in the 2017 5-year ESA status review.

Task 1.1.40 – Monitor state and federal activities in response to ESA listing of Atlantic sturgeon.

Task 1.1.41 – Monitor fishery for consistency with management program and state compliance.

Bluefish

Task 1.1.42 – Work in collaboration with Northeast Fisheries Science Center (NEFSC) to complete a stock assessment update. Consider management response to the update findings in conjunction with MAFMC, if necessary.

Task 1.1.43 – Review specifications for 2018 in cooperation with the MAFMC.

Task 1.1.44 – Monitor fishery for consistency with management program and state compliance.

Coastal Sharks
Task 1.1.45 – Establish specifications for 2018 and later.

Task 1.1.46 – Monitor and engage in the development of Amendment 5b (dusky shark management).

Task 1.1.47 – Review and consider dusky shark benchmark stock assessment for management and consider management response to the assessment findings.

Task 1.1.48 – Monitor activities of NOAA Fisheries and its Highly Migratory Species Division with regards to coastal shark management actions for consistency.

Task 1.1.49 – Monitor fishery for consistency with management program and state compliance.

Horseshoe Crab
Task 1.1.50 – Establish the 2018 specifications using the Adaptive Resource Management (ARM) Framework and quota allocation methodology.

Task 1.1.51 – Engage federal stakeholders, the biomedical community, and shorebird interest groups to secure long-term funding to support data collection for use in the ARM Framework, including the Horseshoe Crab Benthic Trawl Survey. (Task 6.2.3)

Task 1.1.52 – Engage the biomedical community toward finding a solution regarding confidential data use in order to enhance stock assessments and scientific advice for management.

Task 1.1.53 – Continue to develop the 2018 benchmark stock assessment.

Task 1.1.54 – Monitor red knot listing under the ESA.

Task 1.1.55 – Monitor fishery for consistency with management program and state compliance for both the bait and biomedical industries.

Northern Shrimp

Task 1.1.56 – Complete the 2017 benchmark stock assessment and consider management response to the assessment findings.

Task 1.1.57 – Finalize and implement Amendment 3, which proposes measures to stabilize effort in the fishery and minimize catch of small shrimp.

Task 1.1.58 – Establish specifications for the 2017/2018 season. Consider industry test tows to collect biological data, if necessary and as resources allow.

Task 1.1.59 – Monitor fishery for consistency with management program and state compliance.

Shad and River Herring

Task 1.1.60 – Complete the 2017 river herring stock assessment update.

Task 1.1.61 – Initiate development of the 2018 shad stock assessment update.

Task 1.1.62 – Monitor activities of the NEFMC and the MAFMC management actions including but not limited to shad and river herring catch caps and bycatch avoidance programs (see Task 1.2.5).

Task 1.1.63 – Review products of the River Herring Technical Expert Working Group and consider for management use.

Task 1.1.64 – Review and update sustainable fisheries plans and/or habitat plans as required by Amendment 3, if necessary.

Task 1.1.65 – Monitor fishery for consistency with management program and state compliance.

South Atlantic Species

Atlantic Croaker

Task 1.1.66 – Complete the 2017 benchmark stock assessment and consider management response to the assessment findings.

Task 1.1.67 – Monitor fishery for consistency with management program and state compliance.

Black Drum

Task 1.1.68 – Monitor fishery for consistency with management program and state compliance.

Cobia

Task 1.1.69 – Develop and implement a Cobia FMP and work with the South Atlantic Fishery Management Council (SAFMC) and NOAA Fisheries to ensure complementary regulations between state and federal waters.

Red Drum

Task 1.1.70 – Consider management response to the 2016 assessment findings and the Technical Committee and Stock Assessment Working Group responses to the Board tasks following the assessment.

Task 1.1.71 – Monitor fishery for consistency with management program and state compliance.

Spanish Mackerel

Task 1.1.72 – Review annual report from North Carolina concerning Addendum I to the FMP. Consider changes to the management program, if necessary.

Task 1.1.73 – Monitor activities of the SAFMC to ensure consistency between state and federal management programs.

Task 1.1.74 – Monitor fishery for consistency with management program and state compliance.

Spot

Task 1.1.75 – Complete the 2017 benchmark stock assessment and consider management response to the assessment findings.

Task 1.1.76 – Monitor fishery for consistency with management program and state compliance.

Spotted Seatrout

Task 1.1.77 – Monitor fishery for consistency with management program and state compliance.

Spiny Dogfish

Task 1.1.78 – Review recent assessment information and establish specifications beginning in 2018/2019.

Task 1.1.79 – Participate in annual stock status update, as needed.

Task 1.1.80 – Monitor fishery for consistency with management program and state compliance.

Summer Flounder

Task 1.1.81 – Continue development of the comprehensive summer flounder amendment, considering changes to both commercial and recreational management in coordination with MAFMC. Consider technical committee recommendations on climate change impacts on species distribution and allocation.

Task 1.1.82 – Develop and implement an addendum to consider a management approach for the recreational fishery in 2017 and beyond.

Task 1.1.83 – Finalize regulations for 2017 recreational fishery.

Task 1.1.84 – Review 2017-2018 specifications in collaboration with the MAFMC.

Task 1.1.85 – Work in collaboration with NOAA Fisheries and NEFSC to complete a stock status update.

Task 1.1.86 – Support the development of a sex specific stock assessment modeling approach; monitor the progress of model development and engage as appropriate.

Task 1.1.87 – Monitor fishery for consistency with management program and state compliance.

Scup

Task 1.1.88 – Collaborate with MAFMC to on the next amendment if initiated by the Council in 2017.

Task 1.1.89 – Collaborate with NEFSC to complete a data update.

Task 1.1.90 – Finalize regulations for 2017 recreational fishery.

Task 1.1.91 – Review 2018 specifications in collaboration with the MAFMC.

Task 1.1.92 – Monitor fishery for consistency with management program and state compliance.

Black Sea Bass

Task 1.1.93 – Collaborate with MAFMC to consider management response to the 2016 benchmark assessment findings; modify 2017 specifications as needed and set 2108 specifications.

Task 1.1.94 – Finalize regulations for 2017 recreational fishery.

Task 1.1.95 – Develop and implement an addendum to consider recreational fishing measures for 2018 and beyond.

Task 1.1.96 – Monitor fishery for consistency with management program and state compliance.

Tautog

Task 1.1.97 – In response to the 2015 benchmark stock assessment, 2016 regional assessment and 2016 assessment update, finalize and implement management measures for Amendment 1, which proposes regional stock areas for management use, increased monitoring, and a commercial harvest tagging program.

Task 1.1.98 – Monitor fishery for consistency with management program and state compliance.

Weakfish

Task 1.1.99 – Continue Technical Committee work to evaluate sources of mortality.

Task 1.1.100 – Monitor fishery for consistency with management program and state compliance.

Winter Flounder

Task 1.1.101 – Monitor NEFSC stock assessment activities for inshore winter flounder stocks and review/modify specifications for 2018.

Task 1.1.102 – Continue to monitor federal common pool landings and regulations.

Task 1.1.103 – Work through the Northeast Regional Coordinating Council (NRCC) to improve communication between ASMFC, NEFMC, GARFO and the NEFSC to identify stock rebuilding opportunities.

Task 1.1.104 – Monitor fishery for consistency with management program and state compliance.

1.2 Strengthen state and federal partnerships to improve comprehensive management of shared fishery resources.

Task 1.2.1 – Participate on the East Coast Regional Fishery Management Councils and committees regarding matters of mutual interest.

Task 1.2.2 – Participate on the Northeast Regional Coordinating Council (NRCC) and SouthEast Data, Assessment and Review (SEDAR) Steering Committee to set state/federal management and assessment priorities.

Task 1.2.3 – Work with the Regional Fishery Management Councils and NOAA Fisheries to improve alignment between state and federal fishery management programs.

Task 1.2.4 **–** Work with NOAA Headquarters and regional leadership to improve alignment of state/federal budget priorities.

Task 1.2.5 – Continue to work with NEFMC and MAFMC on evaluating and mitigating shad and river herring bycatch. (See Task 1.1.55)

Task 1.2.6 – Continue to work with NEFMC and MAFMC on habitat amendments and impacts to the American lobster and Jonah crab fisheries.

1.3 Adapt management to address emerging issues.

Task 1.3.1 – Continue to monitor developments related to climate change, ocean acidification, stock distributions, ecosystem services, ocean planning and potential fisheries reallocations.

Subtask 1.3.1.1 – Convene the Climate Change Working Group to develop white paper addressing fisheries impacted by climate change.

Task 1.3.2 – Consider approval of Risk and Uncertainty Work Group draft policy for management implementation.

1.4 Practice efficient, transparent, and accountable management processes.

Task 1.4.1 – Continue to track status of stocks relative to biological reference points to evaluate and drive improvement and results in the Commission's fisheries management process.

Task 1.4.2 – Continue the use of decision documents and working groups to structure Board discussion on complex management decisions and increase transparency of pending board action.

Task 1.4.3 – Continue to focus Board attention on developing clear problem statements prior to initiating management changes.

Task 1.4.4 – Continue to use roll call voting procedures for Commission final actions.

1.5 Evaluate progress towards rebuilding fisheries.

Task 1.5.1 – Conduct annual Commissioner assessment of progress towards achieving the Commission's mission, vision, and goals using an on-line survey. Report findings to the ISFMP Policy Board.

Task 1.5.2 – Continue the use of the annual performance of the stock to evaluate species rebuilding progress. Report findings to the ISFMP Policy Board.

Subtask 1.5.2.1 – Establish a Policy Board Working Group to consider options to more effectively review progress in achieving the Commission's vision.

1.6 Strengthen interactions and input among stakeholders, technical, advisory, and management groups.

Task 1.6.1 – Engage American lobster, Jonah crab, summer flounder, black sea bass, horseshoe crab, South Atlantic species, tautog, menhaden and northern shrimp advisory panels (APs) in the development of FMPs and Amendments. Solicit state membership of current active APs and appoint new membership where necessary.

Task 1.6.2 – Review advisory panel guiding documents including chair term limits.

Task 1.6.3 – Continue communication with non-active advisory panels (species in the maintenance mode).

Task 1.6.4 – Integrate non-traditional constituents into Advisory Panels (See Task 5.2.3).

Goal 2 – Provide the scientific foundation for and conduct stock assessments to support informed management actions

Sustainable management of fisheries relies on accurate and timely scientific advice. The Commission strives to produce sound, actionable science through a technically rigorous, independently peer-reviewed stock assessment process. Assessments are developed using a broad suite of fishery-independent surveys and fishery-dependent monitoring, as well as research products developed by a vast network of fisheries scientists at state, federal, and academic institutions along the coast. The goal encompasses the development of new, innovative scientific research and methodology, and the enhancement of the states' stock assessment capabilities. It provides for the administration, coordination, and expansion of collaborative research and data collection programs. Achieving the goal will ensure sound science is available to serve as the foundation for the Commission's evaluation of stock status and adaptive management actions.

Strategies to Achieve Goal

2.1 Conduct stock assessments based on comprehensive data sources and rigorous technical analysis.

Task 2.1.1 – Address data deficiencies and priorities for stocks with <u>limited</u> data or stocks of <u>unknown</u> status. Collect more comprehensive information for data poor stocks in order to transition from problematic to more certain assessment models. Focal areas include sciaenid bycatch data, black sea bass fishery-independent data, menhaden fishery-independent data, river herring at-sea and in-river monitoring, the horseshoe crab trawl survey, improved tautog indices, black drum biological sampling and fishery-independent monitoring of mature fish, American eel surveys covering all life stages**,** and red drum recreational discard size composition. Conduct Jonah crab tagging study to evaluate migration, stock connectivity and growth. *(Supported by NOAA Cooperative Agreement).*

Task 2.1.2 – Complete benchmark stock assessments for Atlantic croaker, Atlantic sturgeon, northern shrimp and spot. Complete assessment updates for river herring, Atlantic menhaden, American eel, Atlantic striped bass, bluefish scup, black sea bass, and summer flounder.

Task 2.1.3 – Conduct independent peer reviews of the Atlantic sturgeon, northern shrimp, and spot and croaker stock assessments.

Task 2.1.4 – Conduct additional workshops with South Atlantic states to complete a southern flounder regional stock assessment (if funding is available).

Task 2.1.5 – Through the Assessment Science Committee (ASC) and Management and Science Committee (MSC), develop the long-term stock assessment schedule to prioritize stocks by management need; present tradeoffs to the Policy Board when assessment scheduling changes are requested.

Task 2.1.6 – Track assessment scientists' workloads in order to complete 2017-2018 stock assessments; using the guidance of the ASC, develop new policies and approaches to better match assessment demand with assessment scientists' capacity.

Task 2.1.7 – Through the ASC, conduct a Data Best Practices Workshop and expand Fishery-Independent Survey Database to promote efficient assessment report compilation.

Task 2.1.8 – Serve as members of the Atlantic Sturgeon, Atlantic Menhaden, American Eel, Northern Shrimp, Tautog, Bluefish, Horseshoe Crab, River Herring and Shad Technical Committees and Stock Assessment Subcommittees to assist in completion of benchmark assessments and annual assessment updates. Utilize the ASC for guidance with assessment methods as necessary.

Task 2.1.9 – Continue to work with state and federal stock assessment scientists and staff of the ACCSP to increase use of ACCSP data in the Commission's technical work.

Task 2.1.10 – Through the Risk and Uncertainty Policy Workgroup, finalize a Commission policy regarding risk and uncertainty, and provide to the ISFMP Policy Board for consideration and approval (See Task 1.3.2).

Task 2.1.11 – Conduct a Commissioner workshop on management risk and uncertainty.

2.2 Proactively address research priorities through cooperative state and regional data collection programs and collaborative research projects

Task 2.2.1 – Update the master list of ASMFC Research Priorities by species as benchmark assessments are completed and new priorities emerge; distribute Research Priorities to the states, NOAA Fisheries, USFWS, and university researchers.

Task 2.2.2 – Organize a Sea Grant Workshop with research directors from the Atlantic states' Sea Grant programs to identify common research priorities and pursue funding opportunities (if funding is available).

Task 2.2.3 – Participate in proposal reviews for NMFS Cooperative Research Programs, Saltonstall-Kennedy, Research Set-Aside, NFWF, ACCSP, MARFIN, and MARMAP, when requested, to evaluate projects and monitor new research activities to promote the states' needs.

Subtask 2.2.3.1 – Develop and communicate research priorities for review and approval by species management boards.

Subtask 2.2.3.2 – Work with federal partners to ensure completed funded projects are reviewed and transmitted to technical committees and boards.

Subtask 2.2.3.3 – Monitor and participate in the MAFMC redesign of the Research Set-Aside Program (RSA) to ensure state interests are incorporated.

Task 2.2.4 – Communicate with the National Fish and Wildlife Foundation (NFWF) on shared research priorities and funding opportunities (e.g., fish passage, catch shares). Participate in NFWF proposal reviews for the Fisheries Innovation Fund.

Task 2.2.5 – Participate on the ACCSP's Coordinating Council, Operations Committee, Bycatch Prioritization Committee, Biological Review Panel, Recreational and Commercial Technical Committees, Outreach Committee and the Computer Technical Committee.

Subtask 2.2.5.1 – Submit ASMFC changes to the ACCSP Biosampling Prioritization Matrix. Consult Fishing Gear Technology Work Group regarding ASMFC input to Bycatch Prioritization Matrix.

Task 2.2.6 – Coordinate and implement the Northeast Area Monitoring and Assessment Program (NEAMAP).

Subtask 2.2.6.1 – Administer funding to conduct 2017 NEAMAP Nearshore Trawl Surveys (Mid-Atlantic, Maine/New Hampshire).

Subtask 2.2.6.2 – Develop and implement strategy to detail future funding needs in order to address annual funding shortfalls for the Mid-Atlantic/Southern New England and Maine/New Hampshire Trawl Surveys.

Subtask 2.2.6.2 – Support continuation of the NEAMAP Nearshore Trawl Surveys through coordination with survey leads and all NEAMAP committees: NEAMAP Board, Operations, Data Management, Analytical, and Trawl Technical Committees

Subtask 2.2.6.3 – Conduct NEAMAP Summit to improve coordination among the committees, assess need for changes in program structure and committee functions.

Subtask 2.2.6.4 – Develop the 2017 NEAMAP Operations Plan.

Subtask 2.2.6.5 – Provide NEAMAP data to coastwide stock assessments; track and demonstrate data use, and report to the ISFMP Policy Board, NEFSC, and Congress; maintain the NEAMAP website as a tool for distributing program information and requesting data.

Task 2.2.7 – Coordinate the South Atlantic component of the Southeast Area Monitoring and Assessment Program (SEAMAP).

Subtask 2.2.7.1 – Coordinate all research components of SEAMAP-South Atlantic: Coastal Trawl Survey, Coastal Longline Surveys, Pamlico Sound Survey, Reef Fish Survey, Southeast Regional Taxonomic Center, and the Cooperative Winter Tagging Cruise**.** Coordinate all current workgroups including the Bottom Mapping, Fish Habitat Characterization and Assessment, Data Management, Crustacean, Coastal Trawl Survey, and the Coastal Longline Survey Workgroups.

Subtask 2.2.7.2 – **Implement the new 5-year SEAMAP Management Plan (2016-2020);** track and demonstrate data use for coastwide stock assessments, and report to the South Atlantic Board and Congress; maintain the SEAMAP website hosted by ASMFC.

Subtask 2.2.7.3 – Participate in the expansion of SEAMAP-South Atlantic fishery-independent data coordination and mapping, as resources allow.

Subtask 2.2.7.4 – Coordinate South Atlantic activities with the Gulf and Caribbean components of SEAMAP.

Task 2.2.8 – Continue the Tagging Certification Program and support the use of tagging data in ASMFC stock assessments. Develop tagging registration programs, update and maintain the tagging resource website, link acoustic tagging information to the Atlantic Coastal Tagging (ACT) network website to improve the efficiency and quality of tagging efforts along the coast; secure telemetry tagging data for use in assessments.

Task 2.2.9 – Develop long-term strategy for collecting striped bass tagging data, including funding, administration, and at-sea support. Continue multi-estuary striped bass telemetry study to determine migration rates and relative contributions to the coast wide stock. *(Supported by NOAA Cooperative Agreement).*

Task 2.2.10 – Continue to participate in the development and implementation of the Marine Recreational Information Program (MRIP), with ASMFC staff serving on Executive Steering Committee, Operations Team, Transition Team, and Angler Registry Team. Report progress to the ISFMP Policy Board, and scientific oversight committees (MSC, ASC).

Subtask 2.2.10.1 – Participate in development of MRIP Strategic Plan.

Subtask 2.2.10.2 – Participate in MRIP new effort survey review and time series calibration for use in upcoming stock assessments and potential changes to management.

Subtask 2.2.10.3 – Continue to highlight concerns regarding delays in releases of Wave data and final annual estimates.

Task 2.2.11 – Coordinate fish ageing activities among Atlantic coast states and university laboratories in order to provide consistent, accurate age data to stock assessments.

Subtask 2.2.11.1 – Complete the age sample exchange and conduct an ageing workshop for **American eel** to prepare laboratories for providing new age data consistent with historical age data.

Subtask 2.2.11.2 – Conduct an annual Ageing Quality Control Workshop using age sample reference collections for multiple species to maintain consistency among state and university ageing technicians.

Subtask 2.2.11.3 – Continue cooperative angler carcass donation programs with the states to collect age samples toward improving age data for assessments.

Subtask 2.2.11.4 – Continue coast wide black drum age sampling to address the deficiency in age data from older fish, for use in future stock assessments. *(Supported by NOAA Cooperative Agreement)*

Subtask 2.2.11.5 – Distribute to all ageing labs the finalized Atlantic and Gulf coasts fish ageing manual with fish ageing protocols; participate in joint coasts ageing manual workshops with GSMFC

Task 2.2.12 – Continue coordination of the ASMFC Observer Trips add-ons for Mid-Atlantic small-mesh otter trawl fisheries through the Northeast Fishery Observer Program (NEFOP). Evaluate Observer add-on impacts in collaboration with target species' assessment scientists and NEFOP.

Task 2.2.13 – Coordinate the activities of the Committee on Economics and Social Sciences (CESS).

Subtask 2.2.13.1 – Develop and provide basic socioeconomic information for inclusion in fishery management plans, amendments, and addenda.

Subtask 2.2.13.2 – Provide technical recommendations to the social and economic data collection and data management programs of the ASMFC and ACCSP.

Subtask 2.2.13.3 – Serve as a steering committee for ASMFC socioeconomic studies.

Subtask 2.2.13.4 – Provide guidance and translation of data from the Atlantic menhaden socioeconomic study to Atlantic menhaden PDT during the development of Amendment 3.

2.3 Facilitate stakeholder involvement in research initiatives and the stock assessment process.

Task 2.3.1 – Seek stakeholder input at data workshops during development of stock assessments. Continue to issue press releases calling for new data when new assessments begin.

Task 2.3.2 – Promote scientifically sound tagging practices and certification of angler-based tagging programs through the Interstate Tagging Committee.

Task 2.3.3 – Develop outreach materials that highlight opportunities for public engagement in the Commission's fisheries management and stock assessment processes. (See Task 5.2.4)

Task 2.3.4 – Track progress of citizen science initiatives through the SAFMC and other entities.

2.4 Promote data collection and research to support ecosystem-based management

Task 2.4.1 – Ecological Reference Points Workgroup: continue to develop ecosystem-based reference points that align with Board-approved management objectives for Atlantic menhaden. (See Task 1.1.27)

Task 2.4.2 – Continue to improve multispecies modeling efforts to support single-species assessments, including development of a new multispecies statistical catch-at-age model.

Task 2.4.3 – Identify opportunities to collaborate with state, federal, and university researchers to use existing data collection platforms to advance ASMFC ecosystem models (e.g. diet studies, surveys of spawning and nursery habitats).

Task 2.4.4 – Through the MSC, track the development of state and federal activities related to climate change and impacts to fisheries; provide updates to the Policy Board and Commissioner Work Group (See Task 1.3.1.1)

Task 2.4.5 – Convene the Fishing Gear Technology Work Group (FGTWG) to evaluate the efficacy of bycatch reduction devices in southern shrimp trawl fisheries to reduce Sciaenid bycatch; conduct FGTWG evaluation of the efficacy of lobster trap design to ensure escapement from derelict gear. (See Task 1.1.11)

Task 2.4.6 – Participate as members of the Chesapeake Bay Sustainable Fisheries Goal Implementation Team and Forage Fish Workgroup.

2.5 Provide stock assessment training to improve the expertise and involvement of state and staff scientists.

Task 2.5.1 – Conduct intermediate and advanced stock assessment methods training workshops.

Task 2.5.3 – Support external stock assessment training opportunities for staff and state scientists.

Goal 3 – Promote compliance with fishery management plans to ensure sustainable use of Atlantic coast fisheries

Fisheries managers, law enforcement personnel, and stakeholders have a shared responsibility to promote compliance with fisheries management measures. Activities under the goal seek to increase and improve compliance with fishery management plans. This requires the successful coordination of both management and enforcement activities among state and federal agencies. Commission members recognize that adequate and consistent enforcement of fisheries rules is required to keep pace with increasingly complex management activity and emerging technologies. Achieving the goal will improve the effectiveness of the Commission's fishery management plans.

Strategies to Achieve Goal

3.1 Develop practical compliance requirements that foster stakeholder buy-in.

Task 3.1.1 – Identify and explore fishery management measures that maximize stakeholder buy-in.

Task 3.1.2 – Evaluate and report on compliance issues associated with newly implemented regulatory measures for **American lobster, tautog, Jonah crab** or other ASMFC-managed species as requested.

Task 3.1.3 – Assist MAFMC in identifying strategies to address violations and illegal harvest involved in RSA programs (if requested).

Task 3.1.3 – Continue working with the Tautog Enforcement Subcommittee to review and evaluate the effectiveness of commercial tagging systems and user acceptance (if adopted).

3.2 Evaluate the enforceability of management measures and the effectiveness of law enforcement programs.

Task 3.2.1 – Work with LEC Coordinator to ensure the input of the LEC throughout the management process on the enforceability of management options proposed in FMPs, amendments, addenda and conservation equivalency proposals.

Task 3.2.2 – Incorporate and reference the revised "Guidelines for Resource Managers" in reviews and evaluations of proposed changes to management programs.

Task 3.2.3 – Report on the enforceability of existing FMPs as part of the annual compliance review for each species.

Task 3.2.4 – Engage and support NMFS and USFWS Offices of Law Enforcement, U.S. Department of Justice and U.S. Coast Guard to facilitate the enforceability of Commission FMPs.

Task 3.2.6 – Exchange information and best practices related to the enforcement of protected and endangered species regulations.

Task 3.2.7 – Annually review and comment on (as needed) NMFS enforcement priorities to ensure they support the enforceability and effectiveness of Commission management programs.

3.3 Promote coordination and expand existing partnerships with state and federal natural resource law enforcement agencies.

Task 3.3.1 – Provide a forum to promote and facilitate interjurisdictional enforcement operations targeting specific fishery resources (e.g. Atlantic striped bass, tautog, American eel). (See Task 1.1.2)

Task 3.3.2 – Maintain communications with the law enforcement advisory committees of the regional fishery management councils, interstate commissions, and other conservation organizations to seek opportunities for collaboration and ensure consistent law enforcement strategies.

Task 3.3.4 – Exchange information regarding planned and ongoing enforcement actions and facilitate communications regarding joint efforts that can assist in long-term fisheries enforcement.

Task 3.3.5 – Share enforcement techniques and law enforcement success stories and provide regional training sessions (if resources allow) to enhance law enforcement efficiency along the Atlantic coast.

Task 3.3.6 – Share information and resources for locating and obtaining enforcement related grants.

Task 3.3.7 – Advance the recommendations of the American Lobster Enforcement Subcommittee to enhance cooperative funding and enforcement activities for commercial fisheries in nearshore and offshore waters.

Task 3.3.8 – Review and evaluate inter-agency measures to enhance tracking of fishery shipment and sale across jurisdictional boundaries.

Task 3.3.9 – Advance any recommendations of the Aerial Enforcement Subcommittee that would support or enhance existing state-federal enforcement for ASMFC-managed species.

3.4 Enhance stakeholder awareness of management measures through education and outreach.

Task 3.4.1 – Continue to highlight the outcomes of law enforcement investigations (penalties and fines) through various outreach tools (website, social media, press releases, fact sheets).

3.5 Use emerging communication platforms to deliver real time information regarding regulations and the outcomes of law enforcement investigations.

Task 3.5.1 – Report on enforcement issues associated with differing federal, interstate, and state regulations using social media and timely press releases.

Task 3.5.2 – Provide forum for enforcement agencies to display successful development and use of enforcement technologies.

Goal 4 – Protect and enhance fish habitat and ecosystem health through partnerships and education

Goal 4 aims to conserve and improve coastal, marine, and riverine habitat to enhance the benefits of sustainable Atlantic coastal fisheries and resilient coastal communities in the face of changing ecosystems. Habitat loss and degradation have been identified as significant factors affecting the long-term sustainability and productivity of our nation's fisheries. The

Commission's Habitat Program develops objectives, sets priorities, and produces tools to guide fisheries habitat conservation efforts directed towards ecosystem-based management.

The challenge for the Commission and its state members is maintaining fish habitat in the absence of specific regulatory authority for habitat protection or enhancement. Therefore, the Commission will work cooperatively with state, federal, and stakeholder partnerships to achieve this goal. The Commission and its Habitat Program endorses the National Fish Habitat Partnership, and will continue to work cooperatively with the program to improve aquatic habitat along the Atlantic coast. Since 2008, the Commission has invested considerable resources, as both a partner and administrative home, to the Atlantic Coastal Fish Habitat Partnership (ACFHP), a coastwide collaborative effort to accelerate the conservation and restoration of habitat for native Atlantic coastal, estuarine-dependent, and diadromous fishes.

Strategies to Achieve Goal

4.1 Identify critical habitat through fisheries management programs and partnerships.

Task 4.1.2 – Review existing reference documents for Commission managed species to identify gaps or updated needed to describe important habitat types.

Task 4.1.3 – Review and revise species habitat factsheets as new data become available.

Task 4.1.4 – Coordinate artificial reef activities among the Atlantic coast states, and between the Atlantic and Gulf States Marine Fisheries Commissions.

Task 4.1.5 – Co-sponsor Artificial Reefs Symposium at AFS 2017 in Tampa; support participation by selected state Artificial Reef Committee members and staff Coordinator.

4.2 Educate Commissioners, stakeholders, and the general public about the importance of habitat to healthy fisheries and ecosystems.

Task 4.2.1 – Facilitate coordination and distribution of information for ecosystem-based management and marine protected area activities, and the potential consequences of significant anthropogenic activities on habitats of concern.

Task 4.2.2 – Participate in regional and national habitat meetings and scientific conferences to facilitate increased communication with agencies and programs that have jurisdiction over habitat.

Task 4.2.3 – Publish annual issue of *Habitat Hotline Atlantic*.

Task 4.2.4 – Review and update the Habitat Management Series: ***Living Shorelines and Submerged Aquatic Vegetation*** for ISFMP Policy Board review and acceptance. Identify a subsequent topic (e.g. climate change, sand mining, power plant impingement, document, innovative wetland restoration techniques).

4.3 Engage local, state, and regional governments in mutually beneficial habitat protection and enhancement programs through partnerships.

Task 4.3.1 – Work with ACFHP to foster partnerships with like-minded organizations at local levels to further common habitat goals.

Task 4.3.2 – Provide stakeholders with the tools to effectively communicate, promote and accomplish habitat protection, restoration, and enhancement programs at the local level.

Task 4.3.3 – Serve as a point of contact and information conduit at the Commission for energy-related issues affecting fish habitat.

Task 4.3.4 – Coordinate the activities of the Fish Passage Working Group (FPWG) to carry out priority tasks as defined by the ISFMP Policy Board. Promote development of effective fish passage approaches and projects through state and federal collaboration.

Subtask 4.3.4.1 – Maintain a coastwide database of dams, dam removals, fishways, and passage efficiency studies. Collaborate with NGOs to incorporate the database in their passage prioritization tools.

Subtask 4.3.4.2 – Implement the fish passage prioritization protocol, maintain a coastwide list of passage project priorities, and develop performance criteria to evaluate passage projects' success.

Subtask 4.3.4.3 – Establish coastwide fish passage targets and add to diadromous species FMPs as amendments/addenda are developed; assist in developing targets for the Federal Energy and Regulatory Commission (FERC) relicensing on the Santee-Cooper River system.

Subtask 4.3.4.4 – Monitor and participate in upcoming FERC relicensing projects; develop guidance for state staff for navigating the FERC dam relicensing process, in order to more effectively improve passage in relicensing prescriptions.

Subtask 4.3.4.5 – Summarize and distribute results of survey describing positive and negative consequences of providing fish passage through consultation with the diadromous technical committees.

Subtask 4.3.4.6 – Respond to state requests for information on fish passage, including FERC relicensing issues, fishway design, and restoration/escapement guidelines.

Task 4.3.5 – Continue to provide coordination support for ACFHP, under the direction of the National Fish Habitat Action Plan (NFHAP) Board.

Subtask 4.3.5.1 – Facilitate communication and outreach with ACFHP partners, overlapping partnerships, and new partners. Develop outreach materials and maintain the ACFHP website.

Subtask 4.3.5.2 – Coordinate the implementation of the 5-year ACFHP Conservation Strategic Plan, including development of an Implementation Plan outlining tasks by year to achieve the goals, objectives, and actions in the Strategic Plan.

Subtask 4.3.5.3 – Support the completion of priority ACFHP Science and Data projects - acquire and analyze fish population, habitat, **and human impact data for the Southeast and Northeast using GIS mapping**; make results available to Partners for the purpose of strategic coastal habitat conservation.

Subtask 4.3.5.4 – Through ACFHP, and in cooperation with other Fish Habitat Partnerships and the National Fish Habitat Board, work with partners to identify and implement monitoring and data standards for assessment of coastal habitat condition and fishery resource status prior to and following alteration projects.

Subtask 4.3.5.5 – Assist in obtaining future funding to support ACFHP operations and fish habitat conservation projects.

4.4 Foster partnerships with management agencies, researchers, and habitat stakeholders to leverage regulatory, political, and financial support.

Task 4.4.1 – Provide information or comment on Atlantic coast projects and permits in accordance with ASMFC project review protocol.

Task 4.4.2 – Solicit funding and promote fish habitat research through diverse activities including partnerships, funding opportunities, workshops, identification of research needs and other strategies.

Task 4.4.3 – Identify partnership opportunities and forge additional relationships with organizations – such as non-governmental organizations and the recreational fishing community – to facilitate the promotion of fish habitat through a collaboration of strengths of different stakeholder groups.

Task 4.4.5 – Seek improvements to habitat webpages, continue to use social media to connect with regional and local decision makers, an otherwise more effectively disseminate the work of the Habitat Committee.

4.5 Identify mechanisms to evaluate ecosystem health.

Task 4.5.1 – Review habitat program goals and evaluate accomplishments annually.

Task 4.5.2 – Work with state and federal agencies, the Councils, and non-governmental organizations to build on existing coastwide GIS efforts, to identify important fish habitats for Commission managed species as defined in the ACFHP Species-Habitat matrix.

4.6 Engage in state and federal agency efforts to ensure climate change response strategies are included in habitat conservation efforts.

Task 4.6.1 – As revisions to habitat sections of FMPs are made include recommendations that account for climate change in fisheries management decisions.

Task 4.6.2 – Identify gaps in state coastal regulatory planning regarding climate change impacts and **make recommendations to increase resiliency**.

Task 4.6.3 – Increase communication on ecosystem based management with Commission committees to find overlap with fish habitat related issues.

Goal 5 – Strengthen stakeholder and public support for the Commission

Stakeholder and public acceptance of Commission decisions are critical to our ultimate success. For the Commission to be effective, these groups must have a clear understanding of our mission, vision, and decision-making processes. The goal seeks to do so through expanded outreach and education efforts about Commission programs, decision-making processes, and its management successes and challenges. It aims to engage stakeholders in the process of fisheries management, and promote the activities and accomplishments of the Commission. Achieving the goal will increase stakeholder participation, understanding, and acceptance of Commission activities.

Strategies to Achieve Goal

5.1 Increase public understanding and support of activities through expanded outreach at the local, state, and federal levels.

Task 5.1.1 – Publish bi-monthly issues of *Fisheries Focus*. Continue to reduce mailing/printing costs through greater electronic distribution.

Task 5.1.2 – Use website to promote ASMFC activities to state and federal partners and stakeholders.

Task 5.1.3 – Promote ASMFC through attendance at fisheries-related trade shows and conferences.

Task 5.1.4 – Promote Commission activities regarding recently assessed and/or high profile species, habitat and law enforcement activities, as well as emerging issues such as fishery allocations and shifting populations due to climate change, to a broader constituency through mechanisms such as targeted press releases, informational brochures, webpage highlights and conference/trade show participation.

Task 5.1.5 – Develop and distribute youth-based educational materials designed to increase awareness of fisheries science and understating of fisheries management to key venues (e.g., teacher kits, Eco-camps, charter boat operations, aquatic educators) to help promote marine stewardship and ocean literacy.

Task 5.1.6 – Collaborate with East Coast Aquaria (New England, Baltimore, North Carolina, Virginia) and relevant partners to promote interstate fisheries management and science activities at the aquaria.

Task 5.1.7 – Promote Commission's mission and programs through outreach meetings with various marine policy and marine science graduate programs.

Task 5.1.8 – Participate in the Mid-Atlantic and New England Fishery Management Councils Marine Resource Education Program.

Task 5.1.9 – Prepare brief, simplified stock assessment overview presentations for posting on YouTube and ASMFC Fisheries Science 101 webpage for black sea bass and Atlantic sturgeon.

Task 5.1.10 – Explore use of story mapping and photo journaling to better communicate science and management activities. (click on the following links to see examples - http://www.arcgis.com/apps/MapJournal/index.html?appid=7530f28f065c486ba0420ca8e26a13f4; http://portal.midatlanticocean.org/ocean-stories/new-recreational-data-covers-coast/; https://noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=728a6cc901f44845be430faa21151535)

Task 5.1.11 - Solicit outside sources to develop short video clips of fisheries management and science activities.

5.2 Clearly define Commission processes to facilitate stakeholder participation, as well as transparency and accountability.

Task 5.2.1 – Publish and distribute **2016 Annual Report** to Congress, state legislators, and stakeholders to provide overview of our activities and progress in carrying out the Commission's mission and public trust responsibilities.

Task 5.2.2 – Prepare Stock Assessment Overviews (in layman's terms) for benchmark and stock assessment updates to facilitate stakeholder understanding of the science behind our management decisions. **Focal species for 2017 are black sea bass, Atlantic croaker, red drum, spot, Atlantic sturgeon, northern shrimp, Atlantic menhaden, and river herring.**

Task 5.2.3 – Enhance engagement in advisory panels and through solicitation of new members and increased participation of existing members (See Tasks 1.6.1 and 1.6.3).

Task 5.2.4 – Develop outreach materials that highlight opportunities for public engagement in the Commission's fisheries management and stock assessment processes. (See Task 2.3.3)

Task 5.2.5 – Develop a fisheries management 101 page for the website.

5.3 Strengthen national, regional, and local media relations to increase coverage of Commission actions.

Task 5.3.1 – Track media communications and coverage through ASMFC-related news clippings and media tracking sheet.

Task 5.3.2 – Conduct a training workshop for science and ISFMP staff on story mapping and photo journaling to expand staff skill set and enhance communication tools.

Task 5.3.3 – Conduct annual meeting of Atlantic Coast Fisheries Communication Group, comprised of Public Information Officers from the Councils, states and federal agencies, to share successful tools, identify key media contacts and work cooperatively on joint projects.

5.4 Use new technologies and communication platforms to more fully engage the broader public in the Commission's activities and actions.

Task 5.4.1 – Use social media tools to increase ASMFC visibility and improve stakeholder engagement.

Task 5.4.2. – Use website capabilities (e.g., video clips) to promote Fisheries Science 101 webinars, videos of fisheries surveys and state on-the-ground projects.

Task 5.4.3 – Monitor the success of website and social media platforms in reaching broader constituency and effectively communicating ASMFC mission, programs and activities.

Goal 6 – Advance Commission and member states' priorities through a proactive legislative policy agenda

Although states are positioned to achieve many of the national goals for marine fisheries through cooperative efforts, state fisheries interests are often underrepresented at the national level. This is due, in part, to the fact that policy formulation is often disconnected from the processes that provide the support, organization, and resources necessary to implement the policies. The capabilities and input of the states are an important aspect of developing national fisheries policy, and the goal seeks to increase the states' role in national policy formulation. Additionally, the goal emphasizes the importance of achieving management goals consistent with productive commercial and recreational fisheries and healthy ecosystems.

The Commission recognizes the need to work with Congress in all phases of policy formulation. Several important fishery-related laws will be reauthorized over the next couple of years (i.e., Atlantic Coastal Act, Magnuson-Stevens Fishery Conservation and Management Act, Interjurisdictional Fisheries Act, Atlantic Striped Bass Conservation Act, and Anadromous Fish Conservation Act). The Commission will be vigilant in advocating the states' interests to Congress as these laws are reauthorized and other fishery-related pieces of legislation are considered.

Strategies to Achieve Goal

6.1 Increase the Commission's profile and support in the U.S. Congress by developing relationships between Members and their staff and Commissioners, the Executive Director, and Commission staff.

Task 6.1.1 – Provide opportunities for in person Commissioner interactions with Members and congressional staff during Meeting Weeks.

Task 6.1.2 – Provide opportunities for the Executive Director to meet with congressional staff on a regular basis.

Task 6.1.3 – Focus interactions on Members of Congress from Atlantic coast states and those that serve on committees of importance to the Commission:

- House and Senate Commerce Justice, Science Appropriations Subcommittees
- House Fisheries, Wildlife, Oceans and Insular Affairs Subcommittee of the Natural Resources Committee
- Senate Oceans, Atmosphere, Fisheries and Coast Guard Subcommittee of the Commerce, Science, and Transportation Committee

Task 6.1.4 – Make connections (via correspondence and in-person meetings) with newly elected Atlantic coast members of the 115th Congress and appropriate Committee Chairs and members.

6.2 Communicate the Commission's federal funding needs to Congress and advocate for sufficient appropriations.

Task 6.2.1 – Clearly convey funding needs to congressional staff.

Task 6.2.2 – Justify the need for federal dollars by the Commission through demonstrating the social, economic, and ecological benefits of Commission activities.

Task 6.2.3 – Work with Commissioners to identify funding needs and develop a strategy to secure funding for priority programs (Atlantic Striped Bass Conservation Act*,* Atlantic Coastal Fisheries Cooperative Management Act, Interjurisdictional Fisheries Act Grants, Stock Assessments line item, Federal Aid in Sport Fish Restoration, Atlantic Coastal Fish Habitat Partnership, and **Fisheries Information Networks**). Seek funding for long-term monitoring surveys including Horseshoe Crab Benthic Trawl, NEAMAP, and SEAMAP. (See Task 1.1.51)

Task 6.2.4 – Demonstrate the value of the Commission as an effective management entity and resource to Members of Congress and their staffs.

Task 6.2.5 – Provide state-specific perspectives to staff and Members in meetings, especially management successes and challenges.

Task 6.2.6 – Contact home state Commissioners before communicating with Members or Congressional staff to get a local perspective.

Task 6.2.7 – Coordinate with the Gulf, Pacific, and Great Lakes Commissions on policy items of mutual interest including federal funding for fisheries programs. Executive Directors should continue providing unified positions on funding and legislative priorities to lawmakers and federal agencies, where appropriate.

Task 6.2.8 – Communicate Commission funding needs to NOAA Fisheries.

6.3 Engage Congress *on fishery-related legislation affecting the Atlantic coast.*

Task 6.3.1 – Monitor federal legislation affecting the Commission, including policy and annual appropriations bills and develop Commission positions on pending federal legislation, including the Atlantic Coastal Fisheries Cooperative Management Act*,* Interjurisdictional Fisheries Act , Anadromous Fish Conservation Act , Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Federal Aid in Fish Restoration Act, in addition to new legislation addressing emerging issues such as marine national monuments and alternative energy initiatives**.**

Task 6.3.2 – Update Commissioners on pending congressional actions that may affect fisheries management as appropriate.

Task 6.3.3 – Coordinate with the Legislative Committee and Government Relations firm to identify relevant policy and legislative issues.

Task 6.3.4 – Monitor congressional hearings related to fisheries issues, and testify or provide statements for the record when appropriate.

Task 6.3.5 – Engage Commissioners in the formulation of the Commission's position on federal legislative policy.

6.4 Promote member states' collective interests at the regional and national levels

Task 6.4.1 – Communicate member states' needs to Congress and our management partners.

Subtask 6.4.1.1 – Contact Commissioners before and after congressional meetings.

Subtask 6.4.1.2 – Facilitate opportunities for Commissioners to communicate directly with their Legislators and staff.

Task 6.4.2 – Participate with national organizations and management partners to address issues of mutual interest.

Subtask 6.4.2.1 – Conduct interagency coordination meetings (Memorandum of Understanding) under ACFCMA to improve state-federal partnerships.

Subtask 6.4.2.2 – Continue to serve as an advisor to Marine Fisheries Advisory Committee (MAFAC).

Subtask 6.4.2.3 – Continue to participate as a member on the Marine Fisheries Initiative (MARFIN) panel.

Subtask 6.4.2.4 – Continue to participate with the Association of Fish and Wildlife Agencies.

6.5 Promote economic benefits of the Commission's actions (return on investment).

Task 6.5.1 – Provide state-specific economic and jobs statistics related to commercial and recreational marine fishing to lawmakers and staff.

Task 6.5.2 – Use specific examples to show successful management can be linked to economic success and increased jobs.

Task 6.5.3 – Demonstrate the differences between federal and state fishery management tools and the economic benefits of the state management approach (flexibility, closer to stakeholders, quicker response time).

Goal 7 – Ensure the fiscal stability & efficient administration of the Commission

Goal 7 will ensure that the business affairs of the Commission are managed effectively and efficiently, including workload balancing through the development of annual action plans to support the Commission's management process. It also highlights the need for the Commission to efficiently manage its resources. The goal promotes the efficient use of legal advice to proactively review policies and react to litigation as necessary. It also promotes human resource policies that attract talented and committed individuals to conduct the work of the Commission. The goal highlights the need for the Commission as an organization to continually expand its skill set through training and educational opportunities. It calls for Commissioners and Commission staff to maintain and increase the institutional knowledge of the Commission through periods of transition. Achieving this goal will build core strengths, enabling the Commission to respond to increasingly difficult and complex fisheries management issues.

Strategies to Achieve Goal

7.1 Conservatively manage the Commission's operations and budgets to ensure fiscal stability.

Task 7.1.1 – Monitor and update as necessary guidelines for cost effective meeting locations and meeting attendee travel policies.

Task 7.1.2 – Responsibly manage and review as necessary the Commission's reserve fund according to the approved investment policy. Review investments annually with AOC.

Task 7.1.3 – Submit a Certification of Indirect Cost to the Department of Commerce.

Task 7.1.4 – Monitor expenditures on a monthly basis and project variances to ensure complete and timely use of available funds relative to grant cycles. Distribute monthly financial report to Senior Staff.

Task 7.1.5 – Prepare for and work cooperatively with CPA firm to conduct annual audit.

Task 7.1.6 – Launch Inventory module in accounting software to electronically track physical inventory. Update physical inventory.

Task 7.1.7 – Continue to provide administrative support to MRIP, including human resources and meeting management, grant and financial monitoring and office space.

Task 7.1.8 – Continue to provide administrative support to the Atlantic Coastal Fish Habitat Partnership (ACFHP), including logistical support for committee meetings and other Partnership activities.

Task 7.1.9 – Fully incorporate ACCSP into the Commission under the new governance structure.

Task 7.1.10 – Appoint Investment Committee for Commission's retirement program.

Task 7.1.11 – Revise Commission's retirement documents to ensure qualifications for participation in the plans are clearly and accurately defined.

Task 7.1.12 – Develop Commission compensation plan with updated job classifications and salaries based on location.

Task 7.1.13 – Develop SOPPs that detail human resource policies for Arlington-based and state-based employees.

Task 7.1.14 – Conduct comprehensive review and revision of Employee Handbook.

7.2 Utilize new information technology to improve meeting and workload efficiencies, and enhance communications.

Task 7.2.1 – Ensure consistency of software across the Commission and continue to cross-train administrative staff.

Task 7.2.2 – Provide targeted staff training for full use of office equipment and software.

Task 7.2.3 – Document standards for electronic record retention and develop site map of Commission electronic filing system for internal use, including protocols for document archiving.

Task 7.2.4 – Continue to audit Commission databases to verify contacts and relevant information.

Task 7.2.5 – Review SOPPs annually and revise as necessary.

7.3 Refine strategies to recruit professional staff, and enhance growth and learning opportunities for Commission and state personnel

Task 7.3.1 – Promote Commission's programs and activities and recruit new talent by conducting seminars to graduate level marine programs.

Task 7.3.2 – Provide opportunities for undergrad and graduate students to participate in summer internships at the Commission.

Task 7.3.3 – Review and revise position descriptions as necessary.

Task 7.3.4 – Review vacancy announcement distribution list and update as necessary.

Task 7.3.5 – Conduct stock assessment methods training workshops. (See Task 2.5.1)

Task 7.3.6 – Facilitate staff participation at national and regional conferences; provide professional training opportunities.

Task 7.3.7 – Facilitate educational opportunities targeted to specific staff based on job responsibilities and facilitate participation.

Task 7.3.8 – Communicate human resources support available to state-based employees.

Task 7.3.9 – Conduct annual meeting with financial advisor to review retirement program performance with staff and provide opportunities for staff and provide opportunities for staff to meet individually with financial advisor to match financial goals with investment choices for retirement.

7.4 Fully engage new Commissioners in the Commission process and document institutional knowledge.

Task 7.4.1 – Work with Executive Committee to determine the appropriate transition and orientation program for new Commissioners.

Task 7.4.2 – Update, on an ongoing basis, the Commissioner Manual. Inform Commissioners when the update is substantial, no less than twice a year.

Task 7.4.3 – Continue to provide orientation materials for new members of Commission supporting committees.

7.5 Utilize legal advice on new management strategies and policies, and respond to litigation as necessary.

Task 7.5.1 – Respond as needed to litigation regarding challenges to Commission FMPs.

Task 7.5.2 – Work with Commission attorney to develop a potential information request policy for consideration by full Commission (FOIA equivalent).

Task 7.5.3 – Ensure annual submission of Conflict of Interest form by Legislative and Governor Appointee Commissioners.

Task 7.5.4 – Continue to work with human resources attorney to ensure all human resources practices are consistent with states laws.

Appendix 1 - FY17 Action Plan for the Atlantic Coastal Cooperative Statistics Program

This plan is intended to provide guidance in achieving the goals of the ACCSP in FY2017 (March 1, 2017 – February 28, 2018). References within this plan are to the ACCSP 2014-2018 Strategic Plan.

8. ACCSP
    - 8.1. Manage and expand a fully integrated data set that represents the best available fisheries data;
        - 8.1.1. Current data warehouse feeds will continue to be maintained and enhanced.
        - 8.1.2. Progress will be made in populating the biological tables in the Data Warehouse
        - 8.1.3. Progress will be made in populating the Bycatch data set in the Data Warehouse
        - 8.1.4. The new query interface will be monitored and adjusted.based on feedback from the end users and research conducted by staff and the Information Systems Committee

    - 8.2. Continue working with the program partners to improve fisheries data collection and management in accordance with the evolving ACCSP standards within the confines of limited funds;
        - 8.2.1. SAFIS will be maintained and enhanced based on requirements from the program partners
        - 8.2.2. Manage the APAIS and other related recreational data collection and management systems.
        - 8.2.3. A collaborative SAFIS redevelopment process will provide functional requirements for an integrated reporting system based on the prior year's visioning process. A redevelopment plan will be drafted based on these functional requirements and software development will begin.
        - 8.2.4. The LOBSTAH system will be fully deployed and in maintenance mode.
        - 8.2.5. Tablet and phone based versions of SAFIS will continue to be developed and deployed.

    - 8.3. Explore the allocation of existing Program funds and work with partners to pursue additional funding;
        - 8.3.1. ACCSP will continue to manage the funding process in accordance with the Funding Decision Document
        - 8.3.2. The performance of funded projects will be tracked by the Operations Committee.
        - 8.3.3. Revisions to the process will be made as needed based on constituent input.

    - 8.4. Maintain strong executive leadership and collaborative involvement among partners at all committee levels;

8.4.1. The Coordinating Council will meet quarterly in order to provide Executive level managers with the most up-to-date information and an opportunity to provide direct input into the Program.

8.4.2. Technical and policy level constituent committees will meet regularly to review and modify technical standards and make policy recommendations to the Coordinating Council

8.5. Monitor and improve the usefulness of products and services provided by the ACCSP;

8.5.1. Metrics will be monitored. These include the collection of system usage statistics, user surveys, and data load and availability statistics. The metrics will be distributed throughout the year, but will be summarized in the Annual Report.

8.5.2. Maintain a clear line of communications between Program Staff and our constituents.

8.5.3. Ensure that there is a feedback loop to gauge the success of the Program in meeting the needs of its constituents.

8.6. Collaborate with program partners in their funding processes by providing outreach materials and other support to demonstrate the value of ACCSP products and the importance of maintaining base support for fishery-dependent data collection programs to state partners and their executive and legislative branches as well as to all other partner agencies

8.6.1. Established outreach processes will continue. These include: routine automated updates for meetings, changes and/or updates in data and significant events, quarterly newsletters, data sheets detailing the status of the Program, articles in 'Fisheries Focus', and the preparation and publication of the Annual Report.

8.6.2. Outreach will maintain a schedule of fisheries related events, reviewing them periodically to identify opportunities to establish or improve stakeholder communications. Appropriate staff will be detailed to these events to ensure that the ACCSP is represented.

8.6.3. Staff will track various stock assessments, conferences, and other data intensive activities with an eye towards participating as fully as possible. Data will be provided were appropriate. This task would include the presentation of papers or posters in support of Program objectives.

8.7. Support nationwide systems as defined in the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

8.7.1. ACCSP will continue to participate in both the FIS and MRIP programs, providing resources as appropriate to the various committees of the programs.

8.7.2. In accordance with the MSA, ACCSP will provide data for the Atlantic Coast to the FIS when requested.

Atlantic States Marine Fisheries Commission

ISFMP Policy Board

October 27, 2016
8:00-10:30 a.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(D. Grout)*	8:00 a.m.
2.	Board Consent *(D. Grout)* • Approval of Agenda • Approval of Proceedings from August 2016	8:00 a.m.
3.	Public Comment	8:05 a.m.
4.	Executive Committee Report (*D. Grout*)	8:15 a.m.
5.	Review Revisions to Conservation Equivalency Guidance Document (*T. Kerns*) **Final Action**	8:25 a.m.
6.	Update on Climate Change Working Group (*T. Kerns)*	8:40 a.m.
7.	Discuss Risk and Uncertainty Policy Workgroup White Paper (*J. McNamee)*	8:50 a.m.
8.	Habitat Committee Report (*T. Kerns*) • Review and Consider the Sciaenid Habitat Source Document **Action** • Review the State Reports on Climate Change Initiatives • Review the Draft Letter to BOEM regarding Seismic Testing **Action**	9:20 a.m.
9.	Atlantic Coastal Fish Habitat Partnership Report (*P. Campfield*)	9:40 a.m.
10.	Law Enforcement Committee Report (*M. Robson*)	9:50 a.m.
11.	Review Non-Compliance Findings, If Necessary **Possible Action**	10:00 a.m.
12.	Other Business/Adjourn	10:05 a.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

Vision: Sustainably Managing Atlantic Coastal Fisheries

MEETING OVERVIEW

ISFMP Policy Board Meeting
Thursday October 27, 2016
8:00-10:30 a.m.
Bar Harbor, Maine

Chair: Doug Grout (NH) Assumed Chairmanship: 10/15	Vice Chair: Jim Gilmore (NY)	Previous Board Meeting: August 3, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (19 votes)		

2. Board Consent
- Approval of Agenda
- Approval of Proceedings from August 3, 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Executive Committee Report (8:15-8:25 a.m.)
Background • The Executive Committee will meet on October 25, 2016.
Presentations • D. Grout will provide an update of the committees work
Board action for consideration at this meeting • none

5. Review Revisions to Conservation Equivalency Guidance Documents (8:25-8:40 a.m.) Final Action
Background • The Executive Committee tasked staff to update the Conservation Equivalency Guidance Document to reflect the current practices of the Commission. • In August MSC and ASC reviewed proposed revisions and made recommendations to the Executive Committee and Policy Board. • Based on direction from the Executive Committee and Policy Board staff updated the Conservation Equivalency Guidance Document for review and approval by the Executive Committee and Policy Board (**Supplemental Materials)**.

Presentations

- T. Kerns will review the revised Conservation Equivalency Guidance Document

Board action for consideration at this meeting

- Approve the Conservation Equivalency Guidance Document (2016)

6. Update on Climate Change Working Group (8:40-8:50 a.m.)

Background

- The Climate Change Work Group was tasked with developing science, policy and management strategies to assist the Commission with adapting its management to changes in species abundance and distribution resulting from climate change impacts.
- The Work group met via conference call to brainstorm how to address the Policy Board task (**supplemental materials**)

Presentations

- T. Kerns will review the Climate Change Workgroup Progress

Board action for consideration at this meeting

- none

7. Discuss Risk and Uncertainty Policy Workgroup White Paper (8:50-9:20 a.m.)

Background

- Previously, the Board approved the purpose statement for the Commission's Risk and Uncertainty Policy.
- The Risk and Uncertainty Policy Workgroup met to develop their recommended decision-tree framework for a Commission policy and created an example for the Board to review. (**Meeting Materials**)

Presentations

- J. McNamee will review Risk and Uncertainty Policy Workgroup White Paper

Board guidance for consideration at this meeting

- Provide feedback on the decision-tree framework

8. Habitat Committee Report (9:20-9:40 a.m.) Action

Background

- The Habitat Committee met October 20 – 21 in Portland, Maine. They welcomed their newest member, Oliver Cox, from Maine, finalized updates to the 2017 Action Plan, and discussed ideas for new management series documents, among other topics.
- The Habitat Committee finalized the Sciaenid Habitat Source Document (**Meeting Materials**), the State Reports on Climate Change Initiatives document (**Meeting Materials**), and the draft letter to BOEM regarding seismic testing (**Supplemental Materials**).
- The Artificial Reef Committee welcomed Michael Malpezzi from Maryland Department of Natural Resources, who will be replacing Erik Zlokovitz.

• The Artificial Reef Committee will be serving on the steering committee for an artificial reef symposium at the 2017 American Fisheries Society Meeting in Tampa, Florida.
Presentations • T. Kerns will present the Habitat Committee updates.
Board action for consideration at this meeting • Approve the Sciaenid Habitat Source Document • Approve the Letter to BOEM regarding Seismic Testing

9. Atlantic Coastal Fish Habitat Partnership Report (9:40-9:50 a.m.)
Background • ACFHP met October 18-20 in Portland, Maine. Highlights include presentations on local projects, reports on science and data mapping initiatives, and a full day workshop dedicated to updating the Conservation Strategic Plan. • ACFHP's chair, Kent Smith, is currently attending the NFHP Science and Data Committee Workshop and Board Meeting in Pensacola, FL. Discussion topics include the NFHAP-USFWS funding allocation methodology, Beyond the Pond 501(c)3 capacity, and an update on the fish habitat legislation. ACFHP will report on discussions at the winter meeting. • ACFHP received 9 proposals for FY2017 NFHAP-USFWS funding, and has evaluated and ranked the projects for recommendation to the USFWS.
Presentations • P. Campfield will present ACFHP updates.
Board action for consideration at this meeting • None

10. Review Non-Compliance Findings, if Necessary

11. Other Business

12. Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ISFMP POLICY BOARD

The Westin Alexandria
Alexandria, Virginia
August 3, 2016

These minutes are draft and subject to approval by the ISFMP Policy Board
The Board will review the minutes during its next meeting

TABLE OF CONTENTS

INDEX OF MOTIONS

1. **Approval of Agenda by Consent** (Page 1).

2. **Approval of Proceedings of May 2016 by Consent** (Page 1).

3. **On behalf of the South Atlantic State/Federal Fisheries Management Board, move to recommend that the ISFMP Policy Board develop a complementary Fishery Management Plan for Cobia** (Page 9). Motion by James Estes. Motion carried (Page 12).

4. **On behalf of the South Atlantic State-Federal Fisheries Management Board, move to recommend to the Policy Board that the South Atlantic Board is the appropriate venue to develop the FMP for Cobia** (Page 13). Motion by James Estes. Motion carried (Page 13).

5. **Move to task the Habitat Committee to draft a base letter to express the Commission's concerns regarding seismic testing and its possible impacts on fisheries and fish habitat, for review by the Policy Board at the Annual Meeting** (Page 25). Motion by Tom Fote; second by Eric Reid. Motion carried (Page 26).

6. **Motion to adjourn** by Consent (Page 41).

ATTENDANCE

Board Members

Patrick Keliher, ME (AA)
Rep. Jeffrey Pierce, ME, proxy for Sen. Langley (LA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Doug Grout, NH (AA)
Ritchie White, NH (GA)
Bill Adler, MA (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Jason McNamee, RI, proxy for J. Coit (AA)
David Borden, RI (GA)
Rep. Craig Miner, CT (LA)
David Simpson, CT (AA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Steve Heins, NY, proxy for J. Gilmore
Emerson Hasbrouck, NY (GA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Andy Shiels, PA, proxy for J. Arway (AA)
Loren Lustig, PA (GA)
Tom Moore, PA, proxy for Rep. Vereb (LA)
John Clark, DE, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
David Blazer, MD (AA)
Rachel Dean, MD (GA)
Ed O’Brien, MD, proxy for Del. Stein (LA)
John Bull, VA (AA)
Rob O’Reilly, VA, proxy for J. Bull (AA)
Doug Brady, NC (GA)
Michelle Duval, NC, proxy for B. Davis (AA)
Robert Boyles, SC (AA)
Malcolm Rhodes, SC (GA)
Pat Geer, GA, proxy for Rep. Nimmer (LA)
Spud Woodward, GA (AA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Staff

Bob Beal
Toni Kerns
Ashton Harp
Amy Hirrlinger

Guests

Sherry White, USFWS
Debra Lambert, NMFS
John Carmichael, SAFMC
Russ Allen, NJ DFW
Bob Ballou, RI DEM

The ISFMP Policy Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 3, 2016, and was called to order at 2:30 o'clock p.m. by Chairman Douglas E. Grout.

CALL TO ORDER

CHAIRMAN DOUGLAS E. GROUT: Welcome all; this is the meeting of the ISFMP Policy Board. Before I go any further, we have a long time member of our ASMFC family that is retiring in a month -- at the end of the month. I would like to have David Simpson come up. We have a little token of our esteem here, for the many years that you've been putting in on technical committees and Management and Science Committee; and the last eight years as a board member.

We have the compass rose pen that will keep you in the right direction for all the years that you've helped steer the commission in the right direction over the years. I greatly appreciate all the time and effort and your expertise that you have put in; both at the technica1 level and at the policy level. I think you and I started about the time, became board members about the same time; but you get to retire earlier. Thank you very much, We appreciate that. (Applause)

MR. DAVID G. SIMPSON: Well, you know I was not really expecting anything. I had told a couple of people that I thought I had to. I was going to pull an A.C. Carpenter; you know, just kind of slip away and see if I went unnoticed. Really, it has been a big privilege and a pleasure to be able to work with the commission.

From things I've said in the past, I think you all know how much I respect and admire this group and the process, the way we do things, how we do things; working with all of you for many, many years, some of you for decades. Toni and I worked on a lot of stuff for a lot of years; summer flounder, scup, black sea bass, lobster and other stuff too I'm sure. Tina and Laura and Bob, this has just been great; and all of you folks, I just can't thank you enough. Again, it really has been a privilege and a pleasure, so thanks. (Applause)

APPROVAL OF AGENDA

CHAIRMAN GROUT: Well. Thank you again, Dave, and we do have an agenda here; and I believe there are a couple other items that people would like to add to the agenda. I know John Clark; you came up and expressed something.

MR. JOHN CLARK: Shad and River Herring Board Chair, Bill Goldsborough and I would like to add to the agenda a brief discussion of the upcoming, I think it was just released, a white paper to the Mid-Atlantic Council. The Mid-Atlantic Council will be discussing shad and river herring management at their upcoming meeting; and then if I understand correctly, voting on their final decision on that in October before the annual board meeting, the annual ASMFC meeting, that is. I was hoping that perhaps the Policy Board can come up with some action to send a request to the Mid-Atlantic Council to let them know our interest in managing the species through our plan working with them on this issue.

CHAIRMAN GROUT: Okay, we'll add that. Is there anything else that we need to add to the agenda? Toni, you said there were another couple items.

MS. TONI KERNS: There was a letter that the Sturgeon Board has requested to send to NOAA on the critical habitat designations. Bob was the chairman of that board, so I think he'll address that.

CHAIRMAN GROUT: All right, anything else, changes to the agenda? Is there any objection to the agenda as modified?

APPROVAL OF PROCEEDINGS

CHAIRMAN GROUT: Seeing none; we also have proceedings from our May, 2016 meeting in our briefing packet. Are there any changes or additions to those proceedings? Seeing none; are there any objections to approving the proceedings? Seeing none; the proceedings are approved.

PUBLIC COMMENT

CHAIRMAN GROUT: Our next item is the opportunity for the public to provide comment on things that are not on the agenda. Is there anybody from the public that has something they would like to speak to the Policy Board on?

STATE DIRECTORS MEETING REPORT

CHAIRMAN GROUT: Seeing none; we'll go to the next agenda item, which is a report by the Chairman on the State Directors meeting we had on Monday, with NOAA Fisheries.

This was an excellent, well attended meeting. Everybody at the meeting thought it was an excellent opportunity for the directors to be discussing issues of common interest with our partners in management. The first thing we talked about was federal budgeting priorities that the commission had.

On our list of priorities for federal budgets was ACA funding. I think we've discussed this before that we have seen increases in the past in the council and commission line, but Atlantic Coastal Act funds have remained flat, so we've been trying to get at least a similar increase to what the commissions have been getting.

We also have a priority FIN and ACCSP funding, SEAMAP, NEAMAP funding, Horseshoe Crab Survey funding, MRIP funding, MRIP-APAIS funding obviously now that we're taking on the APIS Survey, and then jurisdictional fisheries grants; which clearly affect all the states, not only here on the Atlantic Coast, but throughout the coastal United States.

We also had an agenda item on lobster and crab management, and that discussion essentially turned into a discussion about ways to improve commercial reporting via incentives and disincentives. We had a very long and lengthy discussion, and came up with some different thoughts and certainly a lot of people are interested in seeing how we can get to electronic reporting; which would make things much more efficient in the future.

Obviously, it is something we'll have to work on with our fishing industry on those things. Also, we talked about MRIP and APAIS, now that the commission is conducting the Access Point Intercept Survey. We talked about the status. It seems to be going well, during the initial year here with a few minor hiccups. One of the things that surprised some of the states that have not been involved, is the fact that the headboat samplers had to actually pay a fare to get on some of the for-hire vessels; and in one state they actually were required to tip the mates, even though they weren't catching fish or having fish filleted. There was a discussion about that and we've actually referred some of these issues to our Rec-Tech Committee. Further on, we also had more discussion about recreational data, particularly this year with bluefish and black sea bass estimates; the final estimates being very different than what the preliminary estimates were.

We also were concerned about the timing of it, and we're asking about the reasons for the delays in releasing the final estimate. We were told that it was basically because of the large changes. National Marine Fisheries Service wanted to look into that in detail, and find out the reasons and be able to speak informatively about it to us.

They've also developed new business rules for MRIP staff to use when we have low sample size strata, which was one of the problems that was occurring in the charterboat strata on MRIP. You may have seen in your e-mail, some of the charterboat estimates were revised based on new methods they have for low sample size; they essentially collapsed the waves.

There was also discussion about some states have mandatory logbooks, and why they couldn't be used where they have 100 percent mandatory logbooks in some states for charter and parties, and why they couldn't be used instead of MRIP. The response was that logbooks still need MRIP and ACCSP approval before the methods used for these state logbooks could be used for landings info for management.

Then, of course, I think a lot of you heard; we got an update on the revised estimates in the final black sea bass and bluefish rules. Black sea bass was essentially status quo, and with bluefish under the final rule, $1.6 million transfer to the commercial fishery is going to occur. We also had a discussion about coral management and National Monument designation.

In coral management the New England Council continues to work on an amendment to the Habitat FMP. One of the things, when we were discussing monument designation and the commission's position on this, we were given advice that we should be looking sometime in the near future for potentially a proposal being put forward to comment on, and the importance of the commission providing comment on that if and when a proposal comes out.

We also discussed the impacts of the Spring Bottom Trawl Survey out of the Northeast Fisheries Science Center. It had a delay in starting, and actually had a breakdown in the middle where they had to stop. They did complete all of the stations that were required, but of course because of the late start the temporal distribution of the survey was very different than what it has been in past years.

We were asking for input on how that was going to affect assessments of ASMFC managed species. The Center is going to be working on that on a species by species basis, and then what can be done in the future to prevent these things from happening or how to address them. I think we received an e-mail this week from Bill Carp, talking about looking at the use of industry-based platforms as backups for the Bigelow Surveys.

We also had a brief discussion about aquaculture permitting, because NMFS had received a request for aquaculture in the EEZ that would have included striped bass and other species. NOAA Fisheries committed to have future discussions with ASMFC about any potential aquaculture; particularly involving commission managed species in the EEZ. We asked for an update on National Standard 1 Guidelines, and were told that the proposed changes are still at OMD for review and "will be out sometime in the future." We also discussed the New England Fisheries Management Council request to be involved in management of summer flounder, scup and black sea bass.

We asked GARFO when that decision might be made. They indicated they wanted to discuss this request with the Mid-Atlantic Council first, and then also in the fall, they will be talking about it at the NRCC meeting; and after that they will make a decision on what they will do with the New England Council's request to get involved with black sea bass, fluke, and scup management.

Finally, we updated each other on where our Atlantic sturgeon Section 10 permitting process was right now; and committed to providing these updates on an annual basis. Are there any questions from the Policy Board about this? Okay seeing none; I'll move down to the next item, which is another report by me.

EXECUTIVE COMMITTEE REPORT

CHAIRMAN GROUT: This is from the Executive Committee meeting; which was two hours as opposed to seven hours. It should be a little bit quicker.

We had a discussion about, the Executive Director asked us to provide input on ASMFC being leads on staff assessments, and are states still comfortable with this. The issue that brought this up was we've had one or two assessments where the commission stock assessment biologists have taken the lead, and as we've gotten close to completing the assessment, some of the states may not have been fully involved with it; and then were coming up with concerns about the assessments.

The Executive Committee still felt that having the ASMFC leads on these assessments was a good process, and we should continue it and that we will work as directors to try and encourage our stock assessment biologists and technical committee members to speak up if they have concerns early on in the process; early and often.

We also have reviewed the Conservation Equivalency Document that Toni will be going over with you as one of our Policy Board agenda items. We made comments on that. We also reviewed a white paper that was produced by staff on PDT membership, board members being on PDT of the species.

After considerable discussion on this, the original issue with this was there was a concern brought up by some of our commissioners that having board members as Plan Development Team members might have an optics problem with the public. With the potential thought that that particular board member might get two bites of the apple; both in developing the plan and also voting on the final measures in the plan.

After considerable discussion, the Executive Committee felt that the benefits that these board members provide to helping develop these fisheries management plans outweigh the optics issues that may occur with the public. We also began work -- you remember last time we had Collette come and give us a review on Roberts Rules of Order.

One of the things that she recommended to us was to have a document of specific commission procedures that we have that may vary slightly from Roberts Rules of Order. We're still working on this. We provided input to the staff on this. We'll consider it again at the fall meeting, and bring it before the policy board at that time for consideration and approval. We also had a discussion about potential renaming of the Hart Award. With the recent passing of one of our longtime, highly regarded commissioners from Maine, Pat White, there was a proposal put forward to rename it to the Hart-White Award.

We had a discussion about the appropriateness of that and also discussed potential other options, such as maybe naming our awards of excellence after Pat White. We actually sent that to the Awards Committee for further discussion. I know the LGAs had a discussion on that and your discussion will be sent to the Awards Committee; along with the Executive Committee for some resolution again at the fall meeting.

Finally, we some Saltonstall-Kennedy funds that the commission has been getting. Originally, we expected that it was going to be $500,000.00 and the Executive Committee had made some recommendations on how that would be spent. Bob came to us and said that that amount of money is actually only going to be $200,000.00.

The Executive Committee had a discussion on how we would trim down the projects that we would use that on. Essentially, our recommendations are going to be that $150,000.00 of that be used for some of the South Atlantic fisheries independent surveys; such as the longline surveys in several states.

Then the remainder of that would be used to help offset the shortfall that the Maine/New Hampshire Trawl Survey is experiencing this year. Those are the issues that we went over at the Executive Committee. Are there any questions on any of those items? Okay, thank you very much. Now we will move on to the next agenda item; which is Toni giving us a review of our stock rebuilding performance.

MS. KERNS: I am going to just take this brief moment to let the commission know that we have hired a new FMP coordinator, his name is Michael Schmidtke. He did a lot of the blueline tile assessment work with the Mid-Atlantic Council and the South Atlantic Council; presented to their SSCs. He is a PHD candidate out of Cynthia Jones' lab in Old Dominion University; and he will be starting with us on September 1st. We're excited to have him.

I made it easy, it's another Mike. You don't have to learn a new name. We're ready to go. We're ready to have him aboard.

2016 ANNUAL REVIEW OF STOCK REBUILDING PERFORMANCE

MS. KERNS: With that, I am going to go through the 2016 annual review of stock rebuilding performance. As everyone recalls, this is a part of our Strategic Plan for the five-year plan that is ongoing.

The first time we did this was in 2009, and we used the information from the discussion that we have today to help build the 2016 Action Plan; which we will review at the annual meeting. The objective of this program is to validate the status and the rate of progress for our species. If the Policy Board feels that the rate of progress is not what you're looking for, then today would be where we would try to identify some corrective action; whether to take some information back to those boards or back to TCs or staff to work on with those groups.

Again, what we're looking back for feedback today is information to get into the 2017 Action Plan process, and then direct feedback to the specific boards. As you recall, we have five categories; rebuilt sustainable, recovering rebuilding, concerned, depleted and unknown; and each of our species are put into these five categories. For the rebuilt and sustainable, it is pretty much the same list that we had last year; the Gulf of Maine, Georges Bank lobster, Atlantic herring, menhaden, black drum, bluefish, scup, Spanish mackerel, and spiny dogfish. We moved striped bass into the recovering rebuilding section and took red drum out of recovering rebuilding; so we swapped those two species.

I am going to go through the species of concern, where we're taken some action in the past year or had some new information. For black sea bass, we are currently undergoing a stock assessment for black sea bass; which will be completed in December. Black sea bass has a unique life history characteristic which contributes to the uncertainty regarding the stock size, response to exploitation; therefore, the OFL cannot be specified for the fishery, which means that a level of catch cannot be derived from the model results.

We've been using either a constant catch approach or using a data-poor model, in order to determine what the quota is for black sea bass. We are trying to develop reference points and assessment methods to account for this unique life history in the assessment work that is ongoing; and we're exploring a spatially structured stock assessment to address these incomplete mixings of the stock.

We're trying to evaluate the implications of range expansion to the stock and the fishery dynamics, to help us set forth a management plan in the future. For the Atlantic coastal sharks we have several different coastal sharks, but I just wanted to point out here, and hopefully, you can see this in the table; if not it is in your document on the briefing materials;

that in 2015 the bluefin sharks were found to be not overfished and overfishing is not occurring, as well as the Atlantic smoothhound were not overfished and overfishing was not occurring.

To complement the shark conservation act of 2010, the board implemented a fins naturally attached policy for all sharks; with the limitation for the smoothhounds. Harvesters can remove the fins of smooth dogfish, provided the weight of the fins onboard does not exceed 12 percent of the total weight of the smooth dogfish carcass; as well as that the total composition of the catch is at least 25 percent smoothhound, and that is what was approved at the board meeting yesterday.

For horseshoe crab we have put forward to do a benchmark stock assessment for 2018 this year. This will be a unique stock assessment, where most of it will be done pretty much behind closed doors; because of the confidential nature of the biomedical data. The Stock Assessment Subcommittee will be looking at a regional approach so that we can give the board a better understanding of what's happening in each of those regional categories for horseshoe crab.

But dedicated funding is continued to be needed for a coastwide survey to help inform those regional stock assessments, or we should broaden other surveys by the geographical regions. Biological reference points are needed, as well as a mechanism to include biomedical data and mortality estimates in regional assessments; without compromising data confidentiality. We wanted to keep moving forward to try to work with the biomedical groups, so we don't have to have these black box assessments.

For red drum, we had a benchmark stock assessment that was presented to the South Atlantic Board in 2016. The desk reviewed models with a stock synthesis framework suggested that overfishing is occurring in both the northern and southern regions. The board had some questions about the unique life history of red drum; and the results of those assessments and how those life history parameters feed into the different parameters of the model. The Technical Committee is working on five large tasks, and will be reporting out to the South Atlantic Board on those tasks, so that the board can then determine how they want to move forward with management; in response to those Technical Committee tasks, as well as the findings of the stock assessment.

For summer flounder, the 2016 ABC was decreased by 29 percent to reflect the declines in the stock size that we've been seeing; as well as the board approved regional management measures, which is a more precise use of the MRIP data. Next week, summer flounder, scup, and black sea bass and bluefish will be subject to the joint management meeting.

I am sure that many folks have heard in the rumor mill that the summer flounder stock is continuing to decline. This is partially because the stock overestimates SSB in the terminal year as well as overestimates recruitment; and we have not had any real good recruitment classes in recent years, and most of them have been below average. We will figure out how to move forward next week here.

For tautog, the coastwide portion of the stock assessment found the fishery to be overfished and overfishing was occurring. Regional assessments were also completed, and as we heard yesterday, the TC completed an additional set of regional assessments, and have moved forward with the Plan Development Team to look at a four-region approach to develop management measures, as well as we have initiated a tagging program for the commercial fishery to address some of the concerns that we've been seeing with the black market fishery and unknown catch.

Additional species of concerns that were in the list were Atlantic croaker, and the winter flounder Gulf of Maine Atlantic croaker is currently undergoing a stock assessment. The results of that will be out this fall or this winter. With winter flounder Gulf of Maine, as well as the southern New England/Mid-Atlantic, we continue to try to work with the New England Council; as well as through the NRCC to try to move forward on management measures that will help this stock move forward in rebuilding.

The board continues to set very precautionary measures for both of these stocks, which don't seem to be responding to these minimal management measures. For depleted species, for southern New England lobster the stock is depleted and overfishing is not occurring. Abundance is at approximately 42 percent of the threshold, and the current exploitation is below the threshold.

Estimates for recruitment are near zero, and they are at the lowest on record. The TC has been advising the board to use output controls to manage the fishery, while the board continues to use input measures. Before the most recent assessment came out, the Technical Committee had advised 50 to 75 percent reductions for the southern New England lobster management areas; and the board approved a 10 percent reduction, and then took some additional reductions in traps for Areas 2 and 3.

With the results of the new assessment the board is considering a 20 to 60 percent increase in egg production; and tomorrow we'll have a lot of discussions on how the board is going to move forward with measures in southern New England. For northern shrimp, we still are seeing failed recruitment in that fishery. The Technical Committee and Stock Assessment Committee don't expect to see any recovery until at least 2017. The Section continued to implement a moratorium in 2015, and initiated an amendment to look at limited entry in the fishery.

The Section moved forward with having the Plan Development Team look at quotas for each of the states with a fishery. The trawl survey is ongoing right now, and I think they are seeing some maybe good things there. Ashton went on it, so you could ask her about it if you're interested.

Then we received an assessment for weakfish this year. The 2016 assessment found that we are still below the mortality thresholds, and we're below the SSB thresholds. We have very strict regulations on the harvest of weakfish in both the commercial and recreational fishery and continue to have those.

For Jonah crab, the commission implemented the Jonah crab FMP this year. The landings have increased 6.4 times since the early 2000s, with over 17 million pounds of crab that were landed in 2014. The status of the resource is relatively unknown. We don't have a lot of data that we can use for an assessment, including maturity estimates. There are a couple of states that are working on maturity studies, and as soon as we have that information we'll try to get a stock assessment conducted.

In the meantime, we're going to have the Jonah crab TC look at some stock indicators, to try to give the board some information on what kind of changes are occurring in the stock. Then some additional depleted species, shad and river herring, winter flounder in southern New England/Mid-Atlantic, sturgeon, spot and spotted sea trout. Spot is also undergoing an assessment that will be ready this fall; and that is all.

CHAIRMAN GROUT: Any questions for Toni? Ritchie.

MR. G. RITCHIE WHITE: The suggestion on northern shrimp, it is not possible that it can recover in 2017. You might want to move that date out a year or two.

MS. KERNS: That is the advice that we still have, so I was trying to stick with the scientific advice; but yes.

CHAIRMAN GROUT: Any other questions? Malcolm.

DR. MALCOLM RHODES: Just a question. Spotted sea trout are in depleted category? I mean, is that just in local areas?

MS. KERNS: I apologize, Malcolm. They should be under the unknown category, as well as Jonah crab.

MR. WILLIAM ADLER: This is more of an observation from the reports; particularly on black sea bass. I know there is really nothing here, because I believe it is the federal Mid-Atlantic that sets things with that wonderful SSC. But I have a big problem with the fact that nobody can increase the quota on black sea bass, when everybody says that's all they can catch everywhere. I suppose it's just an observation that I don't know what anybody can do to shake them loose to raise that quota; because it's ridiculous. I just wanted to put that on the record, I guess.

CHAIRMAN GROUT: Next week.

MR. ADLER: Get it changed.

MR. DAVID V. D. BORDEN: Just a suggestion for the future. On some of these species there are data limitations that cause some of the problems in terms of the board's adherence with regulations. For instance, there is a very limited lobster sampling program in the offshore areas, which now NOAA and some other organizations have started to address. But I think to the extent going forward that there are problems like that it would be useful to just have some kind of notation in here; so that it draws attention to the need for funding and better data collection programs.

CHAIRMAN GROUT: Good thought, Dave. Bill again.

MR. ADLER: I'm sorry, here I go again. On winter flounder, many times when we've had the board meetings, I brought up the fact on the particular chart that we have here that I think that the target, the top line there, is too high. It is almost like it has never been that high in recent memory; and yet the comments always come back, well it was there at one time, and it's off the chart to the left back in 1776 or whatever it was.

I think that the way this is put forward suggests that we have to really do a lot of work, and according to what I'm looking at here, the bar is too high. I've said this before that I think somebody should really look at perhaps lowering the bars a little more to the realistic thing. I just wanted that one on the record, too.

COMMISSION INVOLVEMENT IN COBIA MANAGEMENT

CHAIRMAN GROUT: Further comments, questions? Okay. The next agenda item is cobia, and whether we're going to potentially become managers of cobia. Toni is going to start it and then I guess Jim has a motion.

MS. KERNS: Just a quick refresher course on cobia and cobia management. Gregg Waugh came in and spoke to the Policy Board at the May meeting, and gave a bunch of this information; but just a reminder of where we are and why we're here. Cobia range from Nova Scotia to Argentina, the stock that we're really thinking about here is the stock that is on the Atlantic Coast, and that is divided up into two groups.

There is the Atlantic migratory group, which ranges from roughly Georgia up to New York, and then there is the Gulf group, which is the east coast of Florida; as well as the Gulf of Mexico. There is primarily bycatch in the commercial fishery, as well as a very valuable recreational fishery. Approximately 83 percent of the recreational harvest in state waters from Georgia north is occurring, and so that is why we have an interest in this fishery; because of that large state water catch.

Cobia is managed currently jointly via the South Atlantic Council and the Gulf of Mexico Fishery Management Council. The Mid-Atlantic Fishery Management Council has two seats on the South Atlantic Council, and so that is how they are involved in cobia management. The Atlantic migratory group, the South Atlantic Council sets the ABC, the TAC, and all the fishery specifications for that group. Then for the Gulf migratory group, the ABC is set by the Gulf of Mexico Council. The South Atlantic and the Gulf of Mexico Council determined a percentage of that ABC; basically a sub-allocation is given to the east coast of Florida.

Then the South Atlantic Council sets the regulations in order to meet that sub-allocation. There is a little bit of joint management going on there. Again, with the South Atlantic Council, the Mid-Atlantic Council has those two seats; and so they do have influence there on the Florida east coast fishery.

In 2015, the Atlantic migratory group cobia's ACL was 630,000 pounds, but landings far exceeded that at 1.5 million pounds. NOAA announced a closure for the Atlantic migratory group cobia effective June 20th in 2016, for that overage in the ACL from 2015. The closure impacted the range of all of those states; but the greatest impacts were seen in the Outer Banks of North Carolina, as well as the states Virginia to the northern extent of the range.

Virginia and North Carolina responded by changing their state specific regulations to lessen the impact of the closure. Then the South Atlantic Council requested that the commission consider joint or complementary management; largely in fact, due to that large state water catch that I told you about earlier, to help regulate that recreational fishery and to have state input on the management measures; to be able to better manage the cobia complex as a whole.

Yesterday the South Atlantic State/Federal Fishery Management Board had a very good, thorough discussion on cobia management and where they wanted to see this management go. They made a recommendation that the commission implement a complementary cobia management FMP. What does complementary mean? It would mean that we would not have to have lockstep measures with the council vote. We would put together an FMP that is somewhat similar to those management measures within the federal plan.

It would be most likely how complementary management has worked in the past, where the Federal Council would set the ABCs and the ACLs, and then the states would work with those ABCs and ACLs, in order to implement management measures within their state waters. We typically jointly look at stock assessments. Oftentimes, the federal partner takes the lead in those stock assessments though. States would do state survey work, they would also monitor their quotas if quotas were put in place.

You could still have state specific regulations that weren't those that mirrored the federal regulations at times that can work out without having negative impacts on state and federal permit holders; depending on how it is designed. The other thing that the board recommended was that the cobia FMP be a part of the South Atlantic State/Federal Fishery Management Board. I will turn it over to Jim for those specific motions that were made at the council.

CHAIRMAN GROUT: Jim.

MR. JIM ESTES: If we can have it up on the screen, please, I'll state the motion and then I'll talk a little bit about the rationale behind it; although Toni covered some of that. **On behalf of the South Atlantic State/Federal Fisheries Management Board, we move to recommend that the Policy Board develop a complementary fishery management plan for cobia.** Now, if I might, a little rationale; Mr. Chair.

CHAIRMAN GROUT: Absolutely. That is a motion by the board so it doesn't need a second. Go ahead, Jim, for the rationale.

MR. ESTES: Toni mentioned some of the rationale. First and foremost I think is that although it differs from state to state, in 2015 about 80 percent of the landings were from state waters, and so that makes a little bit of sense that the commission would have some part of the management. We also discussed a little bit how Atlantic States Marine Fisheries Commission might be a little bit more nimble, and we could react possibly a little quicker than the council could to things that might change.

As Toni mentioned, the South Atlantic Fisheries Management Council consists of three members each from the states of North Carolina through Florida; including federal partners; and the Mid-Atlantic Council has two members, and so there was a little bit of discussion about equal membership.

For example, I know that Virginia, I think, has one member there. Here we're all equal. Those were those main points, unless Michelle has something to add. By the way, we also were lucky to have Dr. Duval with us, because she now serves as Chair of the South Atlantic Fisheries Management Council; and she also serves on our board. It was very useful to have her with us.

CHAIRMAN GROUT: Any questions or discussion from the board? I have one question, and it's from the standpoint of the commission has been taking on a lot of different species in recent years. I wanted to get a feel from Toni or Bob. Do we have the staff capacity to take on yet another very important, probably based on some of the public comments I heard last week, relatively controversial management.

MS. KERNS: I think I'll start and then Bob can fill in anything that I might leave out. I think that if adding cobia, we will be at full, full tilt capacity for staff. I think we'll have to be quite cognizant and careful of our action planning, to make sure that we're not doing more than what we can handle; and then at times during the year we add additional amendments or addendas, and I think we'll have to look at the list and make sure that we prioritize the work that staff is doing.

It is not only our staff that will be impacted, but it is also states staffs for TC members, and stock assessment members, Plan Development Teams, et cetera, that will be cognizant of during those times. Your state members are also quite overloaded at times, and so we want to be cognizant of that. Do you want a budget as well, Doug or no?

CHAIRMAN GROUT: I don't need details in a budget, unless some of the board would. I just wanted some assurance from the staff that we weren't going to be taking away from other management board capacities to be able to move forward by taking this on without additional staff.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Just a quick comment. Two points in addition to what Toni said. One is that we've hired a contractor to work on cobia right now to help out with the staff capacity, and that seems to be working out well. That is an option moving forward to deal with staff capacity. The other is sort of a more philosophical question, which is do the commissioners have time to deal with all the species that we have on our plates right now? We've got four meeting weeks a year, two at four days and two at three days; so that is 14 days a year for the commissioners to tackle all the species that they have to tackle.

That is a pretty big workload. I'm not saying that the cobia sort of is the snowflake that causes the avalanche and makes us not be able to do our work. I think it is just symptomatic of everything that we're doing. Everybody's busy and everybody's pretty well flat out. At the Legislators and Governors Appointees Lunch today, there was a bit of conversation about timing of briefing material and a lot of documents coming the Wednesday before meeting week as supplemental material.

That is another symptom of just being busy between our quarterly meetings. I think all those dimensions play into just prioritizing workload; and make sure that staff is working on the high priority of the folks around this table. As Toni said, we don't really have anyone sitting around the office looking for things to do; but we just want to make sure that we're hitting the most important projects that you want us to work on. Should this move forward, we just need to make sure cobia is in the right place in that prioritized list.

CHAIRMAN GROUT: I think that's a good point, Bob, because you've seen recently it has been difficult for boards to have the thorough discussion that they need, for different management actions within the timeframes that we're allowed; because we're only here three or four days a week. It may be something that we need to consider in the future, particularly for taking on additional species. I saw Michelle's hand and then Robert and then Ritchie.

DR. MICHELLE DUVAL: I'm sort of struck by some of the comments around the table. This is a little bit of déjà vu of similar conversations that we have around the South Atlantic Council table a lot. I know John Carmichael is sitting here in the back of the room. I am sure he would nod his head with regard to capacity and wanting to make sure that staff that are already running at full tilt, don't get overloaded.

Unfortunately, sometimes at the council level we have triage issues that we just simply have to deal with. I guess I am fully aware of the capacity issues here. I don't want to create even the start of the avalanche, but I do think that cobia does meet all the criteria for a species that we would consider for interstate management.

You know, there is certainly some controversy with regard to stakeholders, in terms of taking on cobia. I think I tried to address some of those concerns at the South Atlantic board meeting the other day. I think they are mostly related to assumptions that if the commission were to take on cobia that we would immediately move towards a state-by-state management approach.

I have tried to tell folks that may be certainly an option down the road, but that doesn't mean that that is something that the commission would consider out the gate. I do think that taking on management of cobia would alleviate those concerns about equal representation that Mr. Estes outlined. I think given the migratory nature of the species, given some of the distributional shifts that we are seeing, given some of the warm water conditions that we are seeing. I think that it would be wise for the commission to consider taking on cobia sooner rather than later.

MR. ROBERT BOYLES: I would like to echo Dr. Duval's comments just for the board's consideration, a reminder that fully 80 percent of the cobia caught on the Atlantic coast or caught in state waters, we just spent four and a half hours kicking the can down the road on a very important species; the percentage of quota which my state enjoys is zero.

We've had a request from a sister, delivered in body requesting us to consider taking over management. In South Carolina when we closed our fishery in state waters, as well as in coordination with the federal closure, my anglers asked me how come our sister states to the north are continuing to draw fish out of that population?

Their request of me is one of equity. My interest in this is I fully respect and appreciate fisheries triage. I think that is important for us all to take into consideration. But I will repeat what I said yesterday at the South Atlantic Board to quote Dr. Franklin, "We must all hang together, or surely we will all hang separately." I would urge the Policy Board to approve this motion.

MR. WHITE: I have more of a question than taking a position on this. The word, complementary, I guess I questioned. If we're going to put a lot of resources and effort into coming up with a management plan and managing this fishery, does that mean then that we are just following what the South Atlantic is asking us to do or telling us to do?

I would think that if 80 percent of the harvest is in state waters that the commission would be the lead entity, and the South Atlantic would be following the commission's lead. I guess I don't quite understand how this process would unfold.

CHAIRMAN GROUT: I guess our Executive Director would like to answer that.

EXECUTIVE DIRECTOR BEAL: I'll give it a try. Ritchie, I think a lot of the details still have to be developed. But if there is the maintenance of a federal component in a fishery management plan, then that portion of the management will be bound by the Magnuson-Stevens Act. The South Atlantic Council will, if they maintain their plan, which under this motion they would; will still be obligated to set ACLs and catch limits and accountability measures.

But I think the idea is that through working through the states and the commission, we'll be able to deal with a lot of the allocation issues and slow down the fishery so that the accountability measures that were triggered this year can be deferred or avoided altogether, and the fishery can be better managed and meet the needs of the states.

Because right now, depending on when the closures occur, it advantages and disadvantages certain regions of the coast. Working through the commission process, I think a lot of the commission work will probably be sort of spreading out the benefits or equalizing the benefits across all the states that have cobia.

CHAIRMAN GROUT: Further discussion on the motion? Dave.

MR. BORDEN: I'm supportive of the concept of doing this, but I would just like to note I agree with a lot of what Robert said. Where I get apprehensive is when I think about this many people following our normal FMP development process with PIDs and public hearings and all of those types, in a formal FMP. I think of all the time and effort and labor that go into that. I would go back to the point that Ritchie made is, the issue to me is complementary regulations, and not the full development of a FMP. I don't have the answer for this, but maybe there is a process that we could follow that would short-circuit a lot of our own procedures to try to minimize the workload. The operative phrase here I think is complementary regulations.

If we can simplify the way we develop those, I think it would behoove us, because this is sure to happen with other species. This is just the first one with climate change and all the rest of the things that are going on in the ecosystem. I think we should all expect that this is going to happen again.

MS. KERNS: David, I see some of the points that you're making and we could try to talk potentially to see how we could make some changes to our process potentially. But the commission would have an FMP. It would be largely based on the council FMP, but because it is complementary and not joint, it does allow for the commission to have unique measures that are not in the council plan. You could have some state-specific information within our FMP. It doesn't have to be like similar to summer flounder, scup, and black sea bass.

CHAIRMAN GROUT: Further discussion on the motion, seeing none; do you all need time to caucus on this? **Let me try this. Is there any objection to the motion? Seeing no objection**

to the motion, the motion passes. One of the things, there is a follow up on this, Toni and Bob, as we get into the fall meeting where we're looking at our action plan for the future.

I would like a special consideration given to, not only an analysis of staff capacity, but also of board and technical committee capacity at our current levels of fisheries management; to see if there is the potential that we may need to change things. Maybe we can do it the way it is, but go ahead, Bob.

EXECUTIVE DIRECTOR BEAL: Now related to that a moment ago you mentioned that some of the board meetings are tight, very tight. You indicated that some of the discussions may not be able to sort of develop and unfold and get into as much detail as you want. I think if that is a prevailing perspective of the commissioners that we're trying to jam too much in a meeting week. That would be good for us to know.

We're trying to accommodate all the decisions at staff level that we know need to happen during a meeting week to keep documents moving forward and everything else. But it is more of an art than a science, scheduling these meetings. Some go over, some go under and hopefully around five or six o'clock, we get done for the day. But if that is the sense that we're trying to do much in a meeting week or in a day or in a two-hour meeting or whatever it is. If we can get that feedback to staff, that would be helpful.

CHAIRMAN GROUT: Possibly one mechanism for getting that kind of feedback from our commissioners is we do that annual survey of how we're doing. Maybe we could add a question to that survey; do you think we need more time in our meeting week to thoroughly do our business?

EXECUTIVE DIRECTOR BEAL: Some of your meetings are entirely too long. But that is fair too.

CHAIRMAN GROUT: I agree. We need to have good meeting management. I know I didn't do a good job at Executive Committee in keeping us on time. But I know, from my observation today at Menhaden, Bob Ballou did an excellent job of moving things along, and we were still an hour behind.

MR. WHITE: Yes, because we used to have four, four-day meeting weeks; so we've dropped two days out of our schedule.

CHAIRMAN GROUT: Okay Jim, I believe you have another motion from the board. It's already up there. Okay. Should I read this into the record? I'll let the Board Chair read it into the record for me.

MR. ESTES: **On behalf of the South Atlantic State/Federal Fisheries Management Board, move to recommend to the Policy Board that the South Atlantic Board is the appropriate venue to develop the fisheries management plan for cobia**.

CHAIRMAN GROUT: **Again, this is a board motion. It does not need a second.** Is there discussion on the motion? Toni.

MS. KERNS: Just a quick note for those states that are not on the South Atlantic Board. If you have an interest in cobia or commissions, you can make a request to the Policy Board at any time to be able to declare into that species management board; especially if we're going to have a new species within that board, as well as that we offer seats to the councils on any of our management boards. The South Atlantic Council does have a seat on the South Atlantic State/Federal Board.

DR. DUVAL: Not to belabor this, but I do think that this is something that in terms of where board management of this species moving forward. I think that is something that can be a little bit flexible, and should the commission decide down the road that it really does require its own separate board or a subset of the South

Atlantic Board; you know we can certainly do that. It just seems like right now it is the best place to start.

CHAIRMAN GROUT: Further discussion on this motion? **Is there any objection from any states to this motion; states and federal entities? Seeing none; the motion passes.** Okay, that covers cobia management. We are now official cobia managers.

OVERVIEW OF THE CONSERVATION EQUIVALENCY GUIDANCE DOCUMENT

CHAIRMAN GROUT: Toni, do you want to give an overview of the Conservation Equivalency Guidance Document that we've been reviewing and making changes to?

MS. KERNS: I'll be quite brief on this, in the interest of time. The Executive Committee tasked staff to look at the guidance documents, and one of the guidance documents that we had not looked at in a very long time was the Conservation Equivalency Guidance Document. It just gave an overview of procedures of how states were supposed to go about putting together conservation equivalency plans. Over time as the commission has evolved, what was in that document and how we actually practiced started to separate from each other.

Staff, as well as the Assessment Science Committee and the Management and Science Committee, made some recommendations on how we can make changes to that document to reflect current practices. It includes recommendations on the timing of requests for conservational equivalency proposals; the information that needs to be contained, the evaluation of those proposals, how long they last. We'll be making language changes to the documents based on the recommendations that came out of the Executive Committee meeting and we'll present that to the Executive Committee at the annual meeting; and then present the document to the Policy Board for their review and approval at annual meeting, as well. Again, just to note that it is actually reflecting what our current practices are. There aren't any significant changes. I will highlight if there are any significant changes to current practice in my presentation at the annual meeting.

CHAIRMAN GROUT: Any questions for Toni?

RISK AND UNCERTAINTY POLICY WORKGROUP REPORT

CHAIRMAN GROUT: Okay, we'll move on to Risk and Uncertainty Policy Workgroup. Shanna has –

MS. KERNS: Jay's going to do it actually. He chaired that work.

CHAIRMAN GROUT: Jason, since he is Chair of the Workgroup, is going to do the presentation on this; and there will be an action for consideration of approval of the Risk Policy Statement.

MR. JASON McNAMEE: My name is Jason McNamee; I work for the Rhode Island Division of Marine Fisheries. I am the proud Chair of the ASMFC Risk and Uncertainty Policy Working Group. I've got a quick presentation here. I'll try to get through it quick, so we can get to the heart of the discussion.

Just brief introduction, at the November Executive Committee meeting, the Executive Committee reinitiated a process to develop a Risk and Uncertainty Policy for the commission. It had been attempted before. It got going and then got quiet. We wanted to get it going again. We felt a little more optimistic. This kind of discussion, this type of policy, it's becoming better understood. It's becoming more of a standard in scientific and management procedures.

Some recent examples emphasize the need to develop this policy. I will use a very contemporary example, maybe from this morning. I think the board could have used a little more guidance; I think it would have helped in the discussions this morning at menhaden. This is exactly what this type of policy is meant to do. It sets out that kind of criteria a priori, so you have that guidance.

It could have been that one piece that you needed this morning to help with that process. There have been other examples, striped bass I think it was last year, because there was no guidance, the Technical Committee ended up choosing a risk. It is really not a technical decision, it is a board decision, so a couple of examples there as to why these types of policies are important.

Some of the benefits of a risk policy, they've been used for many years now by the regional councils. There are some negative examples from really rigid applications of these types of policies. But there are also successful examples. It is not all negative. We tend to focus on the ones that get us jammed up; but there are some examples where these risk policies have benefited the management of the different stocks.

In our case, because they've been used for a while now, we have the benefit of hindsight, and so we can build a policy that has a little more flexibility associated with it. A couple more points on the benefits, one of the nice things about setting out the policy ahead of time, it provides a priori guidance to the technical committees for specifying recommendations; and these recommendations will be in line with what the board wishes. It kind of lines everybody up, makes them more efficient. It improves the integration of fisheries science and management by maintaining transparency and creating management level accountability.

That is another nice aspect of setting forth these types of policies. It allows the TCs to work a little more efficiently. You don't have to have that extra bounce, where the TC kind of comes back to the board and says, we need a little more guidance; and so that gets sped up, because that is already provided.

It also provides greater clarity in the process for the stakeholders; they kind of know ahead of time the things that are guiding some of your decisions. Back in April, the ASC and MSC both met at a joint meeting, and we began to scope out a plan for the development based on that request from the Executive Committee.

We created a plan, and what we wanted to do was develop a multidisciplinary working group to work on the policy. What we mean by multidisciplinary, we had members from the MSC, members from the ASC, as well as some board members. We kind of constructed this working group; and our first task was to develop the Risk Policy Statement.

We began working on that. Two products came out of the process to develop the Risk Policy Statement, and so I'll pause for a minute. The Risk Policy Statement is the overarching, guiding principles for the whole rest of the policy. This is that kind of couple of sentences right up front, very high level that sets out the perspective of the policy and the guidance that the following policy will follow; and so it is that high level statement.

We did it kind of in a sequential way, and we got two products. We got the feedback from our Multidisciplinary Working Group, we got some common threads. We had multiple people contribute; each kind of contributed very thematically similar things, which was kind of interesting. We synthesized some of those common threads; and I'll show you that on the next slide.

Then we produced the actual statement, and we'll give you a look at that, as well. The common threads that kind of popped up were consistently applied across all commission species. The people that were on the working group wanted something that kind of be comprehensive, used consistently across all of the species, and not just completely change what you're doing from species to species; you know where appropriate.

They thought it was important to incorporate social and economic factors. That is something we talk about a lot, but don't have a good mechanism for incorporating. This provides us an opportunity to do just that. Provide transparency for the commission process, I've talked about that a couple times, but when you set up this guidance ahead of time, it increases that transparency.

Flexibility should be built in so the policy can be amended and adapt to change. We don't want something that is static and really hard to change. We want something that is flexible that we review through time; and that is one of the things that we'll try and really harp on, as we build this and really keep in mind. A final kind of theme was to provide stability in management measures, and that is something that we talk about a lot but often don't achieve. Stability is another attribute that we can build into this policy. The second thing that we developed was the Draft Statement, so I'm going to yammer away here for a minute. You can ignore my voice and kind of look up there and read through that.

I promise you I am going to go to a slide at the end where the font is much larger, and give you some more time to kind of stare at that. But just a couple of comments before I click through; I've got two more slides. A couple of comments, the Draft Statement, as I mentioned, was sort of a sequential process for us. We asked the Working Group to kind of all contribute their ideal policy statement, and those got sent in.

We kind of coalesced them; and then synthesized them into a single statement, trying to grab everything that had come forward to us. At that point what we did was we put forward that synthesized statement. We had a conference call. We beat it up real good on the conference call, made some good modifications; made it a little more efficient, as well.

It might be hard to believe, looking up at that. But we did, and sent it back out; received a few more comments. The point of all of that is we worked on this pretty hard. We were pretty satisfied with the product, but now we want you all to take a look. Wordsmith it if you want, offer some advice; however you want to approach it.

Just to show you our next step, so establishing the Multidisciplinary Working Group, we did it. We checked that one off the list. Now we're developing the Policy Statement, and it is important for the continuation of this process to get that Policy Statement set; because that guides the process from here on out.

This is the opportunity to set that high level policy guidance, so we know how to proceed with the rest of it. That is what we're hoping to achieve at this meeting. Then we'll meet again and we'll begin to scope out a plan for the rest of the policy. We'll develop one thing we thought would be very useful, which is to develop some examples; so actually walk you through what the policy would do in a sort of example situation.

We've gotten some good feedback on how to that; one data poor, one more data rich, those kinds of scenarios. Then we'll present those examples to the board during the annual meeting. That is our kind of ideal timeline there. I will stop now for questions; I'm going to flip one more slide so that the statement will go back up on the board.

But one comment is with the retirement of Dave Simpson, we'll be down a member on the working group, so if anyone on the board would like to be involved with that, we would be happy to take on another member to offer that board member guidance to the process. With that I will stop talking, put the Policy Statement back up there and take any questions that you might have.

CHAIRMAN GROUT: Questions on the Policy Statement.

MR. ADAM NOWALSKY: This may be premature, but I'll try, anyway. In that the examples we're talking about seeing being driven by this policy statement. Are they similar to the risk policies that he federal council's might be using; such as the B to BMSY ratio is something, then do something with your quotas, or if the stock is overfished and overfishing is occurring do something else. Are we talking about applying something that mathematical that we see at the federal level; or are you contemplating something else? Any indicator of what that something else might be would help me in responding to this statement.

MR. McNAMEE: Yes, excellent question. That was as we began talking about this that is always the question. Are we going to get locked into some like super stringent rigid control rules? The way, at least at this point, that we are envisioning this policy to be applied mechanically is like a decision tree, where you bounce through a set of questions that you ask, based on the information and the species that you're working on. What we think that does relative to -- if you'll bear with me, I don't mean to offer that I know exactly what you're thinking.

But I think you are kind of envisioning a really rigid process. If X equals Y then some result happens. I think what we envision in the decision tree is more nuance to that, so we don't get locked into a really rigid result, based on one single element. There are a number of elements in there that we can all weigh, but in the end the goal is to get to a system that we all know ahead of time; and will kind of know how things are going to flow through that system.

Without being able to offer you the examples specifically, and we did actually go through a mock example at the ASC/MSC meeting, I don't know if that was provided. We didn't provide it to the board, but we did kind of begin to tinker with an example to see how it worked. We'll continue to do that. I can't be more direct with you at this point, because I don't know. We haven't gotten to that point yet.

CHAIRMAN GROUT: Other thoughts and questions and discussion on this? Steve.

MR. STEVE HEINS: Would you envision that this would only be applied to species that the council doesn't already apply a risk policy to, or is there going to be some relationship between commission policy and a council risk policy?

MR. McNAMEE: Good question. I don't envision this as being additive with preexisting risk and uncertainty policies that are out there. But one way that it could be helpful is, there is a process for management uncertainty for some of the jointly managed species; but by and large that management uncertainty aspect is not applied. This could supplement in that aspect of it, but I don't see it as double dipping on the risk; I guess for a lack of a better way to put it.

REPRESENTATIVE CRAIG A. MINER: To me, it describes what I've read in the charter. It is a condensed version. I appreciate the work you've done here. It looks something like what I expect to see from this commission or the board. It would be certainly benefited, and not only that but it is necessary by the demands of the charter that govern this body. I would like to see this move forward, so, good job.

MR. BRANDON MUFFLEY: I am glad to see this move forward. I was part of the original one that when this topic came about a number of years ago that kind of fizzled, so I'm glad to see this go. I think this provides a lot of benefits to the board members; and also to the public, so that they can see some rationale behind some of the decisions that we have. I don't know if this is a question specific to you, Jay, or more to Doug. What would be the way that we would implement this sort of policy?

Like structurally within the commission's guidelines and rules and regulations, how would this specifically be implemented and applied?

CHAIRMAN GROUT: I'm being consulted. Toni is providing me advice that it could be the decision of the board as to whether we want to incorporate this, for example, into the charter; or some of our existing documents as a policy, or we could have a standalone policy statement. Again, that is something that we would have to decide at this particular point in time.

MR. BORDEN: Question for Jason. Jason, did I understand you correctly that it if the commission adopts this, then it basically sets a framework for additional work that would be done; and then you would bring all of it back and ask for formal approval. I mean, if that is the case, my assumption is we don't need a motion at this point; just the acquiescence of the committee.

CHAIRMAN GROUT: That's the way I see it. I would like to have concurrence from this board that this is a policy statement that we would like to move forward with, and then the Working Group will complete their work and then come back and we'd have something that we'd formally adopt.

MR. BORDEN: I think it's a good first step, and I'm comfortable with it; given the fact that we're going to revisit the whole issue at some point with further details.

MR. NOWALSKY: I, as well, support the intent of what we're doing here. My only concern with this as written and I would be interested in feedback about where the specific verbiage came from, would be with regards to requiring full consideration of the uncertainty. I think, by its very nature, the level of uncertainty is uncertain.

I think, we, as managers, those that do the work, the public we represent, can always point to something else that we should be considering or didn't fully consider. What was the thought process to that particular phrase; and is there something else that was considered, the maximum consideration practicable; something to that regards that would allow for that understanding that it is by its very nature uncertain.

MR. McNAMEE: Great question. The idea behind that statement, I think, was to fully account for, to the extent we could, the uncertainties that are accounted for. I think that gets to Steve's question. Some uncertainties are already accounted for. We Monte Carlos sampled the output from the stock assessment.

We projected with uncertainty around parameters X, Y, and Z; and so there are certain things that we have accounted for uncertainty very explicitly, and we kind of itemized those, so we can see them. Then there are these remaining ones for instance that we don't necessarily do a good job of accounting for; economic uncertainty, social uncertainties, things like that. The idea with the statement is to lay bare what we've accounted for and what we've not accounted for; and how we deal with it at that point.

CHAIRMAN GROUT: Further discussion, further comments? What I've heard from those who've spoke, I see support for moving forward with this. Are there any objections to having the Working Group take this and develop examples, and bring back something that we can look at for consideration and potential approval at the fall meeting, or the next available meeting? Seeing none; thank you very much, Jason, for the work of the Working Group on this. I appreciate your leadership on that. Okay, next on our agenda is Lisa Havel with three reports; 10, 11, 12.

HABITAT COMMITTEE REPORT

DR. LISA HAVEL: My first report will be on the Habitat Committee. On May 11th and 12th, the Habitat Committee met in Cape May, New Jersey. They had a presentation by Dr. Ken Able from Rutgers University, reviewed the process for making recommendations to the Policy Board, reviewed the 2016 Action Plan progress, and finalized the topics and articles for the 2016 Habitat hotline, which will be shallow water habitats.

They also discussed climate change actions by state, and discussed seismic testing effects on fish habitat. This was submitted to the Policy Board in a memorandum in the supplemental materials; and I would like to go into more details about that now. Some background on seismic testing, the Habitat Committee discussed whether the effects of seismic testing warrant a position in comments by the commission.

Seismic testing includes oil and gas exploration, siting of offshore wind facilities, and characterization of sand resources. Testing uses loud blasts from air guns up to 180 decibels every few seconds for up to weeks at a time. This can cause temporary changes in functionality of areas for different species; making it a habitat issue.

This should be of interest to the commission, even if it is not a habitat issue. Seismic testing can cause behavioral disruptions in feeding and movement, which can have proximate effects on feeding and reproduction; and ultimately affect stock productivity. Impacts can be minimized if testing is timed to avoid key life history stages.

But you need more information for accuracy and precision in order to set those timings. Seismic testing can also cause injuries in marine organisms. The Habitat Committee's perspectives were influenced by comments from the Mid-Atlantic Fishery Management Council and the South Carolina Wildlife Federation. The Mid-Atlantic Council wrote to BOEM, opposing seismic testing on the U.S. East Coast, citing insufficient data on impacts to marine mammals and fisheries.

The South Carolina Wildlife Federation wrote to the South Atlantic Council, opposing offshore seismic testing and oil and gas development; and asked the council to at least protect essential fish habitat and habitat areas of particular concern in offshore waters. They also asked to designate special management zones, and send comments to BOEM and the Office of Coastal Resource Management.

The Habitat Committee recommends that the commission adopts a position similar to these organizations; and convey that position to BOEM and other entities, and we have the possibility to move this forward today. The Habitat Committee also wanted to include that seismic testing is used to locate oil and gas resources, as I stated. That can have additional detrimental effects to managed species, if oil and gas drilling does start to occur.

CHAIRMAN GROUT: Okay, we have a request from the Habitat Committee to write a letter expressing the commission's concerns about this seismic testing. I would like to have a discussion on this; and also any questions that you may have for Lisa, concerning the Habitat Committee's position on this. Tom, you had your hand up?

MR. THOMAS P. FOTE: I've been in this argument a long time, Rutgers University basically doing seismic testing off New Jersey, and they weren't even doing that; they were doing it for archeological. Under the guise of doing for climate change, they really were looking for – they want to sell the papers for oil and gas drilling, but they couldn't do that off New Jersey, so they did it under the guise of looking how 60 million years ago climate change affected them; and that was totally absurd.

But the latest one is that the Manasquan Ridge, the boats were out there doing seismic testing; not on the magnitude that Rutgers was doing, but a slow one. They were looking for sand granules and to destroy the Manasquan fishery, Manasquan Ridge, which has been a fishing hole for hundreds of years off New Jersey.

Jimmy Loveland just pointed out the fact to me that he went out, and some of you know Jimmy; he was on the Mid-Atlantic Council. He went out the week before and was getting a couple of boxes of summer flounder. Right after they did the testing, all they were getting were three or four fish from the same area.

It dramatically effects, whether it kills them or not it does move them out of the area. The seismic testing is not doing anything good for fishermen, so it is either we do all drilling or we do sand mining for this. I understand we have to do beach replenishment. Usually, I don't bring the Jersey Coast Newspaper here, but there are two interesting articles; one is from the New York Times that a book that a gentleman is putting together right now, and looking at sand mining around the world.

A lot of it is due to major construction that is going on, Singapore and other areas of the world; and how they are destroying all the reefs, all the lumps, everything that is going on. It is just not unique to New Jersey or Florida or any other place that are doing this kind of testing and mining. I'll leave copies on the table, please take a look at the article. I asked Tina, I'll send her the New York Times article so she can send it out in the next commission mailing; but I support a letter going out. If you need a motion, I'll make a motion.

MR. DOUG BRADY: I'm relatively new here. Has this been something that's been on the plate for a while, or is this the first time that this has come in front of the entire commission?

CHAIRMAN GROUT: I believe it is the first time we've had any requests like this.

MR. BRADY: I'm not necessarily opposed to it, but I'm not sure if it doesn't require some more thought if you are going to make these strong statements. This is the first I've seen it. That's just my opinion.

MR. FOTE: Over the years, we've commented on certain projects that would affect spawning areas; anything that affects fisheries, and we have written this type of letter before. In the last 25 years I remember writing quite a few, especially when all the Governors Appointees and Legislative Appointees were on the Habitat Committee. We would look at different issues like this and approve them. We do it after careful discussion and getting all the facts. But we would do letters on that. A lot of it was to protect striped bass habitat or other habitats. The same way we were looking at the dredging issues, or supporting NMFS in some of their habitat issues that they were going on and write a letter in support of them.

MR. MUFFLEY: I also would support a letter from the commission on this issue. As Tom had mentioned, it has been a very active issue in New Jersey, not just for oil and gas exploration; but as Tom had mentioned, under scientific studies in regards to climate change issues, so it has been used for other purposes.

One of the things that I would recommend that be included in the letter is the need for additional research and studies to take place; because that is one of the things we are really lacking, is to understand what these impacts are. Most of the studies that have taken place or have taken place either in laboratory settings to try to understand what the impacts are, or when they evaluated impacts to fisheries, they've been in Europe and in other locations.

We don't have anything specific to the Atlantic Coast to definitively say, what happens when this testing takes place? We have information from the fishermen, but I think we need something more comprehensive; so I would recommend that the letter also discuss the need for research to get a better understanding on the issues.

MR. CLARK: I was just curious, Lisa, did the Habitat Committee also look into coordinating with the Ocean Action Plans that are being developed in both the northeast and the Mid-Atlantic; because I know this is an issue that has come up with the Ocean Action Plan to try to coordinate planning of these type of activities, and limit where they take place?

DR. HAVEL: That did not come up at our meeting, no.

MR. PATRICK C. KELIHER: I think any letter that is written needs to insure that BOEM is going to continually keep the commission apprised of any applications that are being submitted. Frankly, I'm more comfortable commenting on, instead of a blanket statement, commenting specifically to applications that may be submitted for permitting.

I'm sure the federal agencies will be commenting on any of these, and states with coastal zone management programs through the Federal Consistency Act, will be doing that as well. It feels good maybe to send a letter, but to be very specific on specific projects may be more appropriate.

MR. BOYLES: The South Carolina Department of Natural Resources has commented to BOEM on issues of seismic testing. I would point out to the Policy Board that my agency includes both the Marine Resources Division as well as the South Carolina Geological Survey. I reside at the South Carolina Marine Resources Center, which was established almost 50 years ago to promote ocean sciences research and development.

My concern with the letter, although I understand and appreciate some of the comments I've heard around the board about impacts of testing, unknown impacts on fish species. We mentioned that in our specific comments to BOEM. But at the same time, you know, our particular proposal off the South Atlantic, we made some very specific recommendations to BOEM; recognizing that we are interested in understanding what is out there on the shelf. I'm not comfortable with this vis-à-vis the perspectives, particularly from the Wildlife Federation. I understand where they are coming from, but just recognize that my agency has got a little bit broader portfolio.

CHAIRMAN GROUT: I have a quick question for you, Lisa. Then if I know the state of New Jersey wanted to make a motion. After I get the answer to the question, if you would like to put a motion up on the board for consideration by the Policy Board; I would take that after the question. I noticed in the Habitat Committee memo that it has been documented to actually demonstrate injuries to marine resources. What kind of injuries are occurring and to what resources, when this happens?

DR. HAVEL: It has been shown to decimate larval and egg stages, and then also there are sublethal affects like affecting hearing, causing injuries to fish hearing; which can effect orientation and reproduction.

MR. BRADY: I see the perspectives influenced by comments from, I guess that's Mid-Atlantic Fisheries Management Council and the South Carolina Wildlife Federation; and that this letter may take a similar position. Are those perspectives anywhere in our documents?

DR. HAVEL: They are in the supplemental materials.

MR. PATRICK GEER: Just to let you know, the South Atlantic Fisheries Management Council, through their Habitat AP, has a similar comment letter, statement that they put forward back in April of 2015. That is available as well.

CHAIRMAN GROUT: Does New Jersey want to put a motion up on the board for consideration, or not?

MR. FOTE: Before I make the motion, let me explain a couple of points. When we asked from New Jersey, we asked them to do it in the wintertime when there is no fish on those areas that would basically be disturbed; especially when the whales would be missing and the porpoises and everything else.

They refused to do it, because they are looking at when they can do it with graduate students. They are looking at doing it in the summertime that all the fish are there. That was one of the things. Also, the LMB was supposed to do research on the effects of this. As you know, once they did the seismic, they never do any of the research projects to tell us what happened after that; as Brandon pointed out.

Maybe the letter should go along with a motion that we send complementary letters, since we're doing complementary today with the South Atlantic and the Mid-Atlantic Council, asking for any project that is approved that the research needs to take place and needs to be funded before the project takes place, and that we get answers to what goes on there.

It is like when we do dredging. We don't do dredging when fish are spawning. It should be done when the fish are not in the area. It is not my problem if it is not convenient for the guys to blast, but we're here to look after fish and what the effects on fish are. That's one of the things I think we should state in the letter. Again, I understand, Robert, and we need to get research. But we need to get research that doesn't do it during fishing seasons or that will affect commercial fishermen and recreational fishermen; or damage fish, or damage marine mammals. That's my concern here, and if you could do it at alternative times, it is probably harder in the south but it is not harder in the north. There are whole times that there is no fish out there because nobody is fishing. That is one of the ways. I haven't worded the motion; I'm not good at that. I always left it to Pat Augustine.

Doug, do you want me to make a simple motion that we send a complementary letter to go along with the South Atlantic Council and the Mid-Atlantic Council, requesting that any seismic blasting or testing takes place when fish are not in the area, as much as possible, and that research needs to be done on any project that is; and funding for that research needs to be up front before you do the project.

CHAIRMAN GROUT: Did you get that? Once we get that up, I will see if there is a second, unless somebody would like to second it as they heard it. Okay, Eric Reid will second it as he heard it. We'll try and get that up on the board and have discussion on the motion for the discussion. John, as I was asking for a motion, I saw your hand whip up. Do you have something you would like to say?

MR. CLARK: I was just going to note that the Mid-Atlantic Council has a habitat policy and kind of a set of standards to how we respond to this sort of thing, so when one of these site-specific projects comes up, we could have staff write a letter relatively quickly; fire it around to the council, get it approved, and get it out, because often the timeline on these things is such that that sort of thing is a requirement. Maybe you want to take a look at that as well as the letter itself from the Mid.

CHAIRMAN GROUT: Michelle and I see a half hand up. Robert, do you want to speak, too? Michelle first.

DR. DUVAL: To follow up on Pat's comment about the South Atlantic Council letter, which is fairly broad in nature, the council does have energy policies and attach that and a letter to BOEM. I think it was rather general. I have, wearing my agency hat here, I have some of the same reservations as Robert does about sending a very specific letter.

I think I could support a broad letter that encourages advanced communication from BOEM to the commission, with regard to projects that may be occurring along the Atlantic Coast that would have the potential for overlap with our managed species and to encourage consideration of that when reviewing applications. You know, some general language like that. I just have concerns about my ability to approve a motion that is very specific, when my agency, as a whole, is considering specific impacts on projects on a case-by-case basis.

I mean, I don't think any of us want to see any kinds of seismic projects that would significantly impact the species that we're trying to manage here, or be at cross purposes with what we're trying to do. I'm trying to find some way to finesse this into an encouraging BOEM to come to us and work with us and give us a heads up on when some of these things are coming forward. But I'm concerned about my ability to support this motion, given specifics that my agency might not be able to support.

CHAIRMAN GROUT: Tom does that say what your motion is, or would you like to consider modifying your motion so that you might get support from the state of North Carolina?

MR. FOTE: I think this is pretty broad, because all I'm saying is that basically similar letters that you sent in the Mid-Atlantic Council, but because they promise to do the research, and they never do the research, I'm asking for some funding in there. I think it is pretty broad. I don't think it is particular to any project. But if you're going to approve these types of things, this is one of the things you have to do; if you want to Wordsmith that, I am fine with that.

MR. BOYLES: I may need to clarify a comment I made earlier. If you read the letter from the South Carolina Wildlife Federation, you look at Page 2, and if I may Mr. Chairman, I would like to read it. It is our understanding that the designation of the proposed areas as SMZs would also then be categorized as EFHs/HAPCs. This categorization would provide a stronger argument for protecting these important places from activities associated with energy exploration.

We encourage the SAFMC to address the energy development issue and all potential concerns regarding fisheries. To Mr. Fote's point, again, my agency wrote BOEM with concerns; and just for the board's knowledge BOEM had earlier indicated on the South Atlantic area off of South Carolina, they did not intend to lease any areas within 50 nautical miles of the coast.

Our comments were basically; well, if you're not going to lease anything within 50 miles of the coast, why test within 50 miles of the coast. I want to be clear to the board that we are concerned because of some comments New Jersey made earlier. There are documented impacts of seismic testing on fisheries.

I read the comment into the letter, because I think it is a little -- I'm not sure that it was clear and I certainly appreciate where the Habitat Committee is coming from. But if I'm not mistaken, the context of the letter from the Wildlife Federation was to the South Atlantic Council vis-à-vis their development of spawning special management zones. It was not specific to BOEM exploration and development, and I think it is important for the Board to recognize that; and because of that lack of clarity, I just would say I cannot support the motion.

MR. JOHN M. T. BULL: Hearing the concerns expressed around the table, and I have some concerns, as well. One of those concerns is that my agency; the Virginia Marine Resources Commission, has some permitting authority on transmission lines, whether it is renewable energy or if it is traditional oil pipelines. To that end, I really feel uncomfortable about interjecting Virginia at this point; when we may have a say in a permitting role down the road.

It strikes me with the concerns that are being expressed around the table, that maybe this is better to kick it back to the Habitat Committee, to at least come up with a draft letter that we could all review; and then maybe make some suggestions on just how broad it should be or how specific it should be.

MR. MUFFLEY: I won't speak for Tom, because he may have his own thoughts, and I definitely will not be able to speak for him very well. But I don't think that Tom is indicating we need to provide a letter specifically as to what the Habitat Committee was recommending. It was not for the commission to come out on some specific policy statement as to conduct seismic testing or not to conduct seismic testing with a specific area. I think it is to raise the issues of scientific seismic testing; what our concerns are from a fisheries management perspective; and to be more informed and have an open dialogue with BOEM about those particular issues; and to also address the specific research and our lack of real good understanding of what those impacts may be. I don't think it was to say, this should not happen here or there.

I think it was just to raise the issues that this commission may or may not have in regard to seismic testing. I think it was intended to be a little bit more broad, and maybe the Habitat Committee's recommendation was to be much more specific. I'm not really clear. That is my general sense of where this was to go.

MR. ERIC REID: I did second this motion; of course, it was a blank screen when I did it, but that's fine. I did it because I wanted to have this discussion. You're talking about asking for cooperation from BOEM. You're all dreaming, every one of you. Do you think you're going to get cooperation from BOEM?

Look at the proposed wind farm area up in the corner in the entrance to New York Harbor. There was no cooperation from BOEM on that; none. To think you're going to have an open dialogue with BOEM; I'm sorry, I don't think so. Mr. Keliher, I think you're asking for things you're never going to get. But I think what this commission needs to do, and I like Mr. Bull's suggestion of putting this back to the Habitat Committee, and I would like to send a base letter.

We build bases on management plans. I would like to send a base letter to BOEM, stating that we are concerned about their seismic testing and what it may or may not do to our fish; and be ready at any moment to send a topic specific letter to BOEM at any time, any time we so please, whether or not it will fall on blind eyes or deaf ears.

We won't have any hearing left because of seismic testing, I don't know. But my intent is to have this commission say that we're concerned and then pick our battles every time there is one. But do not think for one second you're going to have an open discussion with BOEM.

CHAIRMAN GROUT: Further discussion on this motion.

MR. FOTE: I was trying to be very broad here, and broader than what the Habitat Committee, but now if you want to send it back to the Habitat Committee to get them to draft a letter, and look at what the Mid-Atlantic Council does, look at what the South Atlantic Council does; and give that as guidelines to move forward, I have no problem doing this at the next meeting. It ain't going away.

John, unlike you, where they were talking about 50 miles offshore, when they do this in Jersey they are doing it four miles from the beach. They're doing it 12 miles from the beach, they are doing it right in front of us on all the habitat that's there; because they're looking for areas they are going to sand mine and they want to do it within three miles of the beach, even in state waters.

I'm sorry to say that one of our federal agencies caved into BOEM, because they knew that these were fish habitat areas like the Harvey Cedars Lump, the Sea Isle City Lump, and they're all gone, because I got caught sleeping. I really feel bad about that because I didn't know what they were doing. Excuse me; I was getting a little carried away. By the time I became alerted that they had already destroyed three of the major lumps that were historic fishing areas off New Jersey, now I'm trying to save the last couple that are left. I mean, we're not going to replace those lumps in my lifetime, your kid's lifetime or your grandchildren's and many generations. It only takes a couple of days, and of course that sand doesn't stay there; it winds up going a mile off the beach, but it never reduces that lump that was basically destroyed. That is the only thing I'm looking at.

CHAIRMAN GROUT: **Did I hear at the beginning of your comments there that you would be willing to modify this existing motion to essentially be a general letter based on the South Atlantic and Mid-Atlantic comments that would be drafted by the Habitat Committee. That draft would be brought back before the Policy Board in the fall for our consideration.**

MR. FOTE: Yes, if Eric agrees with that. Of course, I agree with Eric. I've been dealing with Bureau of Land Management for I don't know how many years, and I've run into the same problem; they just give us the wind and they do whatever the heck they want. It's almost as bad as the Army Corps of Engineers. I don't know which one is worse.

MR. GEER: Doug, just one last thing. I sit on the South Atlantic Council's Habitat AP, and I would like to say folks at BOEM have been pretty cooperative. In fact, they have a seat at the table now on that committee. Maybe that's what, I don't know if BOEM has a seat on the Habitat Committee or not for the commission. Maybe that's one way to open that dialogue, and have the same with the other councils, as well. It has made the discussions very lively. But at least the person is at the table with us at every meeting. That's a suggestion I would have.

CHAIRMAN GROUT: That's a good suggestion, too. I know the New England Council has had regular visits from BOEM in recent years. Tom, we've kind of revised this to more of a general letter that is going to be drafted by the Habitat Committee and brought back before the Policy Board for consideration. It is up there, I think on the bottom. Is that something more general that you prefaced your original comments with?

MR. FOTE: Yes, do I have to make that as a substitute motion? I can't make a substitute motion to my motion. I don't know parliamentary procedure for that, but yes. If it is acceptable to Eric, I would basically allow that to be the motion.

CHAIRMAN GROUT: Eric, is it acceptable to you?

MR. REID: It is acceptable to me.

CHAIRMAN GROUT: All right, sorry Dennis for not following my parliamentary procedure here, I know it's a motion of the full board. But I'll try to do a little better job next time.

DR. DUVAL: I think, if we could just add a few words indicating for review by the Policy Board at its next meeting; I think that would sort of complete the thinking. The way it is written now it almost sounds like they are going to draft a base letter, and then that letter is going to run off somewhere and we're not going to see it. I just want to make sure for everybody that that is clear.

CHAIRMAN GROUT: Is that okay with the maker of the motion and the seconder? Any other discussion on this?

MR. MUFFLEY: Not to the specific motion, but I want to be clear that I like Pat's suggestion of maybe, I don't think it needs to be reflected in the motion, but that the letter will if this group agrees, to invite BOEM to be a member or attend future Habitat Committee meetings or something to that effect. But I think that was a good idea; and I think it could be addressed in this letter, as well.

CHAIRMAN GROUT: Further discussion; okay, seeing none; I'm going to try this. **Is there any objection to this motion? Seeing none; the motion is approved, and we'll look forward to a draft letter at our fall meeting.** Boy, that fall meeting is getting full. All right, Lisa, next item.

UPDATE ON THE SCIAENID HABITAT SOURCE DOCUMENT

DR. HAVEL: Moving on, a brief update on the Sciaenid Habitat Source Document, we contracted Dr. Alison Derry to finish the first draft of the document. It was written and it is with the Subcommittee currently for editing; it is on track to be presented at the annual meeting, so it is getting even more full.

Finally, for the Habitat Committee, we provided comments on NOAAs Atlantic sturgeon critical habitat designations. Some members were excused because their states were already providing comments; but overall the Habitat Committee found the designations complete and factual, with minor comments. These comments were represented at the Atlantic Sturgeon Management Board meeting yesterday. With that, I'll take any questions.

CHAIRMAN GROUT: Any questions on the Habitat Committee report? Okay, seeing none; Artificial Reef Committee report.

ARTIFICIAL REEF COMMITTEE REPORT

DR. HAVEL: Moving on, Artificial Reef Committee, we had a joint ASMFC/GSMFC meeting March 14th and 15th in San Antonio, Texas. We have three new state representatives on the committee; Bradley Ennis from Florida, Alicia Nelson from Virginia, and Jason Peters from North Carolina. We were given presentations on reef monitoring efforts and Rigs-to-Reefs in the Gulf of Mexico, presentations on fish aggregation devices and artificial reefs in Japan.

ACFHP gave an update on the black sea bass habitat project, and I'll provide some of those updates in the next update to you all, and there are also state updates at this meeting. The Florida Fish and Wildlife Conservation Commission is jointly hosting a symposium at the American Fishery Society meeting in 2017 in Florida, and I will be serving as the commission representative on the Steering Committee for that symposium.

Our next meeting is February 7th and 8th in Florida, most likely Jacksonville. ASMFC and NOAA co-hosted a two day national artificial reef workshop here June 9th and 10th, here in Alexandria, Virginia. It was attended by approximately 70 people from around the nation, representing federal, state, nonprofit, commercial and recreational fishing entities.

The objectives were to give an overview of the current state of the science, identify considerations for reefs as a management tool, identify challenges and needs for implementing artificial reefs, and discuss the potential for partnerships. There were presentations, panel discussions and weld café discussions. Topics included the history of artificial reefs, the potential as a management tool, the regulatory framework, NOAAs ecosystem-based management policy, regional accomplishments and challenges, current and future science, and looking towards the future. The workshop summary will be released this week. That is it for the Artificial Reef Committee, and I will be happy to take any questions.

MR. CLARK: I was just wondering if the Artificial Reef Committee is going to develop a policy on special management zones at artificial reefs. I know Delaware went through getting reefs designated as SMZs, and I believe New Jersey is interested in it now. Just curious if there was a policy being developed.

DR. HAVEL: South Carolina also has some as well. We are not currently working on a coastwide policy. But if that is something of interest to you, we can definitely talk about that.

CHAIRMAN GROUT: Other questions? Okay, ACFHP.

ATLANTIC COASTAL FISH HABITAT PARTNERSHIP REPORT

DR. HAVEL: Finally, a brief update on the ACFHP progress that we've been making over the last couple months. The ACFHP Science and Data and Steering Committees met in Cape May, New Jersey, May 9th through 11th, and we mostly discussed our conservation strategic planning; 2017 to 2021 will be the new five-year conservation strategic plan.

We are very busy this year working on updating it. Our Species Habitat Matrix was published in Bioscience, and we're working on our website for the Species Habitat Matrix. I am going to give a brief update on the black sea bass habitat progress since the last time I gave a presentation. We received a grant from the Mid-Atlantic Council to support habitat research in the Mid-Atlantic, and we awarded this grant to Dr. Bradley Stevens from the University of Maryland, Eastern Shore.

His project was titled Hab in the MAB: Characterizing Black Sea Bass Habitat in the Mid-Atlantic Byte. The contract has been signed and we're currently working on a press release; that will be released this week, likely. An update on our eelgrass conservation project, we received a grant from NOAA to replace traditional boat moorings with conservation moorings in Narragansett Bay.

This reduces eelgrass damage, increasing fish habitat. Monitoring has taken place this summer and the sign has been installed, so this project is complete. I will be presenting the results at Restore America's Estuaries meeting in December in New Orleans. Here is a visual of the sign that has been installed for everyone that walks by the estuary.

We received funding from NOAA to complete a Southeast Fish Habitat Mapping Project, and this is to spatially prioritize fish habitat protection and restoration sites using JS mapping and analysis. We were looking at habitat threats, fish presence/absence data, and existing or historical maps. This mapping project will take place from North Carolina to Florida.

Using our NFHP U.S. Fish and Wildlife funding for fiscal year 2016, we're going to be putting that funding towards ACFHP operations, a northeast napping project to complement the southeast mapping project that is being funded by NOAA; and also we are putting money towards the Bradford Dam Removal in Westerly, Rhode Island. This will open up 32 miles of spawning habitat and nursery fish habitat; benefitting shad and river herring, among other species. For FY2017 for the NFHP U.S. Fish and Wildlife funding, the announcement will be released August 11, and the deadline to submit proposals will be September 22. We'll be recommending proposals at the fall meeting in Maine. ACFHP would like to thank ASMFC for your continual operational support, and I'll take any questions.

CHAIRMAN GROUT: Questions of Lisa. Seeing none; thank you very much, Lisa for all three of those beautiful reports.

OTHER BUSINESS

MANAGING RESOURCES FOR THE BENEFIT OF ANOTHER FISHERY

CHAIRMAN GROUT: Next item on our agenda is Managing Resources for the Benefit of Another Fishery; Commissioner White.

MR. WHITE: I'll try to be as brief as I can. I'm going to have to educate all the commissioners that don't know about Atlantic herring on the complexities of Atlantic herring management before I get into the issue that concerns me. I'll try to go through it quickly. If anybody has any questions interrupt me, or if the northern three states that are involved in this feel that I left something out or I'm stating something incorrectly; interrupt me while I go.

Atlantic herring is managed jointly with the New England Fisheries Management Council, with the council involved in fishing and the commission involved in landings. Service sets the total annual catch limit, which is then divided across four management areas; we have a slide showing those areas.

The Service has seasonal limitations on allowable gear types in Area 1A, and Area 1A is the area that I'm going to talk about. January 1 to October 1, midwater trawl vessels, which are large hundred foot plus vessels, are banned. January 1 to July 15, small mesh bottom trawl vessels, mostly 50 feet and under are banned; and then allowed in specific areas off of New Hampshire and northern Massachusetts coast, where groundfish are not normally found.

They harvest very small volumes of herring. January 1 to December 31, purse seine vessels are allowed, and many use midwater trawl vessels as carriers. The Section then has divided the 1A quota into trimesters. Trimester 1, January 1 to May 30, there are no landings allowed. Trimester 2, January 1 to September 30, 72.8 percent of the quota is harvested, and Trimester 3, October 1 to December 31, or until the 1A Sub-ACL has reached 27.2 percent.

That is all done, nothing to do with herring management, only to do with lobster. Section further regulates effort by determining a number of landing days allowed each week by authorizing the three northern states, Maine, New Hampshire and Mass, to make in-season-landing-day adjustments. In addition, Section closes three defined areas within 1A when spawning is occurring.

Generally, these closures begin in eastern Maine and move down the coast through western Maine and Massachusetts/New Hampshire. The management of landing days, other than for spawning closure, is for the purpose of providing a steady flow of lobster bait for the lobster industry. This is the reason harvest is not allocated in the first trimester, as there is little lobster fishing during the winter.

The lobster fishery needs more bait than Area 1A quota provides, so it depends on landings from Area 3, and importation of menhaden from the south. The majority of herring is used for lobster bait, but it is not the exclusive use. The states of Maine, New Hampshire, and Massachusetts limit landings days to provide a steady flow of bait; often changing the landings days multiple times during the second and third trimester, going from seven days down to one or two or vice versa. This year a number of circumstances have created a severe lack of lobster bait. Industry stockpiles bait in coolers and freezers from Area 3 late in the fall to be ready for the beginning of spring. Last fall the herring fishery was closed early, in August, due to bycatch of haddock in Area3, therefore coolers were not filled to the level that they normally were.

During the second trimester currently ongoing, very little landings have been available from Area 3, because of haddock mixing with herring. The midwater trawl boats are not out fishing in Area 3. The purse seine fleets has added capacity as a few midwater trawl vessels change gear type and are now rigged with purse seines, which allows them to fish in Area 1A during Trimester 2.

This added effort provides the fleet with ability to harvest the entire Trimester 2 quota very quickly. The issue that concerns me, I believe the Atlantic herring fishery is the only fishery that the commission micromanages. When I say, that we're going to be starting an addendum that could regulate when a boat can land and how much a boat can bring into land on a daily basis; for the sole benefit of an industry involved in a different fishery, being lobster.

The commission is picking winners and losers in both the harvest of and the sale of herring for bait. Some large businesses would favor harvesting at a faster rate, and freezing the catch; while the smaller dealers and lobstermen want fresh bait on a steady basis. This year the quota would have been harvested prior to the commencement of spawning.

Since we have slowed harvest, the spawning closures will take effect this year. I believe this has a potential negative impact on herring resource, as the spawning closures are not perfect. Is it an appropriate role for the commission to be involved in managing the herring fishery for the benefit of the lobster industry, and making decisions that affect businesses that have nothing to do with herring management?

Is this the obligation of the commission, or should the states of Maine, New Hampshire, and Massachusetts be taking on this role? Commissioners have requested the Section begin an amendment to have the ability to limit amounts landed, as I said earlier, amounts landed on a daily and/or weekly basis per vessel, or per carrier.

I request the Policy Board consider establishing a policy to guide the Atlantic Herring Section going forward to either endorse what we have been doing, or making the recommendation that the Section should not be managing in this way, and that it is up to the three northern states to take on this role.

CHAIRMAN GROUT: Ritchie brought this item up at one of our Days Out meetings, and had asked that this be put on for the Policy Board to get our input on this. Again, what he's looking at is this. The question is, is it the role in commission management to be managing a resource for the sole benefit of another fishery? I have Dennis Abbot and any other comments we would like to have on this. Pat will be second.

MR. DENNIS ABBOTT: Just to add to what Ritchie said, every year we go through this exercise of setting the number of landing days. Although we set the landing days, we don't set the fishing days, and these large boats with refrigeration fish more days than there are landings days. Although this year Maine has closed the loop for Maine licensed boats to only be able to fish on those days.

We go into the year, also, not knowing how many vessels are going to be fishing. We don't know how many carriers are going to be fishing, and as a result we're trying to provide a steady supply of lobster bait for the Maine fisherman. It gets to be a more difficult task, as Ritchie described, every year.

MR. KELIHER: The state of Maine has a billion, with a B, dollar lobster fishery. In order to ensure that we have steady access to bait, we have had to micromanage this fishery. I think it's very appropriate that we do so. Area 1A does not come close with the total quota that it has to thoroughly supply bait to the fishery within New England; let alone, the state of Maine.

We now have a capacity problem. The capacity problem in my mind is related strictly to Area 3, where midwater boats are not fishing because of haddock bycatch issues, and waiting as late into the season as possible. What they are doing now is coming in to Area 1A to become carriers for the seine fleet.

Based on what we saw in June this year, the size of the schools, the availability of those schools to landing ports in both Rockland and Portland, we very likely would have exceeded the Area 1A quota in late June or early July. It was imperative that we take those type of micromanagement steps; yes, to benefit the lobster fishery.

Again, I appreciate the concerns being raised by Ritchie, but I disagree with the premise that -- I'm not saying he is saying we shouldn't be doing it, but I'm not sure that it is accurate that we don't frankly do it in other areas. I mean, all of the management that we do is to benefit one sector or another. This one does cross over into lobsters; but again, the importance of this fishery economically to the state of Maine shows me clearly that we need to do that.

MR. ADLER: The Massachusetts lobster fleet is involved in this too, and it is in need of the bait, as well. My concern if we abandon the current way we do things, and nothing is perfect but we try very hard with the three states, to get it right or close to. But my concern would be if the Atlantic States Section divorces itself from what it is doing.

If the states are told they can do what the Section does, I would think that if they were going to assign the states the ability to do basically what we do now, any amendment or addendum or whatever to the herring thing, I wouldn't want the wording to be that those states can't do what they feel is appropriate to manage this herring and supply the bait. I would just be concerned.

It wouldn't be so bad if the states could do it, if they would basically be doing what we do now; but we call it a Section. I wouldn't want an ASMFC plan, addendum, amendment, to restrict what Massachusetts, New Hampshire and Maine have been doing all along. I'll stop there for now.

CHAIRMAN GROUT: Okay, I have Ritchie, Dave Simpson, and Dave Borden.

MR. WHITE: I would like to clarify a little bit, and I know that I've had a hard time explaining this. First off, I would see if the commission felt that the three states should be doing it. I think the Section would allow seven days of harvesting. There is nothing in the herring resource that would not allow the herring resource to be called quickly; and it would probably be better for the herring resource if it were all harvested before spawning.

Then the states can always be more conservative, so the three states then through their licensing of these vessels, as the state of Maine did this year, could then make the decision that is a business decision, of slowing this up. My thinking is, what if something was found in herring that helped cancer; and all of a sudden an industry said, we need this and we need it during the winter.

Then what if Atlantic States, all of a sudden, says, okay, we're going to shift. This is a more important use than lobster bait, and we're going to make sure it is all harvested for this new industry, and it is all going to take place in January and February. I mean that is the same principal as what we're doing here. It would be the same as the menhaden board saying we're going to limit New Jersey's bait harvest, and we don't want them to catch it as fast as they do; because we need more to go to the Maine lobster industry.

That is the principal I'm coming from. I had a number of large bait dealers from Maine at our previous meetings, because I've stated this a number of times at our meetings, come up and say you're totally correct that the government shouldn't be involved in making these business decisions; but we need you to keep doing it. Anyway, I hope that is more helpful.

MR. SIMPSON: I've never quite understood the Section's role in management of sea herring since you are all equally represented on the New England Council, and the New England Council is setting the quotas, which determine how much can be removed and no more. I am concerned where you finished off, why we would get involved in the marketplace.

My understanding of the sea herring fishery is that the overwhelming majority of it goes to bait. I think there used to be more human consumption, but there is very little of it now. Wouldn't that take care of itself, and shouldn't it take care of itself? There is a supplier providing product to a user, and you would think the marketplace would self-adjust.

If we're going to tinker with the timing during which fishing operations occur, I would think we, as a commission, would want to focus our comments and direction on things like bycatch of river herring; other considerations, ecological considerations not economic ones or micromanaging a marketplace. I just am concerned about getting involved in that aspect of private enterprise.

MR. BORDEN: Philosophically, I like the idea of the government staying out of micromanaging businesses. But I think the reality is we all kind of tread a narrow line on this issue. If we were to just look at the value of the herring fishery and we compare it to the value of the Area 1 lobster fishery, I think the lobster fishery is worth 450 million dollars; Pat probably knows better than I do, but somewhere around there.

The herring fishery is worth a fraction, a small fraction of that. I think the issue that Ritchie is raising is valuable, in terms of a discussion, but to me it's kind of a multifaceted problem. If you look at it, I mean, it's a bait crisis is what is happening in industry. It's unfortunate that Steve Train isn't here to comment on it.

The things we do in the herring fishery, the things that we have done in the ground fish fishery, the cuts in menhaden historically, and the cuts next year in terms of the skate allocations, all have an impact. That is all bait that is going in to various lobster fisheries; whether they are inshore or offshore. I mean the other contributing factor here is there has been a rapid acceleration in the number of traps in the Gulf of Maine. You only need to look at Canada, Nova Scotia where they fish 350 to 400 traps. The industry easily can catch the same amount of lobsters that they can with 800 traps, and they use a fraction of the bait. There are a lot of different ways you can look at this. I think it is a worthwhile discussion. I'll be interested to see where it goes, though.

MR. KELIHER: Just for clarity's sake, the regulations that we put on the books this year were asked for by both the herring industry and the lobster industry. Both of them knew the fact that we needed to micromanage; in fact during the course of the winter the seine fleet saw that we were going to be having this issue.

The fact that they knew they needed to be managed and micromanaged, I think, says a lot. They know that they need to avoid a big glut of bait at any one time. It would not be able to be absorbed, and to be able to stretch bait out to help alleviate the shortages that David mentioned, was critical. I think I'll avoid making any comments on trap reductions on the microphone.

MR. ABBOT: It is unfortunate that Steve Train had to leave. At the LGA meeting I asked him how lobster fishing was, and he says right now it is really kind of lousy. He said part of it is because of the imposition of landing day restrictions by the state of Maine, in trying to do the right thing and trying to supply a steady amount of bait.

The price of a barrel of bait has gone from approximately $60.00 to $130.00. It has more than doubled; that is what the market has done. We pull on one end and it comes out the other end in a bad way. I just wanted to add that; that the price of bait has gone crazy this year, and he also added that down east Maine are catching so many lobsters, their profit margin is different and they don't mind paying the higher price, because their catch is so much greater this year as it was last year.

CHAIRMAN GROUT: I'm going to go to Dan, and then I would like to see if there is any discussion from people outside of the Herring Section region about this, whether they have any input one way or the other; because it does seem like this is turning into a Section meeting, or at least a northern states discussion of this. I was hoping if we brought this forward, it would be something that the full Policy Board would be discussing. But Dan, go ahead.

MR. DAN McKIERNAN: I regret that David's not here, he also had to leave, but he has been working in herring for about 40 years and I don't have that experience. But it seems to me that there is a question of governance that takes place here; that if it is not a Section vote, and it is just a three state gentleman's agreement, then I don't think in the future you would have the unanimity among the parties, or the potential for one or more states to break away.

Am I right to assume that because it's a Section vote, the states go back and they tell their bosses, I need to condition this permit or I need this rule, because the Section took this vote or else I'm going to be found out of compliance. Is that the essential question here as to why we do it through the Section, versus just a three-state agreement?

CHAIRMAN GROUT: Because we're managing this as a resource of a whole in this particular management action that we approved, essentially delegated authority to do these days out to limit the days fishing, just to the states that have landings from Area 1A; because that is really where it is. It was supposed to be, I believe, and the plan says it is supposed to be a unanimous vote, because it is supposed to be a consensus, because it is not a full section voting on these things.

MR. McKIERNAN: But are they not mandatory measures by the Section measures to adopt?

CHAIRMAN GROUT: We agree to all put those in.

MR. McKIERNAN: And if we don't?

CHAIRMAN GROUT: We would be found out of compliance?

MR. McKIERNAN: That's what I'm asking.

CHAIRMAN GROUT: Because it is part of the management plan. Any discussion from other board members? Yes, Adam.

MR. NOWALSKY: Well, I think the question I have is, is there a recommendation from Ritchie or somebody else as to what the actionable item would be here that we could weigh in on. I think the goal of getting input from the Policy Board as a whole is to get another set of eyes on this, per se. Okay, hear what you're saying. What would you propose do that we could give some feedback on?

CHAIRMAN GROUT: You can go ahead and say it. I have it written down that you were looking to consider either establishing a policy to endorse the management that we're currently doing, or should the Policy Board develop a policy that would direct the Herring Section to discontinue that type of management.

That is what Ritchie is looking for. Does the Policy Board feel this is something that they should weigh in on? Clearly, Ritchie feels that we should be out of this type of management. You've heard input from others that say we shouldn't be. Tom.

MR. FOTE: Are we manipulating the price of herring? Are we raising the price of herring to $160.00 a barrel to basically benefit certain sectors of this and disadvantage to other people? That's what I'm trying to figure out here, and I don't think that's our business. I don't think that is the Herring Section's business. I don't know. That is what I'm trying to figure out here from listening to the conversation, since I really don't attend the Herring Section meetings that often.

CHAIRMAN GROUT: There might be differing opinions on that. Pat, go ahead.

MR. KELIHER: This is a supply and demand issue. There is not enough supply, so the demand is very high, so the price of bait has gone up. They've been limited to 15 trucks for the week. In order for these boats that some are costing 3 to 4 million dollars a piece with operations and crews; they've had to raise the price of bait.

Did they raise it too high, probably? We're not saying what you've got to charge for bait. We're controlling the supply, knowing that the price was going to go up. If we had of caught it all up in June or early July, the Maine lobster industry would have been in a terrible, terrible situation. That would have been a bigger economic disaster than having to pay a high price for bait.

CHAIRMAN GROUT: Does the board want to weigh in on this with some kind of an action?

MR. SIMPSON: Despite what I said, I think not. I think what I would want to know is the commission process is that based on the fact that I heard there seems to be agreement from both fisheries that this is a good idea. I think when you develop these plans, if you're going out for public comment, you're considering both sides.

That, I think, would satisfy the commission's role here. I have philosophical beliefs that would suggest that we back away from managing these fisheries like we own them, and they're our business and we're going to meter out catch to satisfy another user that we manage. I think if there is a public process and you honor the balanced comment, then I think that is as much as the Full Commission should be concerned about.

MR. BORDEN: With your agreement, I would like to ask Ritchie a question if that's all right.

CHAIRMAN GROUT: Go ahead.

MR. BORDEN: Ritchie, you mentioned the groundfish haddock bycatch issue. To what extent has the Section thought about formalizing a recommendation that that bycatch allowance be raised? My memory of our catch performance in haddock is, I think, we're only catching 15 or 20 percent of the TAC. We've got record year classes in the fishery, so do we need to be this restrictive? If that is forcing the Area 3 boats into Area 1, then couldn't we encourage that by liberalizing the bycatch allowance?

MR. WHITE: The last thing in the world that I would want the commission to get involved in is groundfish. Since we're not, I have no ability to make any comments on haddock, because I'm not involved in that process, and we ought to stay out of it. But I mean that is clearly part of the problem.

I'm not saying that what we're doing should not take place, because I think the three states that are now doing this, and we're saying the Section, but this is not being carried out by the Section. This is being carried out by a subset of the Section; it is only Maine, New Hampshire and Massachusetts that are doing this. It is not always consensus when we pick the days.

The last time we altered the days, which was a couple weeks ago, Massachusetts did not agree with New Hampshire and Maine, and it was a two-to-one vote, and it went that way. But Massachusetts wanted more days and the other states decided against that. You have three states that are acting for the section and for the commission.

It is a public process. We hold either an in-person meeting or a phone meeting with the public; so it is an open and public process when we do this. I'm not suggesting that this shouldn't be done. It is a huge lobster industry, it is a lot of money and that needs to take place; but is it the commission's role to do it, or is it the three states that now do it, is it their role within their own regulations?

Maine went more conservative than the commission this year, and implemented trip limits down to the day and down to how many trucks a boat could bring in. They have the ability to do that for their licensed boats. If New Hampshire got the same regulations and Massachusetts got the same regulations, then those three states, if they all agreed, can be more conservative than the commission, and implement these kinds of regulations. That is my question. If the sense is that the commission should be doing this, and this is a proper role for us, then fine; and we'll continue on the way we're doing it.

CHAIRMAN GROUT: Okay, it's ten after five right now, I would like to see if there is going to be anybody from this Policy Board that wants to make a motion that would be a formal recommendation on this. If not, I think we've had a very thorough discussion of this. The discussion has been centered around the Section members.

Potentially, if the board does not have a mind to make a recommendation here, then maybe it is something that should be put up at the Section as a management action for recommendation. Is there anybody on the board that wants to put up an action here?

CHAIRMAN GROUT: Okay, seeing none at this point, we've had a good discussion on this and we do have a couple of other items under Other Business that we need to address.

LETTER TO THE MID-ATLANTIC FISHERIES COUNCIL CONCERNING SHAD AND RIVER HERRING STOCKS

CHAIRMAN GROUT: The first item is a letter. John Clark, I think you were looking for consideration of this commission sending a letter to the Mid-Atlantic Fisheries Council concerning shad and river herring stocks in the fishery.

MR. CLARK: I know the last thing we need is another agenda item today. Unfortunately, the timing on this one won't wait. In summary, Mike Luisi, who is the Vice Chair of the Mid-Atlantic Council, is here. I believe the Mid-Atlantic Council will be considering their management actions for shad and river herring at next week's meeting; and then they will be making final decisions before ASMFC meets again for the annual meeting.

Based on that, I thought based on consultations with Bill Goldsborough, the Chair of the Shad and River Herring Board that it would behoove the Policy Board to perhaps send another letter to the Mid-Atlantic Council, as we did back in 2012, when this was last considered by the Mid-Atlantic Council.

I guess at that time we sent a letter that raised our concerns, discussed all the efforts and sacrifices the ASMFC states had made to try to restore shad and river herring, and asked that all management approaches taken by the Mid-Atlantic Council would be, I believe the words we used were complementary and joint management approaches for these. Before we get into the specifics of what we would like in a letter, I think I would like to turn it over to Mike to ask what the Mid-Atlantic Council is considering at this time.

CHAIRMAN GROUT: Go ahead, Mike, and then Toni has a comment.

MR. MICHAEL LUISI: Wearing my other hat as the Vice-Chairman of the Mid-Atlantic Council, I think I can clarify very quickly where the council is in their discussions on shad and river herring. Three years ago the council took up the question about whether or not they wanted to consider shad and river herring as a council-managed species.

At the time they determined that it was neither required nor appropriate three years ago; however, they committed to revisiting that three years from then, which is putting us to the time period where we currently are. In the meantime a working group was established composed of regional, state and federal management partners; to address shad and river herring mortality.

Caps were set, there was no assessment work, there was no science driven work that would set harvest limits for shad and river herring; but that commitment was to revisit that issue in three years. On top of the council's commitment there were orders from the U.S. District Court that with some guidance as to how the council would take up the issue again; in reconsidering whether or not shad and river herring would be a council managed species. I think, where we are currently, between the commission and the council is that there are two issues.

One is, whether or not the commission wants to urge or write a letter suggesting the direction that the council should go in, regarding whether or not they continue the more ad hoc approach to managing shad and river herring, or do they take shad and river herring up as a managed species; which would essentially put that into a fishery management plan, for which ABCs would be set and there would be more management control centered around the science-based approach.

A white paper directing the council on that question was just sent out to us all just a couple days ago, so I have yet had the opportunity to review that paper. There is no plan to discuss this as clarification from what I think, I mentioned to John before, there is no current plan to discuss this at next week's council meeting.

The Shad and River Herring Committee will plan to meet the following week via webinar, I believe, to discuss the white paper and set forth the path for our October meeting; where the final decision will be made as to whether or not the council takes shad and river herring on as a managed species.

Now if they do, if the council goes forth with considering shad and river herring as a council-managed species, then I think the question comes as to whether or not the commission would suggest to the council either joint or complementary management measures going forward for the future. But right now, we're kind of in a limbo as to whether or not the council is going to maintain this ad hoc approach, which they would not have an FMP and would essentially continue working with this working group to address shad and river herring mortality.

That could be the path forward. We won't know until October. I don't know where to leave that as far as any decision here as to how this commission would like to help inform the council on their position. There are two positions. Should they take up the species as a managed species, and if so, perhaps a joint or complementary action should be considered. If any of my colleagues around the table here, who sit with me on the council, know anything differently from what I just said, please feel free to correct me. Thanks.

MR. CLARK: Thanks, Mike. Thanks for filling that in. It really does sound pretty much exactly like the situation we were in back in 2012 when this last letter was written, because the letter that the Policy Board did send to the council was stating the concerns of the commission about management.

At the time this one was written, it wasn't known yet which direction the council would go in on the management. I would say maybe the thing for the Policy Board to even just revisit the letter from 2012 and update it perhaps with some more recent information, and send it to the council just to urge action be taken on this issue.

CHAIRMAN GROUT: What is the pleasure of this board? Do we want to redraft the letter that we sent three years ago with more current information? Is there a way that we could send that letter out to the Policy Board, because some members were not originally on the commission at that time?

EXECUTIVE DIRECTOR ROBERT E. BEAL: Yes, 2012 seems like a long time ago sometimes. We can circulate the old letter and we can provide some updated information and maybe circulate sort of a track changes edited old letter to the Policy Board, with some updated information and things that have occurred since the last meeting; and see if that meets the need of the Policy Board. Then the committee is meeting, I think on the 18th, is that when it is? I don't know if we can get it turned around that quickly, but if so we can submit the letter before that meeting.

CHAIRMAN GROUT: Isn't the importance, and Mike and John, you can comment on this. Isn't the importance that we get the letter before the October meeting?

MR. LUISI: Yes, thank you. I think that is the important date, is to get a letter, if the Policy Board wants to send a letter to the council before their final decision; which will be in October. But I do want to just mention though, and it's been too long since I've seen the letter from 2012.

But if the 2012 letter was suggesting action, so prior to 2013 there was no action being taken by the Feds on river herring and shad management. Since 2013, like I said, it is not a council managed species, but action has been taken. In the update, just understand that action has been taken. It is whether or not we go to the next step in that action and consider it as a council- managed species.

MR. BEAL: My recollection is the last time we talked about this there was a direct conversation of, should ASMFC support a stock in the fishery designation or not; at the Mid-Atlantic Council, and we were split on that as a commission. I'm not sure without another vote or some other indication; I'm not sure how we include that yes or no regarding stock in the fishery in a letter, unless we get some more guidance from this group or the Shad and River Herring Board or something.

CHAIRMAN GROUT: But we did send a letter that did not take apposition then on stocks in the fishery. We did not take a position. Go ahead, John.

MR. CLARK: Ashton and Bill sent me the letter, and it did not take a position. It didn't urge the council to go into the stocks in the fishery. It more or less outlined the approaches that the commission would like to see when the council did start managing shad and river herring. For example it said, clearly detail the process by which ACLs and accountability measures would be set.

The commission prefers that ACLs and accountability measures apply only to catch and bycatch in federal waters. If this is not legally possible, the commission requests that it be the responsible party for determining any in-river portion of ACLs. The impacts of inconsistent federal and state water regulations on existing river systems, specific conservation measures, and regional approaches that are being considered; and t0hat type of recommendation was made by the letter.

CHAIRMAN GROUT: I would suggest that staff, a course of action here would be for commission staff to re-circulate an updated version of this letter for comment and input by the Policy Board. Once we get back that comment, any significant changes should be included in there and then send it out for an e-mail poll, as to whether we send it or not.

MR. WHITE: Might another option be to write a letter asking the Mid-Atlantic Board to delay making a decision, and then we send this to the Shad and River Herring Board for their recommendation back to this Policy Board; so that we can kind of fully flush this out. I just don't get the feel that we're kind of rushing this along without figuring all the ramifications.

CHAIRMAN GROUT: Do you have a comment Mike, on the timing?

MR. LUISI: Yes, I do. While it was a council commitment to reconsider this action, I did state that we also received orders from the U.S. District Court; and the U.S. District Court expects an answer by October. We don't have any opportunity to delay.

CHAIRMAN GROUT: That had sent up a whole series of hands. I originally had Emerson and then was it Adam; no, you're all set. I'm going to go with Emerson first, but I just want to know who's on deck.

MR. EMERSON C. HASBROUCK: Just having heard a brief synopsis of the previous letter that John just read off a couple of minutes ago; that got into some detail about what should and should not happen with ACLs and how they should be implemented and where. To me, that is quite a bit of detail that I think is premature at this point in time. That might be appropriate after we find out what the council's decision is on this, but I wouldn't support sending a letter with that type of detail in it right now; because we don't' know what the Council is going to do.

MR. NOWALSKY: I was going to suggest that staff request from the council staff, Jason Didden in particular, to get a copy of the documents that the River Herring and Shad Committee is going to be reviewing. Make those available, and the webinar will be open to the public on the 15th, and anybody here would have the opportunity to listen in.

Perhaps, a member of staff here could as well take notes and circulate any potential actionable item that this board could take up, the commission could take up via e-mail or something prior to what the council has to do in August. I'm not sure there is anything else the commission could do at this point.

CHAIRMAN GROUT: John.

MR. JOHN McMURRAY: Yes, almost of what I was going to say –

CHAIRMAN GROUT: Oh, sorry I was asking who wanted to be in the queue and I didn't see your hand up, John. I'm sorry. Go ahead.

MR. GROUT: Sorry about that. Yes, well most of what I was going to comment on and ask has already been covered. But I would be, of course, in support of the commission weighing in here, but I think at the very least you guys have to get a look at the white paper. I mean, we just got it and we haven't really had a chance to look at it yet. That would probably need to be a requirement before you guys wrote a letter. Of course, timing is an issue, so I don't know how it's going to work.

MR. CLARK: Yes, I just don't want to give everybody a complete sense of déjà vu here, but one of the first paragraphs of the letter said; given that the Mid-Atlantic Council has not yet determined whether it will move forward with Amendment 15 to designate shad and river herring as the stocks in the fishery, it is difficult to provide specific recommendations at this time. We were pretty much in the same boat in 2012. At the same time we did at least urge them the actions that were most important to the commission.

MR. NOWALSKY: I'll just add that in those documents that the council has already put together, one of them being what's called a Draft Decision Document, a little bit longer than what you might typically think of, a page or two cheat sheet. It has a section that contemplates interaction with the ASMFC moving forward.

It talks about joint or complementary management, similar to species we've talked about earlier. I would add that the council is well aware of the commission's interest in the species, and is taking those previous comments into consideration; and weighing those in how to work together moving forward.

CHAIRMAN GROUT: What is the will of this board? I've suggested a way forward. There have been some alternatives that have been put forward, as far as moving forward. One, the way I suggested was to reiterate and update some of the items in the original letter, and have it circulated to the board for any comments.

Then have a vote on it. There have been suggestions that that should wait until the white paper has been reviewed, and then get comments on the board from the white paper. I think one of the difficult things we have to deal with here is that we're not meeting between now and when the council takes up, so we have to try and develop a course of action today; if we're going to take action.

Adam just alluded to the fact that we already sent a letter and it sounded from his perspective, the council was taking into consideration the items that were put forward in that letter three years ago. Maybe we don't need, to reiterate the letter. Would there be any objection to resending a letter that is revised, in the way that I had suggested? Emerson, you're objecting?

MR. HASBROUCK: Yes, because I'm not sure what that letter is going to do; other than what has already been done. If the information we have is that in the council white paper, there is a section about how if the council decides to go forward with shad and river herring, a species in the plan; that there should be coordination and collaboration with the commission. What more are we expecting the council to do, other than to acknowledge the fact that if they go forward they should do it with us?

EXECUTIVE DIRECTOR BEAL: I tend to agree with the notion that the coordination is already there. We've got obviously a number of states that serve on the Shad and River Herring Committee, and then obviously on the Full Council, and then I serve on those, as well. I think the only sort of new piece of information we could provide is, does ASMFC support adding shad and river herring as a stock in the fishery; and I think that is where we were split in the past, so I'm not really sure how to move forward without a clear direction on that. But I think the coordination part seems to be handled pretty well already; in my opinion, anyway.

MR. MUFFLEY: I agree with, I think, where Emerson and Bob went. To me, I don't know what the point of sending another letter addressing general concerns may be; since we're in generally the same area we were in 2012. To me, the point of a letter would be to either support or not the Mid-Atlantic Council in making stocks in the fishery for shad and river herring. That would be the point of a letter. Otherwise, I'm not quite sure what we're going to accomplish.

CHAIRMAN GROUT: Okay, then I'll try the opposite. Is there any objection to not sending a letter? There is an objection from you, John?

MR. McMURRAY: Yes, sorry.

CHAIRMAN GROUT: Okay, then I need a motion one way or the other, John.

MR. McMURRAY: Well, Mr. Chairman, I am not ready to make a motion. I would just offer the suggestion that there is obviously going to be some new information in this white paper. I can't tell you what it is, because I haven't looked at it yet. But it is probably something that the commission is going to want to weigh in on.

MS. KERNS: Doug and I were just side-barring, and how about this as a way to move forward. I've just asked for Jason to get a copy of the white paper to distribute to the Policy Board in an e-mail, and we can distribute that as soon as I can get a copy of the white paper. Then we'll have a member of commission staff listening in on the call the week after the council meeting; and we'll write up a summary of that call.

Then depending on their recommendation, we could put together possible paths forward for the Policy Board to consider. Whatever direction that the council's committee is going, if it is the will of the Policy Board to want to make a recommendation about stock in the fishery or not stock in the fishery, we could do a conference call to discuss that and then have a vote on that; whether or not we make that recommendation in a letter, or we could do that via e-mail.

But I think that if the discussion is anything like it has been in the past, it would be a conference call that we would need to do. But noting that we would have to turn that conference call around quite quickly between now and then, so a doodle poll would have to be filled out quite rapidly; and time would have to be made flexible.

CHAIRMAN GROUT: Any thoughts on that particular course of action here? Yes, John.

MR. CLARK: I think that is a good suggestion. I should have said something earlier. But I think it is a good idea for the Policy Board to weigh in on this. I mean, the current, if I'm not mistaken, I think the ACL for the Mid-Atlantic for shad is pretty large; and there are a lot of shad and river herring being caught in the ocean fisheries.

It really does hurt the efforts that the commission has taken to try to restore these species. We've taken some very drastic actions. As you know, we've closed river herring fisheries up and down the coast. I don't see there is any harm in the commission at least updating the old letter or taking Toni's suggestion there. I think is a great way forward.

CHAIRMAN GROUT: Any other discussion on this particular option of moving forward?

MR. HASBROUCK: I wasn't on the commission back in 2012, so at that time was there a discussion by the commission or one of the boards about whether or not shad and river herring should be included as stocks in the fishery? Did that discussion take place already, and is that a discussion you think we can have via e-mail? I'm kind of thinking -- well, it depends on the answer to the first part of my question.

CHAIRMAN GROUT: Well, Toni was telling me yes, there has been a discussion. I think Bob also mentioned that there had been discussion and the commission were split on that; and so we did not specifically comment on whether there should be stocks in the fishery. I cannot tell you whether our commission would continue to be split.

I would be surprised if there weren't differing opinions on such an action. There has been discussion in the past, yes. That is why Toni was suggesting through this method that there be a conference call that is going to make the final decision on whether we send a letter. I have Andy and then Dave, was it you?

MR. ANDY SHIELS: I had a conversation with John Clark about this earlier today. I had an offline conversation with Mike Luisi a few minutes ago. I think, without putting words in John's mouth, the main purpose here is to make the board aware, make the council aware that the board has some interest in it.

I think Toni's approach is what we discussed just before she said it. That is the right way to go to put this on the radar, to get the information which is going to be available, not until the 15th. The subcommittee will work on this in the meantime, from the council. But on the 15th there will be a webinar, and then more people will have access to that information.

The council will meet next week, but probably isn't going to discuss this. The council then will meet in the first week of October, preceding the next meeting of ASMFC. I think serially and to go in the correct order, and to not threaten anyone; the approach is to follow the course that Toni suggested, get the information out there.

No serious decision has to be made at this point, and let's see where the webinar goes; and when that information is conveyed to the group, the comfort level, and if it calls for something bigger it can certainly be brought up at the annual meeting, because that schedule is not full enough yet. We're looking to add some more menhaden-like issues to it.

MR. BORDEN: I'll make this really short. I agree with Toni's suggestion. I think it's a good one. It is not a perfect solution, but the only thing I would add to that is if we're going to follow that course of action, I would encourage the staff to circulate whatever material becomes available on this issue to everyone, so that we can all inform ourselves before we do the conference call.

CHAIRMAN GROUT: Okay, I'll try it one more time. Is there any objection to moving forward with the action that Toni outlined? Seeing none; that is the course of action that we'll be taking.

STURGEON LETTER TO NOAA ON CRITICAL HABITAT DESIGNATION

CHAIRMAN GROUT:Thank you for a good discussion on this, and now we have one last agenda item and that is a sturgeon letter to NOAA on Critical Habitat Designation. Bob.

EXECUTIVE DIRECTOR BEAL: Hopefully, this letter discussion will go quicker than the last discussion of a letter. At the Sturgeon Board yesterday, I think most folks were there since this is a coastwide board, as the Sturgeon Board is. The board discussed the critical habitat designations for sturgeon, following the ESA listing.

They initiated a process of drafting a letter with a potential approval of that letter and submitting that to National Marine Fisheries Service, to comment on the critical habitat designation. The plan will be for staff to draft a relatively generic letter with just some overarching concepts on the critical habitat designations; with the understanding that the states are going to provide the river-specific comments for each of their river systems that are within their jurisdictions.

A generic letter will be circulated to the Shad and River Herring Board, and if folks are comfortable with that letter, then it would be forwarded to the National Marine Fisheries Service by September 1st. The question before the Policy Board is; since it is a letter from the commission, is the Policy Board comfortable with this process, and sort of comfortable delegating that final decision authority to the Shad and River Herring Board; since that is a coastwide board.

The membership generally mirrors the same folks that are around the table here. Again, it's going to be – what did I say – sorry, sorry, I got brainwashed over the last hour. Yes sturgeon, Atlantic sturgeon letter. Since the Atlantic Sturgeon Board is coastwide. If folks are comfortable with that process and comfortable delegating that decision to the Sturgeon Board, we can move forward through that course.

CHAIRMAN GROUT: Are you all comfortable with delegating that to the Sturgeon Board, which is disguised as a Policy Board? Any objections to that?

MS. ALLISON MURPHY: No objections, but just for the record; NMFS abstains.

ADJOURNMENT

CHAIRMAN GROUT: Okay. Is that close enough? Thank you very much for that, and I believe that is it on the agenda. It's been a long time, and my apologies to ACCSP for running so late here. It has been a tough day, and this meeting is adjourned.

Whereupon the meeting was adjourned at 5:43 o'clock p.m. on August 3, 2016.)

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: ISFMP Policy Board

FROM: Risk and Uncertainty Policy Workgroup

DATE: 10/5/16

SUBJECT: Recommended Decision-Tree Framework for Commission Risk and Uncertainty Policy

In the past, the Assessment Science and Management and Science Committees have attempted to develop a comprehensive risk and uncertainty policy for the Atlantic States Marine Fisheries Commission. This process has been revived as uncertainty becomes better understood and a standard element in scientific and management procedures. Recent management decisions emphasize the need to develop a policy to increase repeatability and transparency of our process. Uncertainty must be adequately accounted for in management decisions in order to meet management target levels, rebuild depleted stocks, and maximize resource utilization. When making fishery management decisions, the level of acceptable risk is ultimately a policy decision and should be clearly articulated to fishery stakeholders and other interested parties. Also, it has been increasingly noted that the lack of a risk policy leaves technical committees with unclear guidance on the acceptable level of risk to account for in their management recommendations. Risk and uncertainty policies have proven to be an effective tool for fishery management bodies to create decision-making accountability, and to maintain transparency throughout the management process by providing the necessary technical committee guidance to develop risk-based management recommendations. The Risk and Uncertainty Policy Workgroup has met several times to discuss the purpose, goals, and objectives of the Commission policy and develop a framework.

Policy purpose statement: *"The Commission recognizes that fishery information is inherently variable, and that successful management requires full consideration of this uncertainty and the associated risks on management decisions. The purpose of the Commission's Risk and Uncertainty Policy is to provide a consistent yet flexible mechanism to account for both scientific and management uncertainty in the Commission's decision making process in order to protect all Commission-managed stocks from the risk of overfishing, while minimizing any adverse social, economic, or ecosystem effects. This Policy seeks to maximize the long term benefits across all of our marine fishery resources by providing objective criteria to characterize both scientific and management uncertainty, and to evaluate management risk. Additionally, the Policy improves transparency in the management process, allowing for better communication among managers, industry, and other stakeholders."*

Goal: Adequately account for uncertainty at all levels of the Commission's management process to maximize informed decision-making

- Apply technical committee expertise to identify, and quantify where possible, sources of scientific uncertainty in the stock assessment process.
- Ensure that management uncertainty is captured in the stock assessment process or integrated into decision-making by utilizing knowledge of issues such as enforcement or non-compliance.
- Incorporate social and economic factors through application of current information and data while recognizing the need to develop more robust quantitative instruments.

M16-89

Goal: Consistently manage Commission species

- Apply across all Commission-managed species while incorporating nuances of each individual species.
- Provide stability with a standardized procedure that is predictable in process, although outcomes may not be predictable.
- Provide explicit guidance to the technical committee for specifying management recommendations that are in line with the Board's risk tolerance for all ASMFC-managed species.

Goal: Provide transparency in Commission's risk-management process

- Clearly articulate and document the sources of uncertainty and the potential repercussions of that uncertainty on management decisions to stakeholders and decision-makers.
- Specify where uncertainties are accounted for in the decision-making process.
- Create management-level accountability through explicit and documented reasoning during final risk acceptance process.
- Increase accessibility to and understanding of the decision-making process to promote better engagement with stakeholders and other interested parties.

Goal: Incorporate flexibility in the Commission's risk-management process

- Implement a standard policy for reviewing the process so there is an avenue to revisit the risk policy and procedures in the face of changing science and knowledge of different fish and fisheries.
- Account for uncertainty estimates that cannot be quantitatively assessed by allowing managers to accept a harvest level that is greater than or less than the level recommended by the technical committee through an explicit documentation of the departure from the quantitative advice, to achieve the risk objectives of the Commission.

A comprehensive risk and uncertainty policy would provide guidance on everything from choosing biological reference points to setting quotas for data poor species. The development of such a policy is the long-term goal of the Risk and Uncertainty Policy Workgroup, but the WG also recognizes the investment in time and resources it will take to bring such a comprehensive document to completion. This would require setting specific management objectives for each species and conducting a management strategy evaluation. Thus, the WG recommends that the development and deployment of the policy be implemented in phases, beginning with a decision tree approach that will allow the Commission to set acceptable risk levels when determining quotas for data-rich species.

The Commission frequently has to set quotas or harvest regulations with a goal of moving a population to, or keeping a population at, a sustainable level, which often is defined by a target and threshold. The management options to achieve this goal are usually evaluated through short-term projections. These projections take into account variability in recruitment, current status, growth, natural mortality, and/or other factors to determine a range of possible outcomes. A technical committee then evaluates what percent of projected outcomes are at or below the F threshold. This is a way of quantifying the risk of a harvest reduction or increase strategy with regard to the stock entering an overfishing state or an unsustainable population size, e.g. the lower the percentage of runs at or below the F target, the higher the risk of exceeding that target will be if the management program is implemented. Generally, smaller reductions or bigger increases will have a higher risk of failing to keep F at or below the target, and it is the Board's responsibility to decide what level of risk they are willing to accept in these management decisions.

The level of acceptable risk will vary from situation to situation. For species that are not overfished and not experiencing overfishing, the Board may accept a higher risk level than for species that are overfished. Likewise, the Board may want to apply a lower risk level for species that do not have robust assessments, or robust data to support harvest policy analyses. Life history characteristics specific to a species being managed may also influence the process of determining risk tolerance. Establishing guidance on what level of risk the Commission is willing to accept in different situations will allow technical committees to work more efficiently and provide the advice the Boards need, and will allow the public greater clarity in understanding the process of how catch advice is developed.

One possible way of providing this advice would be a decision-tree. Each technical committee would review a series of questions as part of their terms of reference for the assessment regarding stock status and the quality of the assessment and/or other information about that species, and arrive at a Board approved pre-determined level of risk (i.e., the probability of overfishing or of exceeding the F target, and the probability of the stock becoming overfished or declining below the SSB target) that would be used to develop catch advice. For example:

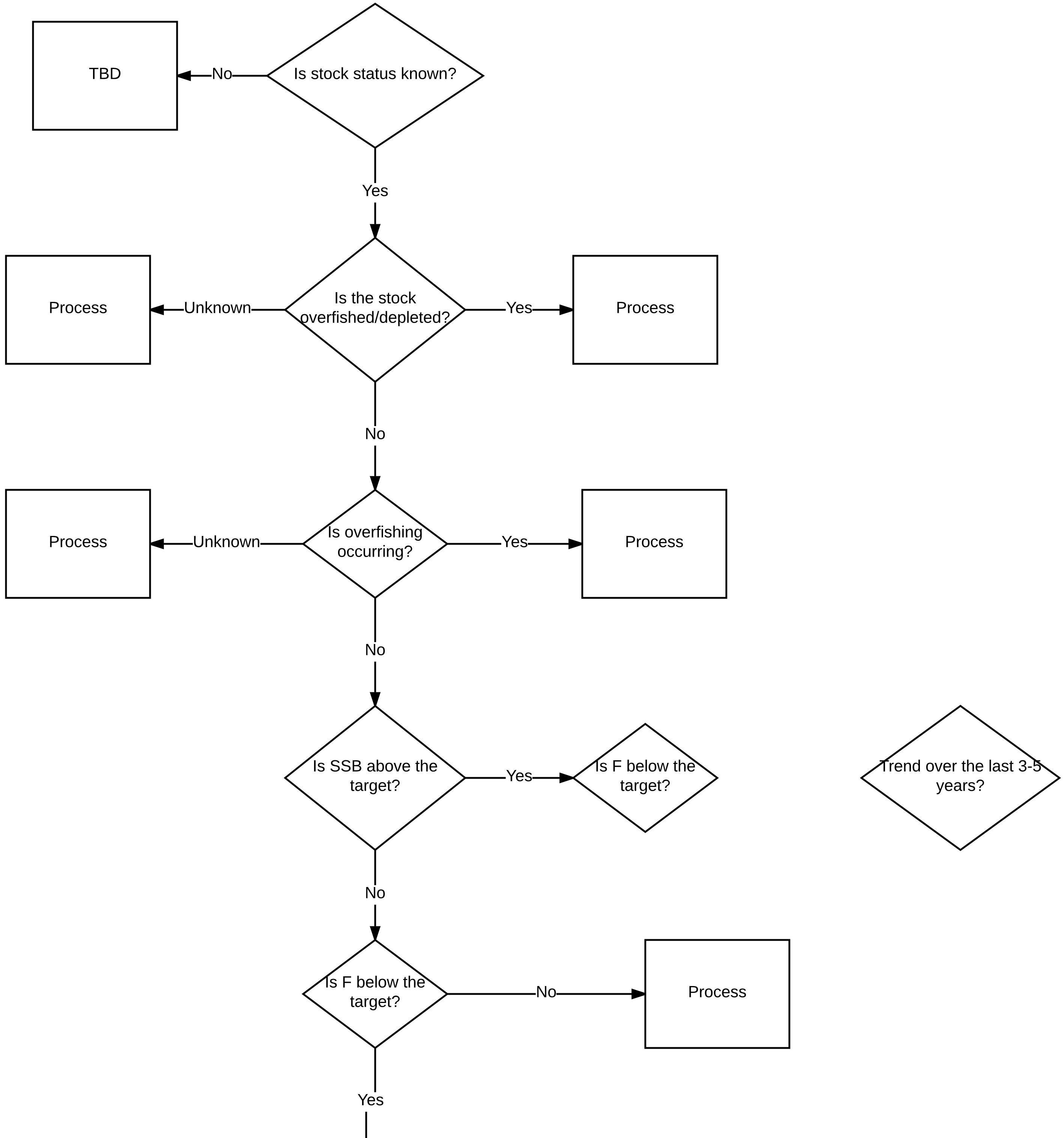
- **Can the stock status be determined?**
- **Is the stock status overfished/depleted?**
- **Is overfishing occurring?**
- **Is SSB above the target?**
- **Is F below the target?**
- **To what degree are the major sources of uncertainty captured within the assessment?**
- **Is there a negative retrospective bias (i.e. underestimating F and overestimating B)?**
- **Is this a long-lived, slow-growing species that would be difficult to rebuild?**

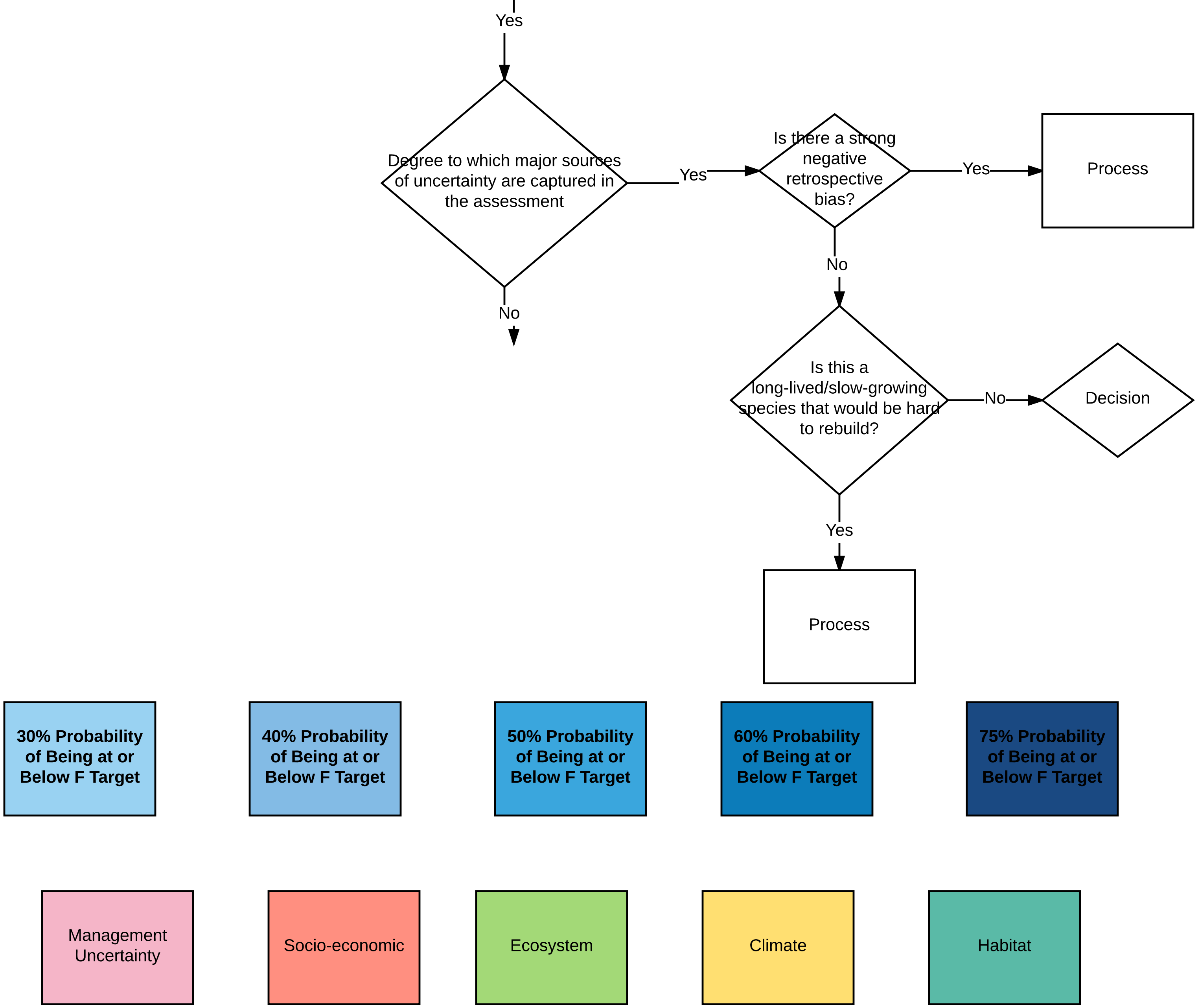
At the end of the decisions, a technical committee would know what probability of overfishing or becoming overfished to use in developing advice based on projections. These levels would be established through the overarching Commission risk policy for all species, but the application of this policy would still allow for some flexibility at the Board level. The Board may select a harvest reduction that is greater than or less than the level recommended by a technical committee to achieve the risk objectives of the Commission, but if they choose an alternate harvest reduction, they must be explicit about the level of risk they are assuming with regards to achieving the F target. This allows some flexibility for qualitative uncertainty estimates while still meeting the transparency and accountability goals of the Commission.

In September, the Risk and Uncertainty Policy Workgroup, met to discuss the development of the Commission's policy using a decision-tree framework. The group focused on populating a decision-tree using an example species that is fairly data-rich and therefore stock status could be determined. Quantitative and objective questions to assess the level of uncertainty surrounding a stock assessment and management process were incorporated into the decision-tree. All topics and questions that the group believed were more qualitative and subjective (either due to lack of data or general information) were placed into categories at the end of the tree. These categories could be used by the Board to describe their reasoning to flexibly change the risk level that the technical committees quantitatively access and recommend beforehand. An informational document could be distributed to the Board that would hold some of the qualitative information in a more descriptive way. The group also recommended creating a template for a formal Advisory Panel report that could provide additional information regarding some uncertainties, especially social science and economic concerns.

The WG added some "placeholder" levels of risk, using examples of Board queries from recent meetings but added some lower probabilities (30%, 40%, 50%, 60%, and 75% probability of being at or below F target). The group decided that stronger justification can come later from the Policy Board, ASC/MSC, and literature meta-analysis. For this example, the risk levels are disconnected from the rest of the chart since the WG did not create a quantitative measure to link them at this time. Giving each question an overall weight, and then scoring the questions relative to each other might make the process more quantitatively linked to each risk level for the final product.

The Workgroup is seeking feedback from the Board on acceptable levels of risk and what characteristics of the stock or the assessment would cause the Board to accept a higher or lower level of risk. Given that this rough draft of the decision-tree was created with only one example species, this is a small component of the final tool that will be the end product recommended to the Policy Board. Board members should consider if this framework is appropriate for accounting for risk and uncertainty in the Commission process.


TBD
No
Is stock status known?
Yes
Process
Unknown
Is the stock overfished/depleted?
Yes
Process
No
Process
Unknown
Is overfishing occurring?
Yes
Process
No
Is SSB above the target?
Yes
Is F below the target?
Trend over the last 3-5 years?
No
Is F below the target?
No
Process
Yes



Yes
Degree to which major sources of uncertainty are captured in the assessment
Yes
Is there a strong negative retrospective bias?
Yes
Process
No
No
Is this a long-lived/slow-growing species that would be hard to rebuild?
No
Decision
Yes
Process
30% Probability of Being at or Below F Target
40% Probability of Being at or Below F Target
50% Probability of Being at or Below F Target
60% Probability of Being at or Below F Target
75% Probability of Being at or Below F Target
Management Uncertainty
Socio-economic
Ecosystem
Climate
Habitat

Atlantic States Marine Fisheries Commission

Atlantic Sciaenid Habitats:

A Review of Utilization, Threats, and Recommendations for Conservation, Management, and Research

Prepared by:

Jimmy Johnson
North Carolina Department of Environmental Quality
Washington, North Carolina
Jimmy.Johnson@ncdenr.gov

January Murray
Georgia Department of Natural Resources
Brunswick, Georgia
January.Murray@dnr.ga.gov

Jay Odell
The Nature Conservancy
Richmond, Virginia
JOdell@tnc.org

Kent Smith
Florida Fish and Wildlife Conservation Commission
Tallahassee, Florida
Kent.Smith@myfwc.com

and

Lisa N. Havel
Atlantic States Marine Fisheries Commission
Arlington, Virginia
LHavel@asmfc.org

ACKNOWLEDGEMENTS

We thank the many sciaenid habitat experts that provided feedback and information for this document over the past three years. Many ASMFC Habitat Committee members and Habitat Coordinators, both past and present, provided valuable input throughout the various iternations of this document, and for that we are very grateful. In addition, much of the information in this document would not have been published without the assistance of state, federal, and NGO habitat coordinators, and academia. Their personal insight, published data, and unpublished resources were invaluable contributions to this document. We are appreciative of their expertise, suggested resources, and review of these chapters.

In particular, we would like to thank Melissa Yuen for initial coordination of this giant undertaking. Doug Adams for his feedback on red drum; Steve Midway for working on black drum, spot, spotted seatrout, and weakfish; Kate Wilke and Brian Boutin's input on the general sciaenid introduction section; and Chip Collier for his expertise on kingfishes. We would also like to thank Alison Deary for seeing this document to completion, and providing recommendations on the threats to sciaenid habitat and future research needs.

CHAPTER 1: Introduction

The Atlantic States Marine Fisheries Commission (hereafter referred to as ASMFC or the Commission) is the principal agency responsible for the management of many sciaenid fish species in state waters. The mission of the Commission's Habitat Program is to work through the Commission, in cooperation with appropriate agencies and organizations, to enhance and cooperatively manage vital fish habitat for conservation, restoration, and protection, and to support the cooperative management of Commission managed species. One of the primary tasks of the Habitat Program is to develop habitat source documents on topics of immediate and broad interest to ASMFC Commissioners. Source documents provide detailed habitat information to inform conservation and management actions by ASMFC and diverse partners.

ASMFC coordinates interstate fishery management plans for Atlantic croaker, black drum, red drum, spot, spotted seatrout, and weakfish. This document is intended to provide up to date information on each of these species' biology, habitat needs, and habitat stresses.

General Sciaenid Information

Sciaenid fishes are found worldwide, containing approximately 70 genera and 270 species (Nelson 1994), of which 21 genera and 57 species have been described in the western Atlantic (Chao 1978). Globally, most sciaenids occur in marine and estuarine waters, while 28 species occur in freshwater. Marine species of sciaenids are found on shallow continental shelves in the Atlantic, Pacific, and Indian Oceans, but are absent from islands in the mid-Indian and Pacific oceans (Nelson 1994). Most sciaenids (with the exception of kingfish), produce deep drumming sounds by contracting and beating muscles against the swim bladder, hence the common names croaker and drum.

In the western Atlantic Ocean, sciaenids are found from Maine to Mexico, with centers of abundance most concentrated from New York to North Carolina, depending on the species. Sciaenids live in shallow coastal waters (less than 125 meters), and in larger bays and estuaries, including their tributaries. In general, they are euryhaline organisms, meaning they can adapt to a wide range of salinities, although preferred salinity varies with species and life stage. Sciaenids utilize a variety of habitats throughout their life stages, including sand and mud substrates, oyster beds, water column, and seagrass. As a group, sciaenids exploit the broadest range of foraging habits, consisting of polychaetes, bivalves, crustaceans, and fishes (Chao and Musick 1977). Their diets vary with locality, prey availability, life stage, and species.

Estuaries are important habitats for many sciaenids at every life stage. In the Mid Atlantic Bight, as many as 14 species can be present in estuaries as larvae, juveniles, or adults over the course of a year (Chao and Musick 1977; Cowan and Birdsong 1985; Able and Fahay 1997; Able et al. 2001). Weakfish, for example, use estuaries as primary spawning habitat (Nye et al. 2008), while Atlantic croaker and spot use them as nurseries and seasonal adult foraging grounds (Chao and Musick 1977; Sheridan et al. 1984). As dominant seasonal members of the estuarine fish assemblage, young sciaenids play important roles as both predators and prey (Dovel 1968; Chao and Musick 1977; Grecay and Targett 1996; Able et al. 2001).

Adults form spawning aggregations and release sperm and eggs into the water column. The spawning period occurs over several months, and often entails multiple spawning events, but timing varies by species. In fact, sciaenids partition out their spawning and nursery residences, which ultimately reduces competition. It's difficult to make generalizations about these species as a group because they have evolved to utilize distinct ecological niches in terms of feeding, timing of spawning, and spawning and nursery areas. For example, spot and Atlantic croaker spawn offshore in the winter, while other species such as weakfish, black drum, and northern kingfish spawn in the spring and summer in coastal areas. Spotted seatrout are essentially year-round estuarine residents who infrequently leave their natal estuary (Holt and Holt 2003; Lowerre-Barbieri et al. 2013).

Fertilized eggs float in the water column and hatch after 1-2 days depending on the species and water temperature. Soon after hatching, larvae are transported from coastal waters farther up into estuaries through active and passive processes. Nursery habitat use is also somewhat partitioned in space and time among species. For example, young-of-year black drum tend to be found in lower salinity habitats than other species of sciaenids. Young-of-year Atlantic croaker show up in late fall/early winter and overwinter in the estuary. Young-of-year spot are found in late winter/early spring, followed by black drum, weakfish, spotted seatrout, and finally red drum. Structurally complex nursery areas, such as seagrasses and marsh creeks, provide larvae and young fish productive feeding grounds and protection from predators (McIvor and Odum 1988; Hoss and Thayer 1993; Kneib 1997; Rountree and Able 2007). Because estuarine habitat provides such favorable conditions for juvenile growth and reduced mortality, this habitat is critical to ongoing productive coastal fisheries (Boesch and Turner 1984; Fogarty et al. 1991; Deegan et al. 2000).

Anthropogenic Impacts

Increasingly dense human populations along our coastlines threaten the health of estuaries and coastal waters. Widespread development, coastal armoring, pollution, and other human impacts have significantly altered the physical and chemical environments of estuarine and marine waters. Changes in hydrologic processes and runoff characteristics can increase turbidity and sedimentation and decrease light transmittance, which may lead to the loss of submerged aquatic vegetation. Anthropogenic alterations to the estuarine environment have been linked to changes in hydrography and salinity regimes, as well as food web modification, which can eventually reduce the quality of habitat for estuary-dependent fishes.

Temperature, salinity, and dissolved oxygen (DO), vary considerably in estuarine environments (Tyler et al. 2009) and these factors are known to affect sciaenid growth rates, spawning, and spatial and temporal distribution. As a group, sciaenids are habitat generalists rather than specialists and may therefore be relatively resilient to changes in abiotic factors. However, Atlantic coast estuaries have been profoundly altered. Despite their ability to take advantage of a range of habitats, sciaenids are not immune to habitat degradation or suboptimal conditions. For example, spotted seatrout are sensitive to cold and often are conspicuous features of "cold kills" in the northern estuaries of their range. In estuarine systems, perturbations to water quality are occurring at rates faster than natural selection can act on organisms to enable them to adapt to the new prevailing conditions (Horodysky et al. 2008).

Key Habitats

Because of the way different species of sciaenids partition their use of habitat, several different habitat types are key, including estuaries, salt marshes, freshwater marshes, oyster reefs, sea grasses, and mud banks/shores. The mouth of the estuary is also very important for staging. In coastal marine areas, the surf zone and sand bar complex is valuable nursery habitat for southern and gulf kingfish, and serves as adult habitat for spotted seatrout, weakfish, red drum, and others. In addition, the coastal shelf (in waters less than 125 m) is used for spawning by some species (i.e., Atlantic croaker).

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CHAPTER 2: Atlantic croaker

Populated with Habitat Section from Amendment 1 to the ISFMP (ASMFC 2005)

Section I. General Description of Habitat

Atlantic croaker was described by Petrik et al. (1999) as a habitat generalist. Field surveys of post-settlement croaker in estuarine nursery areas found no significant differences in abundances among submerged aquatic vegetation (SAV), marsh edge, and sandy bottom (Petrik et al. 1999). In a wetland system, Atlantic croaker along the Gulf Coast preferred non-vegetated bottom adjacent to wetlands rather than the marsh itself (Rozas and Zimmerman 2000). In North Carolina, Atlantic croaker have been documented to utilize SAV, wetlands, non-vegetated soft bottom, and to a lesser extent, shell bottom (Street et al. 2005). Juvenile croaker use these habitats for refuge and foraging and as a corridor through the estuary. In North Carolina, Atlantic croaker is one of the dominant juvenile fish species in the estuaries (North Carolina Division of Marine Fisheries, unpublished data). Because croaker utilizes multiple habitats, the effect of habitat change and condition on fish population is difficult to assess.

Part A. Spawning Habitat

Geographic and Temporal Patterns of Migration

Atlantic croaker spawn predominantly on the continental shelf, at depths ranging from 7 to 81 m (26 to 266 ft), but also in tidal inlets, estuaries (Diaz and Onuf 1985; Able and Fahay 2010). Atlantic croaker have a long spawning season that generally starts in late summer and continues to early spring, with peak reproductive activity occurring in late fall and winter (Diaz and Onuf 1985). In the Chesapeake Bay and North Carolina, spawning begins as early as August and usually peaks in October, whereas peak spawning occurs in November in the Gulf of Mexico (USFWS 1996).

Salinity

Atlantic croaker are a euryhaline species, capable of tolerating a wide range of salinity. It is suggested that this wide tolerance continues during spawning, as they are found to spawn in estuaries and adjacent coastal oceanic waters as far out as the continental shelf (Barbieri et al. 1994). Diaz and Onuf (1985) report that they typically spawn in polyhaline brackish waters.

Substrate

Although Atlantic croaker forage along the benthos, they are pelagic spawners in estuaries and offshore along the continental shelf (Chao and Musick 1977; Barbieri et al. 1994). These habitats tend to be dominated by soft sediment (mud and sand) (Townsend et al. 2004; Friedrichs 2009).

Temperature

Exact spawning locations may be related to warm bottom waters (Miller et al. 2002). Spawning is reported to occur at water temperatures between 16 and 25 °C in North Carolina (Street et al. 2005). In general, spawning is correlated with bottom temperatures higher than 16 °C along the Mid Atlantic Bight (Norcross and Austin 1988).

Dissolved Oxygen

Prolonged exposure to hypoxia has detrimental effects on reproduction in Atlantic croaker. Hypoxia has been linked to decreased gonadal growth, gametogenesis, and endocrine function as well as lower hatching success and larval survival (Thomas et al. 2007; Thomas and Rahman 2009). A study sampling from the dead zone in coastal regions of the northern Gulf of Mexico found that Atlantic croaker experiencing persistent hypoxia displayed an approximate 74 percent decrease in sperm production and a 50 percent decrease in testicular growth compared to fish collected nearby which were not under hypoxic conditions (Thomas and Rahman 2010).

Feeding Behavior

Atlantic croaker are carnivorous. Their diet consists mainly of polychaetes and some fish and arthropods in the spawning months (Hansen 1969).

Competition and Predation

Atlantic croaker were found to be a primary food source of dolphins residing in estuaries, who locate them by listening for their characteristic thrumming sounds (Gannon and Waples 2006).

Part B. Egg and Larval Habitat

Geographic and Temporal Patterns of Migration

After hatching, larvae drift into estuaries by passive and active transport mechanisms via floodtides, upstream bottom currents, and other large-scale and localized oceanographic processes (Joyeux 1998). Arrival time into estuaries varies regionally. Larvae are present as early as June on the Louisiana coast and as late as September in the Chesapeake Bay and on the North Carolina and Virginia coasts (USFWS 1996). Larval size at recruitment into Onslow Bay and Newport River estuary in North Carolina ranged from 4.3 - 9.9 mm standard length (SL)(Lewis and Judy 1983). Immigrating larvae into the Chesapeake Bay are typically 20-26 days old and are 5-7 MM standard length (Nixon and Jones 1997). Upon initial arrival in the estuary, larval croaker are pelagic. During ebbing tides, however, larvae move to the brackish, bottom waters where they complete their development into juveniles (Miller 2002). Restriction to surface water is likely dependent on amount of vertical mixing: they will be closer to the surface in turbulent areas if they are not dense enough to sink to the bottom (Hare et al. 2006).

Salinity

Pelagic eggs are found in polyhaline and euryhaline waters. After hatching, young enter estuaries and move to areas of low salinity (Hansen 1969). These fish migrate into the estuary in the saltwater wedge along the bottom (Haven 1957).

Substrate

Larvae will remain in the water column until mobility function is developed and body density increases enough to allow for settlement (Hare et al. 2006).

Temperature

Larvae can tolerate colder water temperatures than adults, but extremely cold temperatures may be a major source of larval mortality.

Dissolved Oxygen

Eggs and larvae of Atlantic croaker are pelagic and remain offshore for approximately two to three months before ingressing into estuarine nursery habitats (Poling and Fuiman 1998). Therefore, it is unlikely these stages will encounter hypoxic conditions until settlement into the nurseries.

Feeding Behavior

Atlantic croaker larvae are planktonic feeders. Because they primarily locate their food source visually, larvae feed during the day. They may search 12-120 L of seawater for food organisms in a 12 hour day (Hunter 1981).

Diet selection depends upon availability, size of the prey item in comparison to size of the growing larvae, swimming behavior and color of the food organism, as well as prey perception, recognition, and capture (Govoni et al. 1986). Atlantic croaker larvae eat tintinnids, pteropods, pelecypods, ostracods, and the egg, naupliar, copepodid, and adult stages of copepods (Govoni et al. 1983).

Competition and Predation

Larvae enter nursery habitats within estuaries from late summer to late winter with peak ingress occurring in the fall in the western north Atlantic (Able and Fahay 2010; Ribeiro et al. 2015). For larvae of Atlantic croaker that enter estuarine nurseries (i.e., seagrass beds) in the summer, this corresponds with the ingress of other estuarine dependent sciaenid species (e.g., red drum, silver perch, weakfish) (Ribeiro et al. 2015), giving rise to the potential for inter-specific competition among these sciaenid species in nurseries. In the Chesapeake Bay, ectoparasites were prevalent on Atlantic croaker larvae in late summer and early fall (Ribeiro et al. 2016), which is another potential source of mortaility in estuarine systems.

Similar to many other fishes, eggs and larval stages are commonly predated upon by gelatinous zooplankton, which reach peak densities in the Chesapeake Bay during the summer months (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

Part C. Juvenile Habitat

Geographic and Temporal Patterns

Juveniles use estuaries and tidal riverine habitats along the United States Atlantic coast from Massachusetts to northern Florida, and in the Gulf of Mexico, but are most common in coastal waters from New Jersey southward (Able and Fahay 1997; Robbins and Ray 1986; Diaz and Onuf 1985). Recruitment of juveniles into estuaries may be influenced by tidal fluxes in estuaries. For example, in the Pamlico Sound, North Carolina, a shallow estuary where tidal fluxes are largely controlled by wind, recruitment of juveniles is slower than the Cape Fear estuary, where tidal fluxes are dictated by lunar cycles average 1.5 meters (Ross 2003). The Cape Fear estuary is representative of most drowned river valley Atlantic coast estuaries. Juveniles remain in these habitats until early to mid-summer (USFWS 1996). Juveniles migrate downstream as they develop and by late fall, most juveniles emigrate out of the estuaries to open ocean habitats (Miglarese et al. 1982). Juvenile Atlantic croaker tagged in Delaware Bay, New Jersey remained in a localized area of the tidal creeks before fall egress into offshore waters (Miller and Able 2002.) Juvenile and adult croaker are tolerant to a wide range of salinity, temperature, and dissolved oxygen, but prey field seems to be correlated with the presence of croaker. Nye (2008) found that the presence of anchovy was a consistent predictor of croaker occurrence.

Salinity

Juveniles are associated with areas of stable salinity and tidal regimes and often avoid areas with large fluctuations in salinity. The upper, less saline parts of the estuaries provide the best environment for high growth and survival rates (Ross 2003; Peterson et al. 2004). Juveniles concentrate in oligohaline and mesohaline waters (0.5 - 18 ppt), although they may tolerate more extreme salinities (Diaz and Onuf 1985; Ross 2003). Ross (2003) showed that juveniles experience reduced mortality in less saline areas. Lower mortality in the less saline areas may be because of lower physiological stress in those environments (Ross 2003). Growth rates in juveniles may be affected by fluctuating salinities and temperatures (Peterson et al. 2004; Chao and Musick 1977). Large changes in salinity can alter the activity of croakers in a way that reduces local abundance; however, smaller changes do not appear to affect juveniles. Sharp fluctuations in salinity can cause intermediate growth rates and increase the bioenergetic costs for juveniles (Peterson et al. 2004).

Able and Fahay (1997) suggested that cold December waters in Delaware Bay are not conducive to survival of young croaker. Juvenile croaker prefer deeper tidal creeks because the salinity changes are usually less than in shallow flats and marsh creeks (Diaz and Onuf 1985). Salinity may affect the size distribution of juveniles within an estuary, which may be a result of changing physiological requirements as the juveniles develop (Miglarese et al. 1982).

Substrate

Substrate plays a large role in determining juvenile croaker distribution. Juveniles are positively correlated with mud bottoms with large amounts of detritus that houses sufficient prey (Cowan and Birdsong 1985). Sand and hard substrates are not suitable. Juvenile are often found in more turbid areas of estuaries with higher organic loads that provide a food source for individuals, but low turbidity is not a limiting factor in juvenile distribution (Diaz and Onuf 1985). The latter stages of young croaker are found more commonly in deeper channel habitats (Chao and Musick 1977; Poling and Fuiman 1998).

Depth

Juvenile Atlantic croaker live at a variety of depths, depending on the estuary. Many North Carolina estuaries and the coast of the Gulf of Mexico have small tidal fluctuations. In these areas, juvenile croakers amass in shallow, peripheral areas. In estuaries with greater tidal fluctuations such as the Delaware Bay, Chesapeake Bay, or the Cape Fear River Estuary, juvenile croaker assemble in deep channels (Chao and Musick 1977; Diaz and Onuf 1985).

Temperature

Field and laboratory data indicate that juveniles are more tolerant of lower temperatures than adults. Juveniles have been found in waters from 0.4° C - 35.5° C (USFWS 1996) but extreme temperature changes can incapacitate juvenile croakers (Diaz and Onuf 1985). Young-of-year (30-60 mm SL) will experience 100% mortality when exposed to 1° C for a period of 8 days. Prolonged exposure (12 - 24 d) to water temperatures of 3 °C can also lead to high mortality rates (Lankford and Targett 2001). Juveniles migrate from Delaware Bay, New Jersey to offshore waters from August to October when water temperature is 15 °C – 19 °C (Miller and Able 2002). Year-class strength also appears to be linked to overwinter survival of juveniles (Hare and Able 2007).

Dissolved Oxygen

Juveniles may favor conditions that can result in low dissolved oxygen (DO), although juveniles will move out of an area if DO levels decrease beyond preferred tolerances (Diaz and Onuf 1985). Severe hypoxia of bottom water and sediments, often associated with eutrophication, can negatively affect juvenile croaker, causing deaths, a reduced growth rate, and reduced prey availability (Street et al. 2005).

Feeding Behavior

In Delaware Bay, Nemerson and Able (2004) found that the largest concentrations of newly recruited Atlantic croaker were collected over soft bottom habitat containing a high abundance of benthic invertebrates, and that their diet was dominated by polychaetes and crustaceans (80%) with fish comprising <4%. Annelids were an important prey component of their diet. Juveniles consume fish, but not in large quantities as do adults (Avault and Birdsong 1969). Sheridan (1979) found that small croaker rely heavily on polychaetes, but also consumed detritus, nematodes, insect larvae, and amphipods. There is evidence that croaker are somewhat crepuscular in their feeding habits (Nye 2008).

Competition and Predation

There is a potential for interspecific competition among sciaenids in estuaries from late spring to fall because juvenile Atlantic croaker, silver perch, weakfish, and spot are most abundant (Chao and Musick 1977), although sciaenids exhibit variation in morphological characters that may reduce interspecific competition in estuarine nursery habitats (Chao and Musick 1977; Deary and Hilton 2016).

Part D. Adult Habitat

Geographic and Temporal Patterns of Migration

Atlantic croaker is one of the most common bottom dwelling estuarine species on the Atlantic Coast. Atlantic croaker range from the coastal waters of Cape Cod, Massachusetts to Florida, but croaker are uncommon north of New Jersey. Croaker are also found along the Gulf of Mexico coast with high abundances in Louisiana and Mississippi (Lassuy 1983). Juvenile and adult croaker are tolerant to a wide range of salinity, temperature, and dissolved oxygen, but prey field seems to be correlated with the presence of croaker. Nye (2008) found that the presence of anchovy was a consistent predictor of croaker occurrence.

Salinity

Adults are found in a salinity range from 0.2 - 70 ppt, but are most common in waters with salinities ranging from 6 - 20 ppt (Lassuy 1983; Eby and Crowder 2002). Adult croaker catch rates are negatively correlated with increasing salinities (TSNL 1982), but catch rates also vary with season. In spring, most adults are caught in salinity ranges from 3 – 9 ppt, but in summer, catch peaks in two ranges: the low salinities ranging from 6 – 12 ppt, and high salinities ranging from 24 – 27 ppt (Miglarese et al. 1982). Generally, adults avoid the mid-salinity ranges (Miglarese et al. 1982; Peterson et al. 2004). Mean total length positively correlates with bottom salinities (Miglarese et al. 1982). Turbidity, nitrate-nitrogen concentrations, and total phosphate-phosphorous concentrations also correlate positively with croaker abundance and catch (TSNL 1982).

Substrate

Adult Atlantic croaker prefer muddy and sandy substrates in waters shallow enough to support submerged aquatic plant growth. Adults have also been collected over oyster, coral, and sponge reefs, as well as man-made structures such as bridges and piers. Adult Atlantic croaker also use *Thalassia* sp. beds for refuge although abundance in the seagrass beds is temperature-dependent and changes seasonally (TSNL 1982).

Temperature
Temperature and depth are strong predictors of adult croaker distribution, and the interaction between the two variables may also influence distribution (Eby and Crowder 2002). Adult croaker generally spend the spring and summer in estuaries, moving offshore and to southern latitudes along the Atlantic coast in the fall. Their migration is in response to cooling water temperatures because croakers cannot survive in cold winter temperatures. Adults are found in waters from 5 °C - 35.5 °C, but most catch occurs in temperatures over 24 °C (Miglarese et al. 1982). Generally, fish older than 1 year old are absent in waters below 10 °C (Lassuy 1983). Optimal temperatures for growth and survival are not known (Eby and Crowder 2002).

Dissolved Oxygen
The distribution and extent of hypoxic zones in estuaries may also influence habitat use and distribution (Eby and Crowder 2002). Croaker generally shift from deep, hypoxic water to shallow, oxygenated waters during hypoxic events. Their distribution is further limited when hypoxic conditions occur in shallower waters. The lower threshold of DO for Atlantic croaker is about 2.0 mg L^{-1}. Below this limit, Atlantic croaker may not survive or may experience sublethal effects. Studies have shown that Atlantic croaker are virtually absent from waters with DO levels below 2.0 mg L^{-1}, suggesting they are very sensitive to the amount of DO present (Eby and Crowder 2002).

The size of a hypoxic zone influences habitat use as well. When hypoxic conditions spread in an estuary, Atlantic croaker are forced to use less suitable habitat. Atlantic croaker could incur increased physiological and ecological costs in these areas. For example, Atlantic croaker may face increased intra- and interspecific competition for available space or food in what are essentially compressed habitat zones. To avoid the increased ecological cost, croaker may return to waters with lower DO (Eby and Crowder 2002).

Feeding Behavior
Adult Atlantic croaker are opportunistic bottom feeders. The majority of their diet is benthic organisms and ≤20% consists of fish species (Avault and Birdsong 1969; Chao and Musick 1977; Nye et al. 2011). Sheridan (1979) found that large croaker rely heavily on polychaetes, followed by mysids and fish. Croaker have been found to be somewhat crepuscular in their feeding habits (Nye 2008).

Competition and Predation
Hypoxic zones may compress suitable habitat, increasing intra- and interspecific competition for available space or food. (Eby and Crowder 2002). Croaker compete with striped bass, weakfish, and possibly bluefish for anchovy in the Chesapeake Bay (Nye 2008).

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat
Based on the life history requirements of Atlantic croaker, many shallow, estuarine ecosystems are essential. At all life stages, EFHs are characterized by soft substrates (mud and sand). For settlement, larvae prefer lower salinity ecosystems with SAV, but juveniles quickly move from these habitats to deeper channels (Chao and Musick 1977; Poling and Fuiman 1998).

Identification of Habitat Areas of Particular Concern

Estuaries, which are especially vulnerable to anthropogenic changes, are designated as Habitat Areas of Particular Concern (HAPCs) for Atlantic croaker, as well as for other species. Larvae are particularly vulnerable to changes in estuarine conditions. Environmental conditions in spawning areas may affect growth and mortality of egg and larval croakers (Eby and Crowder 2002).

Present Condition of Habitat Areas of Particular Concern

Estuarine areas may be functionally reduced in size or degraded by numerous activities, including but not limited to, development, dredging and filling, toxic chemical and nutrient enrichment discharges from point and non-point sources, habitat alteration (e.g., wetlands converted to agricultural use), failing septic systems, and alterations in seasonal runoff patterns (S.J. Vanderkooy, Gulf States Marine Fisheries Commission, personal communication). These events may reduce the quantity and quality of Atlantic croaker habitat. Scientists believe that Atlantic croaker are affected by these changes, but few specific studies have quantified the effects of habitat degradation on the fishery resource (S.J. Vanderkooy, Gulf States Marine Fisheries Commission, personal communication).

Many coastal and estuarine areas have inadequate water quality because of various land use activities. The Chesapeake Bay is one example of an area that experiences eutrophication from agricultural runoff. Excess nutrients entering coastal waters may cause algal blooms that reduce dissolved oxygen, resulting in hypoxic or anoxic conditions, especially during the summer months (R. Lukacovic, Maryland Department of Natural Resources, personal communication). Large hypoxic areas have also been documented in Louisiana's coastal waters during the summer due to nutrient loading into the Mississippi River from the Midwestern farm belt. These events can directly impact fisheries in the area (S.J. Vanderkooy, Gulf States Marine Fisheries Commission, personal communication).

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of Atlantic Croaker

Juvenile croaker may be affected by hydrological modifications, water quality degradation, or habitat alterations. Hydrological modifications such as ditching and channelization increase the slope of the shoreline and water velocities in the altered stream. Higher water velocity and reduced natural wetland filtration can result in increased shoreline erosion, increasing sediment and non-point pollutant loading in channelized water bodies (White 1996; EPA 2001). Several studies have found that the size, number, and species diversity of fish in channelized streams are reduced and the fisheries associated with them are less productive than those associated with unchannelized reaches of streams (Tarplee et al. 1971; Hawkins 1980; Schoof 1980). Pate and Jones (1981) compared nursery areas in North Carolina that were altered and unaltered by channelization and found that Atlantic croaker and other estuarine-dependent species were more abundant in nursery habitats with no man-made drainage. They attributed this to the unstable salinity conditions that occurred in areas adjacent to channelized systems following moderate to heavy rainfall (>1 inch 24 h^{-1}).

Pollutants negatively affect growth and physical condition of juvenile Atlantic croaker, with significantly reduced growth rates and condition occurring with increasing pollutant conditions (Burke et al. 1993). Low concentrations of heavy metals can accumulate in fine-grained sediments, particularly organic-rich muddy substrates, to toxic levels, and can be resuspended into the water column (Riggs et al. 1991). Primary nursery areas in North Carolina often consist of such fine-grained sediments and are therefore susceptible to toxic contamination of bottom sediments (Street et al. 2005).

Severe hypoxia of bottom water and sediments, often associated with eutrophication, can adversely affect croaker populations through suffocation, reduced growth rates, loss of preferred benthic prey, changes in distribution, or disease (Street et al. 2005). Mass mortality of benthic infauna associated with anoxia has been documented in the deeper portions of the Neuse River estuary in North Carolina, in association with stratification of the water column in the summer (Lenihan and Peterson 1998; Luettich et al. 1999). During these events, oxygen depletion caused mass mortality of up to 90% of the dominant infauna within the affected area (Buzzelli et al. 2002). Utilizing a statistical model and field data, it was estimated that the extensive benthic invertebrate mortality, resulting from intensified hypoxia events, reduced total biomass of demersal predatory fish and crabs during summer months by 17 - 51% in 1997 - 1998 (Baird et al. 2004). The decrease in available energy from reduced benthos greatly reduced the ecosystem's ability to transfer energy to higher trophic levels at the time of year most needed by juvenile fish (Baird et al. 2004).

Alteration of natural shorelines has been shown to have a negative impact on juvenile Atlantic croaker populations. In a study along the Gulf Coast comparing fish abundance between unaltered and altered shorelines (bulkheads or rubble), croaker was most abundant at the unaltered unvegetated shoreline (Peterson et al. 2004). Other anthropogenic activities that can potentially degrade shallow shoreline habitat conditions include dredging and proliferation of docks and marinas (Street et al. 2005).

In spring and fall, moderate water temperatures and hypoxia may not be limiting Atlantic croaker distribution. However, in summer when water temperatures are higher, Atlantic croaker may avoid moderately hypoxic zones in order to avoid the additional physiological costs of staying in waters with less dissolved oxygen (Eby and Crowder 2002). As hypoxia increases in severity and scope within estuarine waters, croaker typically move to shallower parts of an estuary. Large hypoxic zones may limit adult croaker depth and temperature distribution, suggesting a shift in habitat use driven by the severity of a hypoxic event (Eby and Crowder 2002). Atlantic croaker may actually be limited to areas with higher-than-optimal temperatures during hypoxic events (Eby and Crowder 2002).

Unknowns and Uncertainties

Climate change is associated with a suite of perturbations to the prevailing conditions (i.e., temperature, dissolved oxygen, pH, salinity, turbidity, etc.) that will have direct and indirect impacts on the survival and growth of Atlantic croaker, although the magnitude of many of these impacts is not fully resolved. For example, gelatinous zooplankton abundance is expected to increase (Kemp et al. 2005), which may increase predation pressure on eggs and larvae of Atlantic croaker. In addition, hypoxic events are becoming more frequent (Kemp et al. 2005), shifting the distribution of croaker from favored juvenile channel habitats to shallow SAV habitats (Eby and Crowder 2002), which may increase interspecific competition through crowding in nursery habitats. Fish kills related to harmful algal blooms are also becoming a persistent issue in estuarine and coastal regions (Kemp et al. 2005) but the magnitude of these events is not known for Atlantic croaker. To understand how perturbations impact Atlantic croaker, baseline biological information is required (i.e., trophic interactions, sensory development, habitat use) in a developmental context.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Each state should implement a protection plan for Atlantic croaker habitat within its jurisdiction to ensure the sustainability of the spawning stock that is produced or resides within its state boundaries. Each program should inventory the historical and present range of croaker, specify the habitats that are targeted for restoration, and impose or encourage measures to preserve the quantity and quality of Atlantic croaker habitats.

1. States should notify in writing the appropriate federal and state regulatory agencies of the locations of habitats used by Atlantic croaker for each life stage. Regulatory agencies should be advised of the types of threats to Atlantic croaker populations and recommend measures that should be employed to avoid, minimize, or eliminate any threat to current habitat quality.

2. State fishery regulatory agencies, in collaboration with state water quality agencies, should monitor hypoxic conditions in state waters (including estuaries and tidal basins) and report changes in Atlantic croaker abundance or habitat use.

3. Where sufficient knowledge is available, states should designate Atlantic croaker habitat areas of particular concern for special protection. These locations should be designated High Quality Waters or Outstanding Resource Waters and should be accompanied by requirements that limit degradation of habitat, including minimization of non-point source runoff, prevention of significant increases in contaminant loadings, and prevention of the introduction of any new categories of contaminants into the area (via restrictions on National Pollutant Discharge Elimination System (NPDES) discharge permits for facilities in those areas.

4. State fishery regulatory agencies should develop protocols and schedules for providing input on water quality regulations and on Federal permits and licenses required by the Clean Water Act, Federal Power Act, and other appropriate vehicles, to ensure that Atlantic croaker habitats are protected to ensure that specific water quality needs for Atlantic croaker are met.

5. Water quality criteria for Atlantic croaker spawning and nursery areas should be established, or existing criteria should be upgraded, as to ensure successful reproduction. Any action taken should be consistent with Federal Clean Water Act guidelines and specifications.

6. All State and Federal agencies responsible for reviewing impact statements and permit applications for projects or facilities proposed for croaker spawning and nursery areas should ensure that those projects will have no or only minimal impact on local stocks. Any project that would result in the elimination of essential habitat should be avoided.

7. Federal and State fishery management agencies should take steps to limit the introduction of toxic compounds known to accumulate in Atlantic croaker and that pose threats to wildlife and human health.

8. Each State should establish windows of compatibility for activities known or suspected to adversely affect Atlantic croaker life stages and their habitats. Activities may include, but are not limited to, navigational dredging, bridge construction, and dredged material disposal, and notify the appropriate construction or regulatory agencies in writing.

9. Projects involving water withdrawal from nursery habitats (e.g. power plants, irrigation, water supply projects) should be evaluated to ensure that larval or juvenile impingement or entrainment is minimized, and that any modifications to water flow or salinity regimes remain within croaker tolerance limits.

10. Each state should develop water use and flow regime guidelines to ensure the appropriate water levels and salinity levels are maintained for the long-term protection and sustainability of the stock. States should work to ensure that proposed water diversions or withdrawals from rivers upstream will not reduce or eliminate conditions favorable to Atlantic croaker.

11. The use of any fishing gear that is determined by management agencies to have a negative impact on Atlantic croaker habitat should be prohibited within habitat areas of particular concern (e.g. trawling in spawning or primary nursery areas should be prohibited).

12. States should work to reduce the input of contaminants to Atlantic croaker habitats.

13. States should work with the U.S. Fish and Wildlife Service, Divisions of Fish and Wildlife Management Assistance and Ecological Services, and National Marine Fisheries Service (NMFS), Offices of Fisheries Conservation and Management and Habitat Conservation, to identify hydropower dams that pose significant threats to maintenance of appropriated freshwater flows (volume and timing) to Atlantic croaker nursery and spawning areas and target these dams for appropriate recommendations during FERC re-licensing.

Habitat Research Recommendations

Although Atlantic croaker habitats have undergone loss and degradation; studies are needed to quantify the impact on Atlantic croaker populations. For example, there has been some speculation in recent years that extensive areas of low dissolved oxygen in the Chesapeake Bay killed most of the benthic organisms in the deeper water where croaker feed. Unfortunately, no research has been conducted to confirm the impact of hypoxia on food resources in this region (R. Lukacovic, Maryland Department of Natural Resources, personal communication).

The early life history of the Atlantic croaker is not well documented, yet events during this phase could have a significant impact on recruitment. A better understanding of this life stage of the species is needed to identify its habitat requirements, allowing scientists to evaluate the relative impacts of natural and anthropogenic disturbances.

Periodic review of various programs to monitor habitat and water quality could play an important role in understanding Atlantic croaker population dynamics. The following topics should be examined: nutrient loading; long-term water quality monitoring; hypoxia events; incidence of red tides, harmful dinoflagellates and *Pfisteria*; habitat modification permits; and wetlands protection.

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CHAPTER 3: Black drum

Updated research for life stages. EFH, HAPC, and Threats are populated with Habitat Section from the Interstate Fishery Management Plan for Black Drum Some of the black drum habitat sections were adapted from red drum's habitat needs.

Section I. General Description of Habitat

Black drum in the Atlantic form one population, and two separate populations exist in the Gulf of Mexico (Gold and Richardson 1998). Like many coastal species, oceanic spawning is followed by ingress of eggs and larvae to mid and upper estuarine habitats, although substantial variation likely exists with respect to settlement. Juvenile black drum are largely estuarine-dependent, but throughout the first year of life begin moving to the lower estuary and possibly into the coastal ocean by the fall of year one (Able and Fahay 2010). Geographic adult age structure has been suggested, with older individuals more common in the Mid-Atlantic Bight than in the South Atlantic Bight, although a general movement pattern has been described as north and inshore in the spring, and south and offshore in the fall, which may confound true patterns of habitat use.

Part A. Spawning Habitat[1]

Geographic and Temporal Patterns of Migration

In the Atlantic basin, black drum spawn from April to June in the northern range (Joseph et al. 1964; Richards 1973; Silverman 1979). Black drum have been reported to spawn in nearshore waters, particularly bays and estuaries (Hoese 1965; Etzold and Christmas 1979). In the Mid-Atlantic region, spawning in the mouth of the Chesapeake Bay and larger estuaries has been well documented (Able and Fahay 2010) and the presence of a large spring/early summer fishery on spawning fish in the Delaware Bay also supports evidence of spawning occurring inshore and in the spring. Studies in Florida suggest spawning occurs in deep waters inshore, from November through April, with peaks in February and March (Murphy and Taylor 1989). It is noteworthy that the drumming sound made by black drum is associated with spawning behaviors, and several studies have measured noise in an effort to describe reproduction (Gulf of Mexico, Saucier and Baltz 1993, Locascio and Mann 2011; South America, Tellechea et al. 2010).

Fitzhugh et al. (1993) noted a difference in sex ratios in Louisiana during the spawning season between fish caught offshore by trawls (dominated by males), and fish caught inshore by gillnet and haul-seines (dominated by females). These skewed sex ratios were not found before or after the spawning period. The authors concluded the catches reflected a true segregation of the sexes during the spawning period, suggesting the use of different habitats.

[1] Much of the information in this section comes from two spawning studies in the Gulf of Mexico. These studies focused on the acoustics of spawning, and included a great deal of environmental data. Therefore, the ability to generalize about spawning habitat is somewhat limited, and more research is recommended.

Salinity
Salinity during drumming aggregations has been reported to range from 18.8 - 20.8 ppt in Louisiana (Saucier and Baltz 1993). Based on coastal ocean and lower estuary reported spawning habitats, euryhaline or full seawater salinities would be expected as optimal.

Substrate
None of the spawning studies describe substrate in association with a particular spawning aggregation; however, Saucier and Baltz (1993) generally describe the study sites to be heterogeneous, and include silt, clay, mud, sand, and detritus, and Locascio and Mann (2011) describe their sites as soft muddy composite.

Temperature
From studies limited to the Gulf of Mexico, spawning aggregations have been associated with temperatures ranging from 18 – 22 °C (Locascio and Mann 2011) and with means of 18.8 °C (for large drumming aggregations) and 20.8 °C (for moderate drumming aggregations; Saucier and Baltz 1993).

Dissolved Oxygen
Saucier and Baltz (1993) present the only dissolved oxygen (DO) data associated with black drum spawning. They report means of 12.3 and 11.6 mg L^{-1} for large and moderate spawning aggregations, respectively. Inference on DO preference or tolerance ranges (or in other spatial spawning aggregations) should be approached cautiously.

Feeding Behavior
No published work has reported on the feeding behaviors of spawning individuals. It might be inferred—based on nearshore and estuarine habitats—that spawning black drum feed on the same food sources as adults, which includes primarily crustaceans and mollusks.

Competition and Predation
Competition among black drum and with other species is undocumented for spawning adults. Because spawning habitat is not yet described at a fine scale (microhabitat), it is unclear whether spawning habitats are limiting, and if competition exists for these habitats or inclusion in spawning aggregations. Predation of spawning adults is likely similar to adult *P. cromis*, although possibly depressed from both lower predatory metabolic demands from cooler winter and spring water temperatures, and the absence of many estuarine shark species until late spring (Ulrich et al. 2007).

Part B. Egg Habitat

Geographic and Temporal Patterns of Migration
Along the Atlantic coast, black drum eggs are spawned during the spring, from April to June in the northern range (Joseph et al. 1964; Richards 1973; Silverman 1979), and in February and March in the southern range (data from Florida; Murphy and Taylor 1989). Most spawning has been reported or estimated to take place nearshore in the coastal ocean, though some eggs have been sampled in the lower reaches of larger estuaries, such as the Chesapeake Bay (Daniel and Graves 1994). Spawning takes place when temperatures are between 17.5 and 19°C (Joseph et al. 1964; Richards 1973). Black drum eggs are pelagic, and at 20 °C hatch in less than 24 h (Joseph et al. 1964). Some migration from tidal

stream transport may take place; however, due to the short duration of the egg stage, it is unlikely that much distance is covered.

Salinity
Even though spawning occurs nearshore, black drum eggs in the coastal ocean are assumed to be exposed to full marine salinity (35 ppt) or at least polyhaline conditions for the brief duration before hatching (~24 hours).

Substrate
Since black drum eggs are pelagic and positively buoyant, substrate is not considered a critical habitat parameter.

Temperature
Spawning has been reported to take place when temperatures are between 17.5 °C and 19 °C (Joseph et al. 1964; Richards 1973), and thus optimal (or tolerated) egg temperatures are likely very similar.

Dissolved Oxygen
Because the egg stage of black drum occurs entirely offshore, eggs are likely only ever exposed to normoxic waters (>5 mg L^{-1}). It is not currently thought that DO is a limiting factor to survival of black drum eggs.

Feeding Behavior
Black drum eggs subsist entirely off of the yolk sac prior to hatch.

Competition and Predation
Black drum eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (and largely met by the oceanic or estuarine conditions). Predation of eggs undoubtedly occurs by a variety of oceanic and estuarine consumers. Specifically, Cowan et al. (1992) reported predation of black drum eggs by ctenophores and hydromedusae in the Chesapeake Bay with potentially very high levels of predation during years where both gelatinous predators have high abundances.

Part C. Larval Habitat

Geographic and Temporal Patterns of Migration
Black drum larvae hatch around 2.5 mm SL (Able and Fahay 2010) and ingress from nearshore and lower estuarine egg habitats using tidal stream transport to variable locations within estuaries. Overall the general pattern documented for larvae is to move from higher salinity areas to lower salinity estuarine habitats (from otolith microchemical analyses; Rooker et al. 2004), and Gold and Richardson (1998) used molecular methods to characterize black drum as estuarine-dependent in the early years. However, black drum may be less dependent on upper, oligohaline and mesohaline estuarine habitats as larvae have been collected in higher salinities of 21 ppt (Peters and McMichael 1990). As with other sciaenids, it is likely that larval black drum settle in a range of estuarine habitats with confounding of estuarine-specific habitat availabilities.

Salinity

Peters and McMichael (1990) collected larvae off the Gulf Coast of Florida in salinities ranging from 21 to 31 ppt. The larval stage of black drum likely uses the lowest salinity habitats of any life stage, although there are few records of larvae collected in low salinity, upper estuarine habitats.

Substrate

Peters and McMichael (1990) collected larvae off the Gulf Coast of Florida over a variety of substrates, including sand, mud, and shells. Larval collections in the Atlantic, particularly with respect to substrate, are poorly known.

Temperature

Peters and McMichael (1990) collected larvae off the Gulf Coast of Florida in water temperatures ranging from 21.9 °C to 24.6 °C.

Dissolved Oxygen

DO demands are likely met offshore, as well as inshore after ingress. Both of these habitats typically do not experience hypoxic conditions in the winter and spring, although no published studies have reported on any limitations.

Feeding Behavior

Like most larval fish, black drum feed on their yolk sac initially (up to 4 days, or to an estimated 2.8 mm SL; Joseph et al. 1964). Post-yolk sac larvae then begin to feed generally on zooplankton (Benson 1982), and more specifically copepods (Peters and McMichael 1990).

Competition and Predation

Black drum larvae may experience density dependence, although this phenomenon has not been documented and the variety of settlement habitats may release them from specific habitat or spatial constraints. Additionally, the species' relatively long spawning season may mitigate against a temporal bottleneck for habitat. Larval black drum are likely subject to predation by a range of estuarine predators; particular attention to hydromedusa and ctenophore predators has been hypothesized to impact recruitment in years of low black drum production and high densities of hydrozoans (Cowan et al. 1992).

Part D. Juvenile Habitat

Geographic and Temporal Patterns of Migration

Broadly, juvenile black drum likely use a range of estuarine habitats. Small juveniles have been documented in upper and middle parts of estuaries, where salinities are low (<6 ppt; Able and Fahay 2010). However, by the summer months, juveniles begin moving down in the estuary into tidal and marsh habitats and are not found in rivers. By the fall, some juveniles are even found in ocean habitats. Beach seine sampling in Florida nearshore lagoons found high levels of juveniles, indicating juvenile black drum remain inshore (Peters and McMichael 1990).

Salinity

Salinity exposure is likely variable both across a cohort as well as the individual level. Some juveniles have been sampled in lower estuary, high salinity (>30 ppt) locations (Peters and McMichael 1990), while others have reported juvenile black drum in freshwater (Frisbie 1961; Thomas and Smith 1973). Some reports have discussed a size effect to down-estuary movement, in which migrations to lower estuarine or oceanic habitats is influenced by size. In general, smaller individuals inhabit low salinity tributaries whereas larger individuals inhabit higher salinity regions found at the mouths of bays and rivers (Frisbie 1961).

Substrate

Peters and McMichael (1990) reported juvenile black drum over unvegetated mud bottoms, and Pearson (1929) reported muddy, estuarine bottoms as the most common juvenile substrate. However, as with salinity, juveniles likely use a range of habitats and substrates.

Temperature

Juveniles likely experience a range of temperatures throughout their first year in an estuary. Juveniles in the Gulf of Mexico primarily sampled over summer and fall months were captured at 20.8 °C - 26.3 °C (Peters and McMichael 1990). Winter temperature drops are common causes of estuarine fish kills, and black drum are vulnerable to this condition (Simmons and Breuer 1962). McEachron et al. (1994) noted black drum in several winter kills in Texas coastal waters, though the length data suggests many of these fish were adults and not juveniles.

Dissolved Oxygen

Currently, there is no known information on juvenile black drum sensitivity to DO levels.

Feeding Behavior

Small juveniles primarily feed on amphipods, mollusks, polychaetes, and small fishes (Peters and McMichael 1990). As juveniles grow, Peters and McMichael (1990) found their consumption of shrimp, crabs, fish, and mollusks became more dominant, with the shift correlating to the development of pharyngeal jaw toothplates and molariform teeth.

Competition and Predation

Based on the within-estuary movement during the first year of life and wide use of estuarine resources, little is reported on competition among black drum or with other estuarine species, although they likely compete with other sciaenids (Sutter et al. 1986). Pharyngeal teeth permit black drum to eat a wide variety of mollusks and other prey items, which may limit competition on a single food source (Sutter et al. 1986). Predation of juvenile black drum likely takes place by estuarine predators, such as spotted seatrout, jacks, sharks (Murphy and Muller 1995).

Part E. Adult Habitat

Geographic and Temporal Patterns of Migration

While adult black drum likely move between estuarine and nearshore habitats, multiple investigators have noted two trends. The first trend is the expected movement toward deeper waters with age (i.e., out of tidal creeks and into lower estuaries). The second geographic pattern involves general adult movements north and inshore during spring, and south and offshore during fall (Richards 1973; Murphy and Taylor 1989). Jones and Wells (2001) note the possibility of age separation, with greater proportions of older fish north of Cape Hatteras, North Carolina. However, it is unclear what proportion of the Atlantic population undergoes migration or whether they are influenced by factors other than spawning. Even the literature has been inconsistent in regard to how to characterize adult habitat use. For example, Sutter (1986; citing Hoese and Moore 1977) stated that adult black drum are predominantly estuarine but other studies have cited an ocean residency period. Given the long lifespan of black drum

(>50 years) and factors driving adult habitat use (e.g., spawning migration, general seasonality), it is likely that they use a variety of inshore and nearshore habitats.

Salinity
Lower estuarine and coastal oceanic environments used by black drum are likely polyhaline or full seawater. Black drum are commonly found in waters with a salinity range of 9-26 ppt (McIlwain 1978) but individauls can tolerate salinities as low as 0 ppt and as high as 80 ppt (Gunter 1956; Simmons and Breuer 1962; Leard et al 1993).

Substrate
Adults likely use a wide variety of habitats and substrates, and Sutter (1986) suggests that adults are most common over sand and soft bottoms where oysters and clams can be found. Black drum in Louisiana were observed to avoid large, open areas of soft sediment (George 2003).

Temperature
McIlwain (1978; in Sutter 1986) reported black drum adults in a range of temperatures consisting of 12 °C - 33 °C. The range reported here may be interpreted as a suitable range, and more extreme temperatures may be tolerated.

Dissolved Oxygen
No studies have reported on dissolved oxygen requirements for black drum, though there is little reason to suspect that adults experience sustained periods of limited dissolved oxygen. Both their mobility and range of habitats suggest that they are not constrained to or by specific, low oxygen environments.

Feeding Behavior
Adult black drum continue their predation on benthic crustaceans and mollusks, although Ackerman (1951) reported surface feeding on menhaden. Blasina et al. (2010) reported on black drum in Argentina and also found crustaceans and mollusks to dominate the diet. With efforts underway to rehabilitate Atlantic oysters, some have looked into the ability of black drum to depress recovering oyster populations (Benson 1982; Brown et al. 2008).

Competition and Predation
Competition among black drum is likely minimal as there are no suspected habitat or forage limitations regularly imposed on adults. Adult black drum, based on their large size, are unlikely to be consumed, but have been documented to be preyed upon by sharks (Murphy and Muller 1995).

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat
Prior to transfer of management authority for red drum from the South Atlantic Fishery Management Council (SAFMC) to ASMFC, the SAFMC reviewed the Essential Fish Habitat (EFH) and HAPC designations for Red Drum. The SAFMC concluded the EFH and HAPCs would still be protected, as similar areas had been designated for other federally managed species. As a result, these areas, which also serve an important role in the black drum life cycle, have retained protection and are referenced here and in the Amendment 2 to the Red Drum FMP (ASMFC 2002).

The designated EFH includes tidal freshwater, estuarine emergent vegetated wetlands (flooded salt marsh, brackish marsh, and tidal creeks), estuarine scrub/shrub (mangrove fringe), submerged rooted vascular plants (seagrass), oyster reefs and shell banks, unconsolidated bottom (soft sediment), ocean high salinity surf zones, and artificial reefs (SAFMC 1998). The area covered ranges from Virginia through the Florida Keys, to a depth of 50 m offshore.

Identification of Habitat Areas of Particular Concern
For black drum, HAPCs includes the following habitats: tidal freshwater, estuarine emergent vegetated wetlands (flooded salt marshes, brackish marsh, and tidal creeks), estuarine scrub/shrub (mangrove fringe), submerged rooted vascular plants (seagrasses), oyster reefs and shell banks, unconsolidated bottom (soft sediments), ocean high salinity surf zones, and artificial reefs. These areas overlap with the designated HAPCs for red drum, designated in Amendment 2 to the Red Drum FMP (ASMFC 2002). These HAPCs include all coastal inlets, all state-designated nursery habitats (i.e. Primary Nursery Areas in North Carolina), sites where spawning aggregations of red drum have been documented and spawning sites yet to be identified, areas supporting submerged aquatic vegetation, as well as barrier islands off the South Atlantic states as they maintain the estuarine environment in which young black drum develop.

A species' primary nursery areas are indisputably essential to its continuing existence. Primary nursery areas for black drum can be found in estuaries, such as coastal marshes, shallow tidal creeks, bays, tidal flats of varying substrate, tidal impoundments, and seagrass beds. Since young black drum move among these environments, it is difficult to designate specific areas as deserving more protection than others. Moreover, these areas are not only primary nursery areas for black drum, but they fulfill the same role for numerous other resident and estuarine-dependent species of fish (i.e., other sciaenids) and invertebrates.

Similarly, juvenile black drum habitat extends over a broad geographic range and adheres to the criteria that define HAPCs. Juvenile black drum are found throughout tidal creeks and channels of southeastern estuaries, in backwater areas behind barrier islands and along beach fronts during certain times of the year. It is during this period that juveniles begin moving between low and higher salinity areas (Rooker et al. 2004). Therefore, the estuarine system as a whole, from the lower salinity reaches of rivers to the mouth of inlets, is vital to the continuing existence of this species.

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of Black Drum

Threats to black drum habitats include the following: loss of estuarine and marine wetlands, loss of oyster reefs, coastal development, nutrient enrichment of estuarine waters, poor water quality, hydrologic modifications, and alteration of freshwater flows into estuarine waters.

Present Condition of Habitat Areas of Particular Concern

Coastal Spawning Habitat: Condition and Threats Coastal Spawning
It is reasonable to assume that areas where coastal development is taking place rapidly, habitat quality may be compromised. Coastal development is a continuous process in all states and all coastal areas in the nation are experiencing significant growth. The following section describes particular threats to the

nearshore habitats in the South Atlantic that meet the characteristics of suitable spawning habitat for black drum.

One threat to the spawning habitat for black drum is navigation and related activities such as dredging and hazards associated with ports and marinas (ASMFC 2013). According to the SAFMC (1998), impacts from navigation related activities on habitat include: direct removal/burial of organisms from dredging and disposal of dredged material, effects due to turbidity and siltation; release of contaminants and uptake of nutrients, metals and organics; release of oxygen-consuming substances, noise disturbance, and alteration of the hydrodynamic regime and physical characteristics of the habitat. All of these impacts have the potential to substantially decrease the quality and extent of black drum spawning habitat as well as prey resources.

Besides creating the need for dredging operations that directly and indirectly affect spawning habitat for black drum, ports also present the potential for spills of hazardous materials. The cargo that arrives and departs from ports includes highly toxic chemicals and petroleum products. Although spills are rare, constant concern exists since huge expanses of productive estuarine and nearshore habitat are at stake. Additional concerns related to navigation and port utilization are discharge of marine debris, garbage, and organic waste into coastal waters.

Maintenance and stabilization of coastal inlets is of concern in certain areas of the southeast. Studies have implicated jetty construction to alterations in hydrodynamic regimes thus affecting the transport of larvae of estuarine-dependent organisms through inlets (Miller et al. 1984; Miller 1988).

Estuarine Nursery, Juvenile and Sub-adult Habitat: Condition and threats

Coastal wetlands and their adjacent estuarine waters constitute primary nursery, juvenile, and sub-adult habitat for black drum along the coast. Between 1986 and 1997, estuarine and marine wetlands nationwide experienced an estimated net loss of 10,400 acres. However, the rate of loss was reduced over 82% since the previous decade (Dahl 2000). Most of the wetland loss resulted from urban and rural activities and the conversion of wetlands for other uses. Along the southeast Atlantic coast, the state of Florida experienced the greatest loss of coastal wetlands due to urban or rural development (Dahl 2000). However, the loss of estuarine wetlands in the southeast has been relatively low over the past decade although there is some evidence that invasion by exotic species, such as Brazilian pepper (*Schinus terebinthifolius*), in some areas could pose potential threats to fish and wildlife populations in the future (T. Dahl, personal communication).

Throughout the coast, the condition of estuarine habitat varies according to location and the level of urbanization. In general, it can be expected that estuarine habitat adjacent to highly developed areas will exhibit poorer environmental quality than more distant areas. Mollusks, which are a dominant component of the black drum diet, bioaccumulate toxins in their tissues (Shumway et al. 1990) although the impact of this bioaccumulation on black drum is not known. Hence, environmental quality concerns are best summarized on a watershed level.

Threats to estuarine habitats of the southeast were described in Amendment 2 to the Red Drum FMP (ASMFC 2002). Due to the black drum's dependence on estuarine habitats throughout its early years, these same threats are likely to impact black as well as red drum.

Nutrient enrichment of estuarine waters throughout the southeast is a major threat to the quality of estuarine habitat. Forestry practices contribute significantly to nutrient enrichment in the southeast. Areas involved are extensive and many are in proximity to estuaries. Urban and suburban developments are perhaps the most immediate threat to black drum habitat in the southeast. The almost continuous expansion of ports and marinas in the South Atlantic poses a threat to aquatic and upland habitats. Certain navigation-related activities are not as conspicuous as port terminal construction but have the potential to significantly impact the estuarine habitat that black drum require. Activities related to watercraft operation and support pose numerous threats including discharge of pollutants from boats and runoff from impervious surfaces, contaminants generated in the course of boat maintenance, intensification of existing poor water quality conditions, and the alteration or destruction of wetlands, shellfish and other bottom communities for the construction of marinas and other related infrastructure.

Estuarine habitats of the southeast can be negatively impacted by hydrologic modifications. The latter include activities related to aquaculture, mosquito control, wildlife management, flood control, agriculture, and silviculture. Also, ditching, diking, draining and impounding activities associated with industrial, urban, and suburban development qualify as hydrologic modifications that may impact the estuarine habitat. Alteration of freshwater flows into estuarine areas may change temperature, salinity and nutrient regimes as well as alter wetland coverage. Studies have demonstrated that changes in salinity and temperature can have profound effects in estuarine fishes (Serafy et al. 1997) and that salinity partly dictates the distribution and abundance of estuarine organisms (Holland et al. 1996). Hence, black drum are probably as susceptible as any other estuarine organism to such changes in the physical regime of their environment.

Oyster reefs in Louisiana are a preferred habitat (George 2003) and oysters are a common prey (Blasina et al. 2010). However, in the Chesapeake Bay, oysters have been reduced to 1% of historical levels (Kemp et al. 2005), which represents a significant decline in both a preferred habitat and prey of black drum.

Adult Habitat: Condition and Threats

Threats to the black drum's adult habitat are not as numerous as those faced by postlarvae, juveniles, and subadults in the estuarine and coastal waters. Current threats to the nearshore and offshore habitats that adult black drum utilize in the South Atlantic include navigation and related activities, dumping of dredged material, mining for sand and minerals, oil and gas exploration, offshore wind facilities, and commercial and industrial activities (SAFMC 1998).

An immediate threat is the sand mining for beach nourishment projects. Associated threats include burial of bottoms near the mine site or near disposal sites, release of contaminants directly or indirectly associated with mining (i.e. mining equipment and materials), increases in turbidity to harmful levels, and hydrologic alterations that could result in diminished desirable habitat.

Offshore mining for minerals may pose a threat to black drum habitat in the future. Currently, there are no mineral mining activities taking place in the South Atlantic. However, various proposals to open up additional areas off the Atlantic coast to seabed mining have been introduced by the Federal Executive and Legislative branches.

Offshore wind farms may also pose a threat to black drum habitat at different life stages in the future (ASMFC 2011). Currently, there are no offshore wind farms established in the United States. However, the Atlantic coast is a potential candidate for future wind farm sites.

Unknowns and Uncertainties

Habitat preferences, physiological tolerances to temperature, salinity, and dissolved oxygen, and life history information is lacking for black drum. Without these data, it is extremely difficult to predict how black drum populations will respond to climate variability, ocean acidification, environmental toxins, and hypoxic conditions. For example, during an hypoxic event black drum are mobile and are able to avoid hypoxic waters whereas their prey (sessile mollusks) are unable to avoid these conditions, potentially increasing mortality of black drum prey. Therefore, there are many ecological linkages in estuarine and coastal ecosystems that need to be examined to understand direct and indirect impacts of habitat degradation on the various life stages of black drum.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Particular attention should be directed toward black drum habitat utilization and habitat condition (environmental parameters). A list of existing state and federal programs generating environmental data such as sediment characterization, contaminant analysis, and habitat coverage (marsh grass, oyster beds, submerged aquatic vegetation) should also be produced and updated as new information arises. Habitats utilized by black drum range from the tidal freshwater out to and likely beyond, the shelf break. Thus, virtually any study generating environmental data from estuarine or coastal ocean systems could be of value.

1. Where sufficient knowledge is available, states should designate black drum HPACs for special protection. These locations should be accompanied by requirements that limit degradation of habitat, including minimization of non-point source and specifically storm water runoff, prevention of significant increases in contaminant loadings, and prevention of the introduction of any new categories of contaminants into the area.

2. Where habitat areas have already been identified and protected, states should ensure continued protection of these areas by notifying and working with other federal, state, and local agencies. States should advise these agencies of the types of threats to black drum and recommend measures that should be employed to avoid, minimize, or eliminate any threat to current habitat quality or quantity.

3. States should minimize loss of wetlands to shoreline stabilization by using the best available information, incorporating erosion rates, and promoting incentives for use of alternatives to vertical shoreline stabilization measures (e.g., sea walls), commonly referred to as living shorelines projects.

4. All State and Federal agencies responsible for reviewing impact statements and permit applications for projects or facilities proposed for black drum spawning and nursery areas should ensure that those projects will have no or only minimal impact on local stocks. Any project that would eliminate essential habitat should be avoided, if possible, or at a minimum, adequately mitigated.

5. Each State should establish windows of compatibility for activities known or suspected to adversely affect black drum life stages and their habitats, with particular emphasis to avoid spawning season. Activities may include, but are not limited to, navigational dredging, bridge construction, and dredged material disposal, and notify the appropriate construction or regulatory agencies in writing.

6. Each state should develop water use and flow regime guidelines, where applicable, to ensure that appropriate water levels and salinity levels are maintained for the long-term protection and sustainability of the stocks. Projects involving water withdrawal or interrupt water flow should be evaluated to ensure that any impacts are minimized, and that any modifications to water flow or salinity regimes maintain levels within black drum's tolerance limits.

7. The use of any fishing gear that is determined by management agencies to have a negative impact on black drum habitat should be prohibited within habitat areas of particular concern. Further, states should protect vulnerable habitat from other types of non-fishing disturbance as well.

8. States should work with the USFWS's Divisions of Fish and Wildlife Management Assistance and Ecological Services, and National Marine Fisheries Service's Offices of Fisheries Conservation and Management and Habitat Conservation, to identify hydropower and water control structures that pose significant threats to maintenance of appropriate freshwater flows (volume and timing) to black drum nursery and spawning areas and target these dams for appropriate recommendations during FERC re-licensing.

9. States should conduct research to evaluate the role of submerged aquatic vegetation and other submersed structures in the spawning success, survival, growth, and abundance of black drum. This research could include regular mapping of the bottom habitat in identified areas of concern, as well as systematic mapping of this habitat where it occurs in estuarine and marine waters of the states.

10. States should continue support for habitat restoration projects, including oyster shell recycling and oyster hatchery programs as well as seagrass restoration, to provide areas of enhanced or restored bottom habitat, which serve as nurseries or foraging grounds.

11. Water quality criteria for black drum spawning and nursery areas should be established, or existing criteria should be upgraded, to ensure successful reproduction of these species. Any action taken should be consistent with Federal Clean Water Act guidelines and specifications.

12. State fishery regulatory agencies, in collaboration with state water quality agencies, should monitor water quality in known habitat for black drum, including turbidity, nutrient levels, and dissolved oxygen.

13. States should work to reduce point-source pollution from wastewater through improved inspections of wastewater treatment facilities and improved maintenance of collection infrastructure.

14. States should develop protocols and schedules for providing input on water quality regulations, and on Federal permits and licenses required by the Clean Water Act, Federal Power Act, and other appropriate vehicles, to ensure that black drum habitats are protected and water quality needs are met.

Habitat Research Recommendations

The Interstate Fishery Management Plan for Black Drum (2013) states three research needs for black drum habitat.

- Expand existing fishery independent surveys in time and space to better cover black drum habitats, if possible (especially adults).
- Conduct otolith microchemistry studies to identify regional recruitment contributions.
- Conduct new and expand existing acoustic tagging programs to help identify spawning and juvenile habitat use and regional recruitment sources.

Additional research objectives also need to focus on resolving the preferred and physiological tolerances of black drum, at all life stages, for temperature, salinity, and dissolved oxygen. Studies also need to examine the impact of black drum consuming mollusks in polluted, industrialized regions since mollusks bioaccumulate toxins.

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CHAPTER 4: Red drum

Populated with text from the Red Drum Habitat Addendum (2013)

Section I. General Description of Habitat

Part A. Spawning Habitat

Red drum (*Sciaenops ocellatus*) spawn from late summer to late fall in a range of habitats, including estuaries, near inlets, passes, and near bay mouths (Peters and McMichael 1987). Earlier studies have illustrated that spawning often occurred in nearshore areas relative to inlets and passes (Pearson 1929; Miles 1950; Simmons and Breuer 1962; Yokel 1966; Jannke 1971; Setzler 1977; Music and Pafford 1984; Holt et al. 1985). More recent evidence, however, suggests that in addition to nearshore vicinity habitats, red drum also utilize high-salinity estuarine areas along the coast (Murphy and Taylor 1990; Johnson and Funicelli 1991; Nicholson and Jordan 1994; Woodward 1994; Luczkovich et al. 1999; Beckwith et al. 2006). Direct evidence of red drum spawning has been documented deep within estuarine waters of the Indian River Lagoon, Florida (IRL) (Murphy and Taylor 1990; Johnson and Funicelli 1991). More recently, an intensive 2 year ichthyoplankton survey consistently collected preflexion (2–3 mm) red drum larvae up to 90 km away from the nearest ocean inlet from June to October with average nightly larval densities as high as 15 per 100 m3 of water in the IRL (Reyier and Shenker 2007). Acoustic telemetry results for large adult red drum in the IRL further support estuarine spawning of this species within the IRL system (Reyier et al. 2011)

Geographic and Temporal Patterns of Migration

Red drum have a range extending from the Long Island south to the western Gulf of Mexico but it rarely occurs north of the Chesapeake Bay. Although spawning can occur in a variety of nearshore habitats, it often occurs near the mouths of large embayments from July to October (Able and Fahay 2010). Peak spawning takes place between August and September. In addition, red drum are thought to return to natal estuaries for spawning (Bacheler et al. 2009a; Patterson et al. 2004).

Salinity

High salinity, coastal estuarine areas provide optimal conditions for egg and larval development, as well as circulation patterns beneficial to transporting larvae to suitable nursery areas (Ross and Stevens 1992).

Substrate

Substrate sediments in spawning habitats are fine to coarse, unconsolidated sands. Current regimes conducive to larval transport ensure that fine sediments are sorted out of the substrate mix. Little is known regarding specific substrate types where spawning occurs within true estuarine habitats, but limited estuarine ichthyoplankton studies on red drum suggests recently hatched larvae are found over a mix of sand, sand-shell hash and sand-mud substrates. However, the release of gametes during spawning occurs in the surface waters, away from the benthos (Barrios 2004).

Temperature

Spawning in laboratory studies have also appeared to be temperature-dependent, occurring in a range from 22 °C to 30 °C but with optimal conditions between temperatures of 22 °C to 25 °C (Holt et al.

1981). Renkas (2010) was able to duplicate environmental conditions of naturally spawning red drum from Charleston Harbor, South Carolina in a mariculture setting, and corroborated that active egg release occurred as water temperature dropped from a peak of approximately 30 °C during August. Cessation of successful egg release was found at 25 °C, with no spawning effort found at lower temperatures (Renkas 2010). Pelagic eggs, embryos, and larvae are transported by currents into nursery habitats for the duration of egg and larval stages (Peters and McMichael 1987; Beck et al. 2001).

Dissolved Oxygen

Little information exists regarding specific dissolved oxygen (DO) concentrations in relation to red drum spawning. Preliminary passive acoustic surveys in North Carolina waters suggest that DO levels of bottom waters may play a significant role for red drum aggregation formation. Spawning fish were significantly lower at sites with DO levels of bottom waters below 2.5 mg/l (Barrios 2004)

Feeding Behavior

No published work has reported on the feeding behaviors of actively spawning individuals. It might be inferred—based on nearshore and estuarine habitats—that spawning red drum feed on the same food sources as adults, which includes primarily larger fishes, crustaceans, and mollusks. Limited sampling of adult red drum in North Carolina revealed blue crab (*Callinectes sapidus*) made up 51% of the diet by number and occurred in 48% of the stomachs (Peacock 2014). The same study found the diet of adult red drum in South Carolina was more diverse than in North Carolina, where red drum consumed mostly Atlantic menhaden (*Brevoortia tyrannus*) and a diverse group of marine decapods and brachyurans.

Competition and Predation

Predation on spawning adults is likely similar to other adult red drum, depending on habitat. Various shark species (e.g. bull shark, *Carcharhinus leucas*; blacktip shark, *C. limbatus*) are potential predators of spawning adults.

Part B. Egg and Larval Habitat

Nelson et al. (1991) reported that red drum eggs are commonly encountered in several southeastern estuaries, in salinities above 25 ppt. Laboratory experiments in Texas (Neill 1987; Holt et al. 1981) established that optimum temperature and salinity for hatching and survival of red drum larvae are 25 °C and 30 ppt, respectively. The spatial distribution and relative abundance of eggs in estuaries mirrors that of spawning adults in the fall (Nelson et. al. 1991). Eggs and early larvae utilize high salinity waters inside inlets and passes and within the estuary. In Florida, Johnson and Funicelli (1991) collected viable red drum eggs in Mosquito Lagoon, Florida, in average daily water temperatures of 20 °C – 25 °C and average salinities of 30 - 32 ppt. The largest number of eggs collected during the study was in depths ranging from 1.5 to 2.1 m and highest concentrations of eggs were found at the edge of the channel.

Geographic and Temporal Patterns of Migration

Upon hatching, red drum larvae are pelagic (Johnson 1978) and growth rates are temperature-dependent (Holt et al. 1981). They make the transition between pelagic and demersal habitats within a few weeks after reaching nursery habitats (Pearson 1929; Peters and McMichael 1987; Comyns et al. 1991; Rooker and Holt 1997; Havel et al. 2015). They ingress into lower salinity nursery habitats in estuaries using tidal (Setzler 1977; Holt et al. 1989) or density-driven currents (Mansueti 1960; Bass and Avault 1975; Setzler 1977; Weinstein 1979; Holt et al. 1983; Holt et al. 1989; Peters and McMichael

1987; McGovern 1986; Daniel 1988). Once in the nurseries, red drum larvae grow rapidly (Baltz et al 1998).

Red drum larvae along the Atlantic coast are common in most major southeastern estuaries, with the exception of Albemarle Sound, and they are abundant in the St. Johns and Indian River estuaries, Florida (Nelson et al. 1991). Data on the spatial distribution of red drum larvae in the Gulf of Mexico has been summarized by Mercer (1984). More recently, Lyczkowski-Shultz and Steen (1991) observed diel vertical stratification among red drum larvae found in depths <25 m at both offshore and nearshore locations.

Salinity
Red drum eggs have been commonly encountered in several southeastern estuaries in high salinity waters (above 25 ppt) (Nelson et al. 1991). The highest numbers of eggs were gathered in average salinities from 30 - 32 ppt at the edge of the channel (Johnson and Funicelli 1991). Salinities above 25 ppt allow red drum eggs to float while lower salinities cause eggs to sink (Holt et al. 1981). However, early stage red drum larvae were commonly found within estuarine waters of the Indian River Lagoon, Florida in salinity as low as 20 ppt (Reyier and Shenker 2007).

Spatial distribution and relative abundance of eggs in estuaries, as expected, mirrors that of spawning adults (Nelson et al. 1991); eggs and early larvae utilize high salinity waters inside inlets, passes, and in the estuary proper.

Substrate
Upon hatching, red drum larvae are pelagic (Johnson 1978; Holt et al. 1981). Newly hatched red drum spend around twenty days in the water column before associating with benthos (Rooker et al. 1999; FWCC 2008). The size at settlement is determined by the substrate of the settlement site (Havel et al. 2015). Daniel (1988), however, found larvae younger than 20 days old already settled in the Charleston Harbor estuary.

Temperature
Larval red drum (1.7 - 5.0 mm mean SL length) were found in temperatures between 26 °C – 28 ° C (Lyczkowski-Shultz and Steen 1991). Research conducted in Mosquito Lagoon, Florida, found viable red drum eggs at average daily water temperatures ranging from 20 °C to 25 °C (Johnson and Funicelli 1991). In Texas, laboratory experiments conducted by Neill (1987) and Holt et al. (1981) concluded that an optimum temperature for the hatching and survival of red drum eggs and larvae was 25 °C.

Dissolved Oxygen
Mean DO concentration where larval red drum were captured in the Indian River Lagoon, Florida was 6.3 mg/l (Reyier 2005).

Feeding Behavior
Larval red drum are opportunistic feeders (Bass and Avault 1975). In Louisiana waters, larvae < 15 mm fed heavily on zooplankton (e.g. copepods and copepod nauplii) whereas in Florida larvae (8 – 15 mm) in Tampa Bay feed primarily on copepods, mysids, and polychaetes (Peters and McMichael 1987).

Competition and Predation
Little information is available on competition or predation on larval red drum. Predators of larval fishes include a variety of organisms (planktonic crustaceans, chaetognaths, larger planktivorous fishes, and

gelatinous organisms) (Duffy et al. 1997). Red drum spawn in the Gulf of Mexico from late summer to early fall, which coincides with elevated numbers of several species of jellyfish that represent dominate predators of eggs and larvae (Kraeuter and Setzler 1975). For example, during peak red drum spawning season in the Indian River Lagoon, no red drum eggs were collected when high ctenophore numbers were present (Johnson and Funicelli 1991).

Part C. Juvenile Habitat

Juvenile red drum utilize a variety of inshore habitats including tidal freshwater habitats, low-salinity reaches of estuaries, estuarine emergent vegetated wetlands, estuarine scrub/shrub, submerged aquatic vegetation, oyster reefs, shell banks, and unconsolidated bottom (SAFMC 1998).

Geographic and Temporal Patterns of Migration

The distribution of juvenile red drum within estuaries varies seasonally as individuals grow and begin to disperse. Along the South Atlantic coast, they utilize a variety of inshore habitats. Late juveniles leave shallow nursery habitats at approximately 200 mm TL (10 months of age). They are considered subadults until they reach sexual maturity at 3 - 5 years (C. Wenner, personal communication). It is at this life stage that red drum use a variety of habitats within the estuary and when they are most vulnerable to exploitation (Pafford et al. 1990; Wenner 1992). Tagging studies conducted throughout the species' range indicate that most subadult red drum tend to remain in the vicinity of a given area (Beaumarriage 1969; Osburn et al. 1982; Music and Pafford 1984; Wenner, et al. 1990; Pafford et al. 1990; Ross and Stevens 1992; Woodward 1994; Marks and DiDomenico 1996; Adams and Tremain 2000). Movement within the estuary is most likely related to changes in temperature and food availability (Pafford et al. 1990; Woodward 1994).

Tagging studies indicate that late age-0 and 1 year-old red drum are common throughout the shallow portions of the estuaries and are particularly abundant along the shorelines of rivers and bays, in creeks, and over grass flats and shoals of the sounds. During the fall, those subadult fish inhabiting the rivers move to higher salinity areas such as the grass flats and shoals of the barrier islands and the front beaches. With the onset of winter temperatures, juveniles leave the shallow creeks for deeper water in the main channels of rivers (9 - 15 m) and returned again to the shallows in the spring. Fish that reside near inlets and along the barrier islands during the summer are more likely to enter the surfzone in the fall.

By their second and third year of growth, red drum are less common in rivers but are common along barrier islands, inhabiting the shallow water areas around the outer bars and shoals of the surf and in coastal inlets over inshore grass flats, creeks or bays. In the northern portion of the South Carolina coast, subadults use habitats use broad, gently sloping flats (up to 200 m or more in width). Along the southern part of the South Carolina coast, subadult red drum inhabitat narrow (50 m or less), fairly level flats traversed by numerous small channels, typically 5 - 10 m wide by less than 2 m deep at low tide (ASMFC 2002).

Salinity

Wenner et al. (1990) collected post-larval and juvenile red drum in South Carolina from June 1986 through July 1988 in shallow tidal creeks with salinities of 0.8 - 33.7 ppt, although the preferred salinity range in the Indian River Lagoon is between19 to 29 ppt (Tremain and Adams 1995).

Substrate

In general, habitats supporting juvenile red drum can be characterized as detritus or mud-bottom tidal creeks as well as sand and shell hash bottoms (Daniel 1988; Ross and Stevens 1992). Within seagrass beds, investigations have shown that juveniles to prefer areas with patchy grass coverage or sites with homogeneous vegetation (Mercer 1984; Ross and Stevens 1992; Rooker and Holt 1997). In a Texas estuary, young red drum (6 - 27 mm SL) were never present over non-vegetated muddy-sandy bottom; areas most abundant in red drum occurred in the ecotone between seagrass and non-vegetated sand bottom (Rooker and Holt 1997). In South Carolina, Wenner (1992) indicated that very small red drum occupy small tidal creeks with mud/shell hash and live oyster as common substrates (since sub-aquatic vegetation is absent in South Carolina estuaries).

Temperature

Juvenile red drum are tolerant to a wide range of temperatures (8.5 – 33.5 °C) (Bacheler et al. 2009b; Able and Fahay 2010). In the winter of their first year, 3 - 5 month old juveniles migrate to deeper, more temperature-stable parts of the estuary during colder weather (Pearson 1929). In the following spring, juveniles become more common in the shallow water habitats.

Dissolved Oxygen

In estuarine creek habitats in the Indian River lagoon, FL (IRL), subadults and small adult red drum were collected in waters with mean DO levels ranging from 5 ppm to 10 ppm (year round) (Tremain and Adams 1995). Within main lagoon habitats in the IRL, large subadults were found in DO concentrations ranging from 4 to 12 ppm (Adams and Tremain 2000).

Feeding Behavior

Larger juveniles are opportunistic feeders foraging on mysids, amphipods, palaemonid and penaeid shrimp, crabs, small fishes, and other sciaenids (Bass and Avault 1975). A higher diversity in prey items was found in stomachs of red drum collected over sand bottoms vs mud bottoms (Odum 1971). In Tampa Bay, FL, juvenile red drum to 75 mm fed primarily on mysids, polychaetes, amphipods, and insects in juveniles to 75 mm, with crabs and fish dominant in larger juveniles larger than 105 mm (Peters and McMichael 1987).

Competition and Predation

Small juvenile red drum are prey for numerous estuarine fish species and likely compete with other sciaenids. Larvae and juveniles are also consumed by pinfish (Minello and Stunz 2001).

Part D. Adult Habitat

Along the Atlantic Coast adult red drum migrate north and inshore in the spring and migrate offshore and south in the fall. Overall, adults tend to spend more time in coastal waters after reaching sexual maturity. However, they do continue to frequent inshore waters on a seasonal basis. Less is known about the biology of red drum once they reach the adult stage and accordingly, there is a lack of information on habitat utilization by adult fish. The SAFMC's Habitat Plan (SAFMC 1998) cited high salinity surf zones and artificial reefs as essential fish habitat (EFH) for red drum in oceanic waters, which comprise the area from the beachfront seaward. In addition, nearshore and offshore hard/live bottom areas have been known to attract concentrations of red drum. The following description of these habitats was adapted from that provided in the SAFMC's Habitat Plan (1998b).

Geographic and Temporal Patterns of Migration

Adult red drum make seasonal migrations along the Atlantic coast. In the spring, adults move north and inshore but offshore and south in the fall. Overall, adults tend to spend more time in coastal waters after reaching sexual maturity. However, they do continue to frequent inshore waters on a seasonal basis. In the Indian River Lagoon, FL, limited seasonal migrations (Reyier et al. 2011) including some movement to coastal inlets in fall during the spawning season have been detected (Reyier et al. 2011). In Mosquito Lagoon (northern IRL), a portion of the adult population remain within the estuary where documented spawning occurs (Johnson and Funicelli 1991, Reyier et al. 2011).

Salinity

Adult red drum inhabit high salinity surf zones along the coast and adjacent offshore waters, at full marine salinity. Adults in some areas of their range (e.g. Indian River Lagoon, FL) can reside in estuarine waters year-round, where salinities are variable.

Substrate

In addition to natural hard/live bottom habitats, adult red drum also use artificial reefs and other natural benthic structures. Red drum were found from late November until the following May at both natural and artificial reefs along tide rips or associated with the plume of major rivers in Georgia (Nicholson and Jordan 1994). Data from this study suggests that adult red drum exhibit high seasonal site fidelity to these features. Fish tagged in fall along shoals and beaches were relocated 9 - 22 km offshore during winter and then found back at the original capture site in the spring. In summer, fish moved up the Altamaha River nearly 20 km to what the authors refer to as “pre-spawn staging areas” and then returned to the same shoal or beach again in the fall.

Temperature

Bottom water temperatures in deeper hard/live bottom areas range from approximately 11 °C - 27 °C whereas inshore areas typically exhibit cooler temperatures (SEAMAP's South Atlantic Bottom Mapping Work Group effort 1992).

Dissolved Oxygen

Large subadults and small adults were collected in waters of the Indian River Lagoon, FL where mean DO levels ranged from 5 ppm to 10 ppm (year round) (Tremain and Adams 1995).

Feeding Behavior

Red drum are opportunistic foragers and their prey varies with size and season (Scharf and Schlight 2000). Adults feed on a variety of crustaceans, mollusks, and fishes (Chao 2002). Common prey species of adult red drum of the coast of Texas are white shrimp, gulf menhaden, and swimming crabs (blue crabs and related species) (Scharf and Schlight 2000).

Competition and Predation

Predators of large adult red drum within nearshore and offshore habitats likely include an array of shark species. Blacktip sharks and sandbar sharks have been observed within and surrounding large red drum schools off the Atlantic coast of Florida.

<u>Section II. Essential Fish Habitats and Habitat Areas of Particular Concern</u>

Essential Fish Habitat

The SAFMC recognizes several habitats as EFH for red drum. These natural communities include tidal freshwater, estuarine emergent vegetated wetlands (flooded salt marsh, brackish marsh, and tidal creeks), estuarine scrub/shrub (mangrove fringe), submerged rooted vascular plants (seagrass), oyster reefs and shell banks, unconsolidated bottom (soft sediment), high salinity surf zones, and artificial reefs (SAFMC 1998). The area covered ranges from Virginia through the Florida Keys, to a depth of 50 m offshore.

Identification of Habitat Areas of Particular Concern

For red drum, this includes the following habitats: tidal freshwater, estuarine emergent vegetated wetlands (flooded saltmarshes, brackish marsh, and tidal creeks), estuarine scrub/shrub (mangrove fringe), submerged rooted vascular plants (sea grasses), oyster reefs and shell banks, unconsolidated bottom (soft sediments), ocean high salinity surf zones, and artificial reefs. The SAFMC, which has a similar designation for their HAPCs, has recognized HAPCs for red drum along the U.S. coast including all coastal inlets, all state-designated nursery habitats (i.e. Primary Nursery Areas in North Carolina), sites where spawning aggregations of red drum have been documented and spawning sites yet to be identified, and areas supporting submerged aquatic vegetation. The SAFMC (1998b) also cited barrier islands off the South Atlantic states as being of particular importance since they maintain the estuarine environment in which young red drum develop. Inlets between barrier islands are of concern because the productivity of the estuary depends on the slow mixing of fresh and seawater that occurs in these areas. Finally, inlets, channels, sounds and outer bars are of particular importance to red drum since spawning activity is known to occur in these areas throughout the South Atlantic. Moreover, subadult and adult red drum utilize these areas for feeding and daily movements.

A species' primary nursery areas are indisputably essential to its continuing existence. Primary nursery areas for red drum can be found throughout estuaries, usually in shallow waters of varying salinities that offer certain degree of protection. Such areas include coastal marshes, shallow tidal creeks, bays, tidal flats of varying substrate, tidal impoundments, and seagrass beds. Since red drum larvae and juveniles are ubiquitous in such environments, it is impossible to designate specific areas as deserving more protection than others. Moreover, these areas are not only primary nursery areas for red drum, but they fulfill the same role for numerous other resident and estuarine-dependent species of fish and invertebrates, especially other sciaenids.

Similarly, subadult red drum habitat extends over a broad geographic range and adheres to the criteria that define HAPCs. Subadult red drum are found throughout tidal creeks and channels of southeastern estuaries, in backwater areas behind barrier islands and in the front beaches during certain times of the year. Therefore, the estuarine system as a whole, from the lower salinity reaches of rivers to the mouth of inlets, is vital to the continuing existence of this species.

SAFMC HAPC Designations for Red Drum

Of the designated EFH, HPACs have been recognized for red drum by the SAFMC. Areas which meet the criteria for HAPC include all coastal inlets, all state-designated nursery habitats of particular importance to red drum, documented sites of spawning aggregations from North Carolina to Florida, other spawning areas identified in the future, and areas supporting submerged aquatic vegetation (SAFMC 1998). These HAPC include the most important habitats required during the life cycle of the species, including spawning areas and nursery grounds. Other areas of concern are barrier islands.

Present Condition of Habitat Areas of Particular Concern

Red drum populations along the Atlantic coast are managed through the Atlantic Coastal Fisheries Cooperative Management Act (Atlantic Coastal Act). Unlike the Magnuson-Stevens Fishery Conservation and Management Act which addresses fishery management by federal agencies, the Atlantic Coastal Act does not require the ASMFC to identify habitats that warrant special protection because of their value to fishery species. Nonetheless, the Commission believes this is a good practice so that appropriate regulatory, planning, and management agencies can consider this information during their deliberations.

A subset of red drum habitats, which the Commission refers to as Habitats of Concern (HOC), is especially important as spawning and nursery areas for red drum. HOC for red drum include all coastal inlets, submerged aquatic vegetation beds, the surf zone (including outer bars), and state-designated nursery habitats (e.g., Primary Nursery Areas in North Carolina; Outstanding Resource Waters in South Carolina's coastal counties; Aquatic Preserves along the Atlantic coast of Florida).

Coastal Spawning Habitat: Condition and Threat

The productivity and diversity of coastal spawning habitat can be compromised by the effects of industrial, residential, and recreational coastal development (Vernberg et al. 1999). Coastal development continues in all states and coastlines of the nation despite the increased protection afforded by federal and state environmental regulations. Threats to nearshore habitats in the south Atlantic that are documented spawning habitats for red drum or are suitable spawning habitats are described below.

Navigation and boating access development and maintenance activities, such as dredging and hazards from ports and marinas, are a threat to spawning habitats of red drum. According to the SAFMC (1998) and ASMFC (2002), navigation related activities can result in: removal or burial of organisms from dredging or disposal of dredged material, effects due to turbidity and siltation, release of contaminants and uptake in nutrients, metals and organics, release of oxygen-consuming substances, noise disturbance, and alteration of hydrodynamic regime and habitat characteristics. All listed effects have the potential to decrease the quality and quantity of red drum spawning habitat.

Ports also pose the threat of potential spills of hazardous materials. Cargo that arrives and departs from ports can contain highly toxic chemicals and petroleum products. The discharge of oil may have also altered migration patterns and food availability. Port discharge of marine debris, garbage, and organic waste into coastal waters is also a concern. While spills are rare, constant concern exists for extensive spans of estuarine and nearshore habitats proximal to ports are at risk of contamination. Even a small spill could result in a huge exposure of productive habitats. Oil releases such as the MC 282 or Deepwater Horizon oil release (2010) into the Gulf of Mexico has severely affected aquatic life, water quality, and habitat posing many threats such as mortality, disease, genetic damage, and immunity issues (Collier et al. 2010). Chemicals in crude oil can cause heart failure in developing fish embryos (Incardona et al. 2004, 2005, 2009). Chronic exposures for years after the Exxon Valdez oil spill were evident in fishes and other marine life, resulting in a higher pattern of mortality (Ballachey et al. 2003). Oiling of nearshore high-energy habitats along beaches of the Gulf of Mexico from Louisiana to Florida occurred for prolonged periods of time during the spring of 2010, and weathered oil products were found in offshore sediments where spawning red drum can occur.

Beach nourishment projects and development of wind and tidal energy could also alter red drum spawning and offshore adult habitat dynamics. Beach nourishment can result in removal of offshore sediments resulting in depressions and altering sediment characteristics along the shoreline (Wanless 2009). Sediments eroded from beaches after nourishment projects can also be transported offshore and bury hard bottoms, which can diminish spawning aggregation habitat for red drum. Beach nourishment projects can also alter forage species abundance, distribution, and species composition in the high-energy surf zone for a time, but this varies by species and timing of nourishment activities (Irlandi and Arnold 2008). Wind and tidal energy projects can create artificial structure in migration corridors and submarine cables may produce electrical fields that can affect red drum movement patterns and habitat use in affected areas (DONG 2006; OEER 2008; ASMFC-Habitat Committee 2012).

Use of certain types of fishing gear, such as trawls and bivalve dredges, can also adversely affect spawning habitat (Essential Fish Habitat Steering Committee 2002). Trawls and dredges remove structure-forming epifauna, alter sediment contours, redistribute reef aggregate materials (e.g. fractured rock outcroppings and boulders), and change infaunal and demersal organism abundance and community assemblages in fished areas. Fishing also reduces forage species abundance, which are common red drum prey, indirectly affecting spawning success through reduced foraging success. The most significant effect of this type of fishing gear is long-term changes in bottom structure and long-term changes in benthic trophic and ecosystem functions. These effects can be on the order of months to years in low energy environments, so alterations can have a long-term effect on red drum spawning habitat.

Spawning is optimal within a specific range of temperatures. Climate change and resulting temperature regime changes in spawning habitats could alter the timing of spawning and egg development, which may be detrimental in a specific habitat area of concern. Such alterations in phenology are recognized as such a threat to the survival of many species (USFWS 2011). Significant climate change could alter current patterns and significantly change water temperatures, affecting migration, spawning patterns, and larval survival (Hare and Able 2007; USFWS 2011).

Estuarine Spawning, Nursery, Juvenile and Subadult Habitat: Condition and Threats

Between 1986 and 1997, estuarine and marine wetlands nationwide experienced an estimated net loss of 10,400 acres (Dahl 2000). The majority of this loss was from urban and rural activities, which converted wetlands to other uses. Along the south Atlantic coast, Florida experienced the greatest loss due to urban or rural development (Dahl 2000). In Tampa Bay, 3,250 acres of seagrass have been recovered between 2008 and 2010 (EPA 2011b).

Reduced water quality can lead to increased susceptibility to pathogens, which can result in lesions, developmental issues, disease of major organs, and mortality in red drum and other fishes (Conway et al. 1991). Red drum may exhibit a higher tolerance to bacteria with age, and antibody response also increases as water temperature does (Evans et al. 1997). Atrazine, a widely used pesticide in the United States, reduced growth rates in red drum larvae by 7.9% - 9.8% (Alvarez and Fuiman 2005). Potentially toxic contaminants have been detected in red drum, including mercury (Adams and Onorato 2005) and persistant organic pollutants (Johnson-Restrepo et al. 2005).

Nutrient enrichment of estuarine waters is a major threat to water quality and habitat available to red drum. In the southeast, forestry practices significantly contribute to nutrient enrichment, as does pesticide use, fertilizers, and pollution runoff (ASMFC 2002; NSCEP 1993). Urban and suburban development are the most immediate threat to red drum habitat in the southeast. Port and marina expansion also impact the estuarine habitat important to red drum by pollution contributed from stormwater originating from altered uplands and through alterations to hydrodynamic flows and tidal currents. Watercraft operation can result in pollutant discharge, contributing to poor water quality conditions. Facilities supporting watercraft operations also result in the alteration and destruction of wetlands, shellfish and other bottom communities through construction activities. Motorized vehicles in

Class A (<16 ft) and Class 1 (16 - 25 ft) have seen major recreational growth in estuarine waterways (NMMA 2004). Operation of watercraft equipped with outboard and inboard engines and propellers over shallow seagrass communities can cause increased seagrass scarring (Sargent et al. 1995). Mining activities in nearby areas can also pose a threat with nutrient and contaminant runoff, dredging material deposition, and through alterations of the hydrology of the estuary.

Hydrologic modifications can negatively affect estuarine habitats. Aquaculture, mosquito control, wildlife management, flood control, agriculture, and silviculture activities can result in altered hydrology. Ditching, diking, draining, and impounding activities also qualify as hydrologic modifications that can impact estuarine environments (ASMFC 2011). Alteration of freshwater flows into estuarine areas may change temperature, salinity, and nutrient regimes as well as wetland coverage. Studies have shown that alteration in salinity and temperature can have profound effects in estuarine fishes (Serafy et al. 1997) and that salinity can dictate the abundance and distribution of organisms residing in estuaries (Holland et al. 1996). Construction of groins and jetties has altered hydrodynamic regimes and the transport of larvae of estuarine dependent organisms through inlets (Miller et al. 1984; Miller 1988).

Shoreline erosion patterns can also affect the hydrodynamics and transport of larvae to estuarine environments. Erosion has the potential to alter the freshwater flow into habitats essential for egg, larval, and juvenile survival. Whether erosion is human-induced or naturally occurring, nearshore habitats are consequently affected and eroded sediment is transported and deposited elsewhere (ASFMC 2010). Beach nourishment activities can result in sedimentation in estuaries, covering seagrass beds and other nearshore habitats, and causing water quality to deteriorate (Green 2002; DEP 2011). Along the Atlantic coast, living shorelines are becoming popular to control and minimize erosion (ASFMC 2010).

Trawl fisheries are a threat to estuarine habitat for red drum. In combination with the physical and biological effects identified in the Essential Fish Habitat Steering Committee workshop proceedings (2002), trawling activities and bivalve harvesting activities(oyster tonging, clam raking, clam kicking, etc.) can severely damage seagrass systems (Stephan et al. 2000). Such activities can reduce the productivity of estuarine red drum habitat, reduce forage species abundance, and alter movement patterns for red drum schools. Effects of these fishing gears can be mitigated through effective management strategies, such as exclusion of trawl fisheries from seagrass communities.

Climate change could result in faster erosion of certain nearshore areas and loss of shallow nursery habitats to inundation. Projections of global sea level rise are from 18 - 59 cm by the year 2100, with an additional contribution from ice sheets of up to 20 cm (IPCC 2007). In addition to sea level rise, climate change could alter the amount of freshwater delivery and salinity levels in estuarine areas (USFWS 2011). As temperature increases, the surface water in estuaries and marshes also increases, which reduces oxygen solubility (EPA 2011a) and can stress the environment. Estuarine waters are vulnerable to acidification, but seagrasses are particularly susceptible to changes in water column acidity (EPA 2011a), which is an important nursery habitat for larval and juvenile red drum.

Adult Habitat: Condition and Threats

While threats to adult red drum habitat exist, they are not as numerous as those faced by post-larvae, juveniles, and subadults in estuarine and coastal waters. According to the SAFMC (1998) and ASMFC (2002), threats to both nearshore and offshore habitats that adult red drum utilize in the south Atlantic include navigation management and related activities; dredging and dumping of dredged material; mining for sand or minerals; oil and gas drilling and transport; and commercial and industrial activities, and are similar to those for red drum coastal spawning habitat.

Currently, mineral mining activities in the south Atlantic are highly limited. Offshore mining has the potential to pose a threat to adult red drum habitat in the future. Mining activities could alter the hydrology, sediment landscape, and water quality of surrounding areas, affecting both fish and their habitat, by causing sediment plumes or releasing metallic substances into the water column (Halfar 2002).

A more immediate threat to red drum adult habitat is the mining of sand for beach nourishment projects. Associated risks include burial of hard bottoms near mining or disposal sites, contamination, and an increase in turbidity and hydrological alterations that could result in a diminished habitat (Green 2002; Peterson and Bishop 2005). Although adult red drum are euryhaline and eurythermal, drastic or sudden changes in salinity and/or temperature can result in mortality (Gunter 1941; Buckley 1984).

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of Red Drum

Red Drum utilize all available estuarine and nearshore habitats throughout their life history. Although regional habitat types, such as mesohaline submerged aquatic vegetation communities, might be limited locally, red drum can use multiple habitat types at each stage of their development. There is no supporting evidence that habitat is currently limiting to populations of red drum throughout their range.

Oyster reefs are an important habitat to red drum at the juvenile and subadult life stages. In South Carolina, the abundance of red drum is not limited by the availability or health of oyster reef habitat, despite significant reductions of oyster reef habitat throughout the range of the red drum population. Creeks, tributaries, and estuaries are important habitats for red drum. Larval, juvenile, and subadult red drum are particularly sensitive to pollution contributed to watersheds by human activities. There is currently no evidence that chemical pollution is a limiting factor for juvenile and subadult red drum. However, changes in hydrology due to watershed activities that alter stormwater flow and sedimentation might restrict red drum larval recruitment both locally and regionally. Additionally, sediment accumulation may alter submerged aquatic vegetation abundance and circulation patterns resulting in lower recruitment into small creeks.

Unknowns and Uncertainties

Not much is known regarding the preferred ranges and physiological tolerances of red drum and how it changes during development. In the context of climate change, more information is needed to predict how different life stages of red drum will be impacted by increased temperatures, altered freshwater flow regimes, increased acidity, and decreased dissolved oxygen. In addition to direct physiological impacts of climate change on red drum, indirect effects on red drum also need to be examined (e.g., habitat degradation, reduced prey abundance, and increased disease susceptibility).

Larval and juvenile red drum are also known to use many different habitats as nurseries, although the relative contribution of a particular nursery to the adult population has not currently been assessed.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Amendment 2 to ASMFC's Interstate Fishery Management Plan for Red Drum (2002) states 15 habitat management recommendations for red drum.

1. Each state should implement identification and protection of red drum habitat within its jurisdiction, in order to ensure the sustainability of that portion of the spawning stock that either is produced or resides within its boundaries. Such efforts should inventory historical habitats through mark-recapture studies or other means as available, identify those habitats presently used for spawning or nursery areas (Section 3.8), specify those that are targeted for recovery, and impose or encourage measures to retain or increase the quantity and quality of red drum essential habitats.

2. Each state should notify in writing the appropriate federal and state regulatory agencies of the locations of habitats used by red drum. Regulatory agencies should be advised of the types of threats to red drum populations and recommended measures which should be employed to avoid, minimize or 95 eliminated any threat to current habitat extent or quality.

3. Each state should establish Habitat Areas of Particular Concern (HAPCs) or similar designations appropriate for each state which hosts significant amounts of red drum spawning and nursery habitat. Each protected area should include sufficient amounts of necessary habitats for red drum, i.e., oyster reef, intertidal marsh or submerged rooted vascular vegetation, tidal creeks, intertidal flats, and adjacent deepwater estuarine to provide for individuals from age 0 to age 5 to reside therein. States may determine that such areas may warrant Marine Protected Area status and be closed to harvest either seasonally or permanently. It may be advantageous to locate such areas within existing special management areas such as National Wildlife Refuges, National Parks, including National Seashores, or state-designated areas such as Primary Nursery Areas (North Carolina).

4. Each state should establish freshwater inflow targets for estuaries documented as important red drum spawning, nursery or wintering habitat. Such targets should be derived where possible from flow data which predate significant hydrological alterations, and should mimic as closely as possible a natural hydrograph (defined as the pattern which predates significant anthropogenic alterations).

5. Where sufficient knowledge is available, states should seek to designate red drum essential habitats for special protection. These locations should be designated High Quality Waters or Outstanding Resource Waters and should be accompanied by requirements for non-degradation of habitat quality, including minimization of non-point source runoff, prevention of significant increases in contaminant loadings, and prevention of the introduction of any new categories of contaminants into the are (via restrictions on National Pollutant Discharge Elimination system (NPDES) discharge permits for facilities in those areas).

6. State fishery regulatory agencies should develop protocols and schedules for providing input on water quality regulations to the responsible agency, to ensure to the extent possible that water quality needs for red drum are restored, met and maintained. Water quality criteria for red drum spawning and nursery areas should be established or existing criteria should be upgraded to levels which are sufficient to ensure successful reproduction. Any action taken should be consistent with federal Clean Water Act guidelines and specifications.

7. State marine fisheries agencies should work with permitting or planning agencies in each state to develop permit conditions and planning considerations to avoid or mitigate adverse impacts on HAPCs or other habitats necessary to sustain red drum. Standard permit conditions and model policies that contain mitigation protocols should be developed. The development of Memoranda of understanding (MOU) with other state agencies is recommended for joint review of projects and planning activities to ensure that habitat protections are adequately implemented.

8. Federal and state fishery management agencies should take steps to limit the introduction of compounds which are known or suspected to accumulate in red drum tissue and which pose a threat to human health or red drum health.

9. Each state should establish windows of compatibility for activities known or suspected to adversely affect red drum life states and their habitats, such as navigational dredging, bridge construction and dredged material disposal, and notify the appropriate construction or regulatory agencies in writing.

10. Projects involving water withdrawal from spawning or nursery habitats (e.g. power plants, irrigation, 96 water supply projects) should be scrutinized to ensure that adverse impacts resulting from larval/juvenile impingement, entrainment, and/or modification of flow, temperature and salinity regimes due to water removal will not adversely impact red drum spawning stocks, including early life stages.

11. States should endeavor to ensure the proposed water diversions/withdrawals from rivers tributary to spawning and nursery habitats will not reduce or eliminate conditions favorable to red drum use of these habitats.

12. The use of any fishing gear or practice which is documented by management agencies to have an unacceptable impact on red drum (e.g. habitat damage, or bycatch mortality) should be prohibited within the affected essential habitats (e.g. trawling in spawning areas or primary nursery areas should be prohibited).

13. Each state should review existing literature and data sources to determine the historical extent of red drum occurrence and use within its jurisdiction. Further, an assessment should be conducted of areas historically but not presently used by red drum, for which restoration is feasible.

14. Every effort should be made to eliminate existing contaminants from red drum habitats where a documented adverse impact occurs.

15. States should work in concert with the U.S. Fish and Wildlife Service, Division of Fisheries Resources and Ecological Services, and the National Marine Fisheries Service, Office of Habitat Conservation, to identify hydropower dams and water supply reservoirs which pose significant threat to maintenance of appropriate freshwater flows to, or migration routes for, red drum

spawning areas and target them for appropriate recommendations during Federal Energy Regulatory Commission (FERC) relicensing evaluation.

Habitat Research Recommendations

Amendment 2 to ASMFC's Interstate Fishery Management Plan for Red Drum (2002) states seven research needs for red drum habitat, characterized as high (H), medium (M), and low (L) priority.

1. Identify spawning areas of red drum in each state from North Carolina to Florida so these areas may be protected from degradation and/or destruction. (H)

2. Identify changes in freshwater inflow on red drum nursery habitats. Quantify the relationship between freshwater inflows and red drum nursery/sub-adult habitats. (H)

3. Determine the impacts of dredging and beach renourishment on red drum spawning and early life history stages. (M)

4. Investigate the concept of estuarine reserves to increase the escapement rate of red drum along the Atlantic coast. (M)

5. Identify the effects of water quality degradation (changes in salinity, DO, turbidity, etc.) on the survival of red drum eggs, larvae, post-larvae, and juveniles. (M)

6. Quantify relationships between red drum production and habitat. (L)

7. Determine methods for restoring red drum habitat and/or improving existing environmental conditions that adversely affect red drum production. (L)

SAFMC's Habitat Plan for the South Atlantic Region (1998) and the National Marine Fisheries Service Habitat Research Plan (Thayer et al. 1996) outlines the following needs and recommendations for research.

1. Investigate the relationship between habitat and yield of red drum throughout its range, including seasonality and annual variability as well as the influence of chemical and physical fluxes on these relationships.

2. Identify and quantify limiting conditions to red drum production, particularly in HPACs.

3. Conduct cause-and-effect research to evaluate the response of red drum populations and HPACs to anthropogenic stresses including responses to alterations in upland areas and the role of buffer zones.

4. Encourage research in the development of bio- or photo-degradable plastic products to minimize impact of refuse on inshore, coastal and offshore habitats that red drum utilize at various stages of development.

5. Quantify the impacts of acid deposition on red drum estuarine habitats.

6. Conduct research on habitat restoration and clean-up techniques including the development of new approaches and rigorous evaluation protocols. Research should focus on such topics as contaminant sequestration, bio-remediation techniques, the role and size of buffer zones, and the role of habitat heterogeneity in the restoration process.

7. Conduct research to assess the impacts of oil, gas and mineral exploration, development or transportation on red drum and red drum HPACs

8. Determine impacts of dredging nearshore and offshore sandbars for beach renourishment on all life history stages of red drum, particularly spawning adults.

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CHAPTER 5: Spot

Populated with text from the Omnibus Amendment to the ISFMP for Spanish Mackerel, Spot, and Spotted Seatrout (ASFMC 2012)

Section I. General Description of Habitat

Spot are found in estuaries and coastal areas from the Gulf of Maine to the Bay of Campeche, Mexico, and are concentrated between the Chesapeake Bay and South Carolina (Phillips et al. 1989). Juvenile spot prefer shallow water areas, less than 8 m, over fine sediment and in tidal marshes (Phillips et al. 1989; Strickney and Cuenco 1982; Chesapeake Bay Program 1991). Juvenile spot are found in salinities ranging from 0 - 30 ppt and water temperatures from 5 °C – 30 °C (Stickney and Cuenco 1982; Phillips et al. 1989, ASMFC 1987), and therefore are found from polyhaline to freshwater nursery areas. Adult spot are more abundant in coastal waters and lower estuaries whereas juveniles are abundant in lower salinity areas.

Part A. Spawning Habitat

Data indicate that spot spawn further offshore and in deeper waters than other sciaenids. Spot typically migrate offshore and spawn in the relatively deep water of the outer continental shelf, though some evidently spawn in both nearshore waters and estuaries (Dawson 1958; Lewis and Judy 1983). Ripe adults aggregate off beaches in the fall and start migrating offshore to more southern waters (Pearson 1932). Spot may spawn repeatedly over several weeks (Hildebrand and Cable 1930), with some individuals remaining offshore after spawning (Pearson 1932; Wenner et al. 1979, 1980). Fall migrations of maturing spot to offshore waters were reported from Chesapeake Bay (Hildebrand and Schroeder 1928), North Carolina (Roelofs 1951), and South Carolina estuaries (Dawson 1958). Ripe spot were collected in depths up to 82 m off South Carolina (Dawson 1958) and 12.8-16.1 km off the Georgia coast (Hoese 1973). Smith (1907) stated that in North Carolina spot spawn in the sounds and inlets and Hildebrand and Cable (1930) suggested that spawning occurred in close proximity to passes off North Carolina; however, no evidence was offered to support these statements. Larval distributions of spot also indicate that spawning occurs more heavily offshore (26 - 128 m) than inshore (14.6 - 20.1 m; Lewis and Judy 1983; Warlen and Chester 1985).

Geographic and Temporal Patterns of Migration

By the fall, spot either remain in estuaries another year (after year 1) or migrate offshore. For those that remain nearshore, some adults may spawn on the inner continental shelf during the late fall, if water temperatures remain warm enough. For those that migrate to the outer continental shelf, spawning will occur if temperatures are suitable for spawning and egg development (17.5 °C – 25 °C) (Hettler and Powell 1981). Compared to other sciaenids, spawning spot are further offshore and in deeper waters. Ripe spot have been collected in depths up to 82 m off South Carolina (Dawson 1958) and shallower waters 8 - 10 mi off the Georgia coast (Hoese 1973). It is unknown what proportion of spent adults return inshore, or any other habits or behaviors they exhibit (other than the assumption that some proportion return to nearshore or estuarine waters).

Salinity

There is no evidence that spawning individuals experience anything less than full seawater based on their offshore location.

Substrate
While the behaviors of juvenile and adult spot likely center on feeding, and thus substrate, it is unknown to what degree substrate influences spawning individuals. Based on the time of year and the offshore habitats required for spawning, it is unlikely that substrate plays a prominent role in spot behavior. Additionally, spot eggs are pelagic and positively buoyant, so substrates likely does not influence their distribution.

Temperature
Temperature may be the strongest driver of spawning spot behavior. Maturing individuals move offshore in the fall, and if capable (probably based on size) spawn in the late fall if water temperatures are still >17.5 °C (Hettler and Powell 1981). If these two conditions are not met, which is likely true for most of the population, mature spot continue their migration offshore to the outer continental shelf habitats where higher winter temperatures can be found.

Dissolved Oxygen
Spawning adults likely experience normoxic conditions (>4.0 mg/L DO) offshore, and thus dissolved oxygen (DO) is not a limiting factor or strong influence on behavior.

Feeding Behavior
Spawning adult feeding behaviors are likely a continuation of adult feeding, which takes place in the substrate feeding on epifauna and benthic infauna (Chao and Musick 1977); however, it is unknown how much time or effort spawning individuals spend on feeding.

Competition and Predation
Because food and space are unlikely limited, environmental constraints (e.g., temperature) are probably greater factors than competition and predation. Offshore predation of spot is not well documented, but thought to be a continuation of the predation seen in lower estuary and nearshore habitats (e.g., sharks, sciaenids, flounders).

Part B. Egg Habitat

Geographic and Temporal Patterns of Migration
Offshore of the U.S. southeast Atlantic coast, spot eggs are spawned during the winter months, but spawning often extends from late fall to early spring (Flores-Coto and Warlen 1993). Exact locations of spawning are not documented, though based on spawning temperature requirements of 17.5 °C - 25 °C (Hettler and Powell 1981), eggs may be spawned in the inner continental shelf early in the spawning season before temperatures decrease. It is likely, however, that the majority of spot eggs are spawned after the fall on the outer continental shelf as this is the only offshore location supporting temperatures high enough for spawning (Warlen and Chester 1985). Detailed descriptions of the egg (and larval) inshore advection processes remain an active field of study, although the positively buoyant eggs are likely moved toward the coast by a combination of wind and warm water eddies, such as those from the Gulf Stream. For example, Govoni et al. (2013) found that spot larvae in warm water cyclonic eddies that both advance development (with warm water temperatures) and enhanced feeding opportunities for late larvae (supported by increased primary productivity).

Salinity
Because the egg stage of spot occurs entirely offshore, full seawater (approximately 35 ppt) is likely necessary for proper development and transport of eggs, though no studies have explicitly reported any tolerances or thresholds.

Substrate
Because the egg stage of spot occurs entirely offshore and the eggs are positively buoyant, substrate is not considered a critical aspect of spot egg habitat.

Temperature
Spawning adults and larvae (≤15 d old) are have relatively high temperature requirements (17.5 °C - 25 °C) (Hettler and Powell 1981; Warlen and Chester 1985), which suggests that spot egg temperature requirements are also between 17.5°C - 25 °C. Spot eggs hatched within 48 h under laboratory conditions at 20 °C, which is likely a realistic temperature based on empirical data (Powell and Gordy 1980).

Dissolved Oxygen
Because the egg stage of spot occurs entirely offshore, eggs are likely only ever exposed to normoxic waters (5 - 8 mg/L). It is not currently thought that DO is a limiting factor to survival of spot eggs.

Feeding Behavior
Spot eggs subsist entirely off the yolk sac prior to hatch.

Competition and Predation
Spot eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (temperature, salinity, and oxygen requirements largely met by the offshore conditions). Predation of eggs undoubtedly occurs but has not been well studied or reported. Although potentially large numbers of eggs are killed from predation, there is no reason to think that pelagic oceanic predators are targeting spot eggs over other, similar pelagic eggs.

Part C. Larval Habitat

Geographic and Migration Patterns
Powell and Gordy (1980) report that the yolk sac and oil globule were absorbed within 5 d of hatch, in a laboratory setting at 20 °C. Newly hatched larvae are likely still close to offshore spawning locations, which have been suggested to be up to or beyond 90 km offshore (Flores-Coto and Warlen 1993). Larvae cover (through a combination of passive and active migration or transport) perhaps the largest geographic distance of any life stage of spot, with the possible exception of adults migrating for spawning. As with the egg stage, larvae depend on wind and currents (e.g., warm water eddies) for transportation and complete their development over the continental shelf waters during the winter (Able and Fahay 2010). In the winter and through early spring, larval spot ingress into estuarine habitats and settle into upper regions of an estuary (Ribeiro et al. 2015).

Salinity
Corresponding with the range of habitats seen by larvae, a range of salinities is also experienced. Beginning offshore, full seawater (approximately 35 ppt) dominates until larvae enter coastal estuaries,

where salinities likely vary considerably. It is unknown what proportion of larvae settles in upper estuarine or oligohaline habitats.

Substrate

For the majority of the larval phase, spot are pelagic and not in contact with or preferring a particular type of substrate. During settlement, they will interact much more with the substrate, though it remains unclear what (if any) substrate preferences exist for post-settlement larvae.

Temperature

Govoni et al. (2013) reported the densest larval spot concentrations were found along the continental shelf, which ranged in temperature from 11 °C - 19 °C. Temperatures preferences for larvae may not be as high as for spawning adults and egg development since larvae must be transported through waters that are cooler than the offshore waters in which they were spawned. Additionally, spring estuarine water temperatures, particularly in the southeast U.S., may vary substantially based on atmospheric and terrestrial factors, and thus spot toward the end of their larval phase likely experience a wide range of temperatures. Perhaps the greatest temperature threat to larval spot comes from cold temperatures in estuaries. Hoss et al. (1988) reported a stress response to cold temperatures that resulted in an energy deficit at temperatures ≤10 °C.

Dissolved oxygen

DO demands are likely met offshore, as well as inshore after ingress. Both of these habitats typically do not experience hypoxic conditions in the winter and early spring, although no published studies have reported on any limitations.

Feeding Behavior

Larval spot are planktonic feeders. Copepods and ostracods are the primary food up to 25 mm SL (Hildebrand and Cable 1930). Spot larvae are also known to eat tintinnids, pteropods, pelecypods, ostracods, and the egg, naupliar, copepodid, and adult stages of copepods (Govoni et al. 1983). By settlement into nursery habitats (~20 mm SL), sediment is found in the stomachs suggesting that spot are foraging along the bottom (Deary 2015).

Competition and Predation

Spot larvae likely do not enter into any limiting ecological competition, as their habitat demands are basic—it is unknown whether larvae are limited spatially after settlement, and they are largely planktonic feeders. Predation of larvae undoubtedly occurs both offshore and inshore, yet these processes are difficult to quantify in a way meaningful to the overall population or abundance (i.e., at broad scales and not characterized by spatial or temporal effects of a single study). Similar to the early stages of many other pelagic fish larva, the early stages of spot are significantly predated upon by gelatinous zooplankton (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

Part D. Juvenile Habitat

Tidal salt marshes and larger estuaries are recognized primary nurseries for spot (Weinstein 1979; Currin et al. 1984), although juvenile spot have been frequently collected offshore on the inner continental shelf (Woodland et al. 2012). Due to the generally high productivity of estuaries, this habitat provides ample prey for spot, which feed mostly on small bottom dwelling worms and crustaceans (Chao and Musick 1977). Atlantic coast estuaries are often shallow and structurally complex, providing a physical refuge from predators. In addition, spot are well adapted to live in the physiologically stressful, low dissolved oxygen environment of small tidal creeks (Cochran 1994). Research in Rose Bay, North Carolina suggests that during their first summer, spot grow and disperse from shallow edges of the bay to all depths (Currin 1984). Although exceptions exist, this pattern is the generally observed for many coastal species.

Geographic and Temporal Patterns of Migration

Juveniles occupy a variety of estuarine habitats, although in the early spring they are abundant in seagrass habitats (Olney and Boehlert 1988). Young-of-year juvenile spot are abundant in shallow bay habitats and intertidal and subtidal creeks in the spring (Able et al. 2007; Able and Fahay 2010). By late summer, larger juveniles are common in intertidal and subtidal marsh habitats.

Salinity

Juvenile spot are found in salinities ranging from 0 to 30 ppt (polyhaline to freshwater) (Phillips et al. 1989; ASMFC 1987) in nursery areas. Ross (2003) noted spot occupy water with a wide salinity range. Even though spot are tolerant to salinity, juveniles are more abundant in less saline estuarine nursery habitats, suggesting these are preferred nurseries (Thomas 1971; Ross 2003; Able and Fahay 2010).

Substrate

Juvenile spot likely have a preference for a substrate type, such as mud (Bozeman and Dean 1980; Strickney and Cuenco 1982). However, a number of studies highlight the opportunistic aspect of spot with regard to habitat. Juvenile spot have been collected over shell, sponge, and peat substrates (Able and Fahay 1998; Able and Fahay 2010). Strickney and Cuenco (1982) report mud being the most suitable, but fine sand and coarse sand. Hettler (1989) concluded that up to 1/3 of juveniles might spend their time in Spartina (*Spartina alterniflora*) vegetation and Weinstein and Brooks (1983) reported spot use seagrass meadows. In many systems across the Atlantic distribution of spot, abundance may vary among substrate type, although spot are ubiquitous and a distribution-wide substrate preference has not been reported.

Temperature

The preferred temperature range of juvenile spot is 6 °C - 20 °C, with a tolerable temperature range extending from 1.2 °C - 35.5 °C (Parker 1971). Juvenile spot are susceptible to winter kills when estuarine temperatures drop suddenly; however, there is likely individual variation in the susceptibility to this source of mortality, and those later-spawned spot (which are smaller in size) likely have lower survival to low temperatures.

Dissolved Oxygen

Much work has been done in regard to spot DO tolerances. This work has been done largely in response to the growing number and size of hypoxic events in coastal rivers and estuaries (Breitburg et al. 2009) that spot inhabit. Originally, Ogren and Brusher (1977) reported DO preferences >5.0 mg L^{-1}, although they can tolerate DO as low as 0.8 mg L^{-1} with 95% survival (Burton et al. 1980). Mortality increases to 95% when DO drops below 0.8 mg L^{-1} (Burton et al. 1980). Though recent work has begun to show that spot actively avoid hypoxic areas and even inhabit the margins of these areas (Campbell and Rice 2014).

Feeding Behavior

Juvenile spot feed mostly on small bottom dwelling worms and crustaceans (Chao and Musick 1977; Deary 2015). Hales and Van Den Avyle (1989) noted the flexibility in juvenile diets, including insect larvae, polychaetes, harpacticoid copepods and other crustaceans. Several studies have reported that spot behavior is often driven more by feeding opportunities than by predation risk (Weinstein and Walters 1981; Miltner et al. 1995; Nemerson and Able 2004), which collectively suggests that prey availability and abundance many drive habitat associations to a greater degree than predators.

Competition and Predation

Density-dependence is often cited as the greatest competitive effect on juvenile spot (Craig et al. 2007), particularly as hypoxia limits available habitat and increases fish densities in suitable areas (Campbell and Rice 2014). Predators of spot include common estuarine predatory fish, such as sharks, seatrout (*Cynoscion spp*.), and flounders (*Paralichthys spp*.), among others (Rozas and Hackney 1984).

Part E. Adult Habitat

Adult spot are common in coastal waters during the spawning season and in estuaries and nearshore waters during the other parts of the year. They are typically found over sandy or muddy bottoms in waters up to approximately 60 m deep.

Geographic and Temporal Patterns of Migration

Designation of 'adult' is typically defined by the presence of mature reproductive tissue or after the production of viable gametes (Helfman et al. 2006). Under this designation, it is unknown exactly when spot become adults other than vaguely suggesting around ages-1 or 2 (Hales and Van Den Avyle 1989). Given this transition and the relatively short lifespan of most spot, here we refer to adult spot as those that have lived one year and moved to offshore habitats, which typically takes place around October or November, though in the Chesapeake Bay and estuaries to the south some young-of-year may overwinter in estuaries (Able and Fahay 2010). Adults distribute in the inner continental shelf in the fall, while individuals that are mature begin to move farther offshore to warmer waters.

Salinity

Adult spot are tolerant of salinities up to 60 ppt (ASMFC 1987; Phillips et al. 1989) and are more abundant in coastal waters and lower estuaries and less abundant in lower salinity areas, compared to juveniles.

Substrate

Adult spot are bottom-oriented, and require substrates to forage on epifauna and benthic infauna (Chao and Musick 1977). Adults likely prefer muddy substrates to sand or vegetated substrate, which has been reported for juveniles (see juvenile substrate section), although offshore adults will likely utilize sand substrates, which are more common outside of estuaries.

Temperature

As with other habitat variables, adult spot are likely tolerant to a wide range of temperatures, though specifics have not been reported. Despite any tolerances, however, lower temperatures drive migrations offshore in the fall (Pacheco 1962).

Dissolved Oxygen

As with juveniles, adults are likely tolerant of a wide range of DO, but prefer normoxic conditions (>4.0 mg L^{-1}; Chao and Musick 1977). Hypoxic conditions (<2.0mg L^{-1}) are less common offshore, and thus DO is probably less of a concern for adults than for juveniles.

Feeding Behavior
Adult feeding behaviors are a continuation of juvenile feeding, which takes place in the substrate foraging on epifauna and benthic infauna (Chao and Musick 1977). It is unknown whether adult feeding behaviors change offshore.

Competition and Predation
Density dependence may be less of a factor for adults than was for juvenile spot as there are fewer adults than juveniles because offshore habitats are likely less spatially limiting than smaller and highly-variable upper estuary environments. Holland et al. (1977) did report sharp mid-summer declines of benthic macroinvertebrates in the Chesapeake Bay, although this occurred largely in upper bay habitats where adults are less likely to inhabit. Predation of spot is dominated by sharks and other estuarine and nearshore predatory fishes, such as other sciaenids and flounders (Bowman et al. 2000).

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat
The South Atlantic Fishery Management Council's Essential Fish Habitat Plan identifies essential fish habitat for coastal migratory pelagic species as including sandy shoals of capes and offshore bars, high profile rocky bottom, and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including Sargassum (SAFMC 1998). It further recognizes all coastal inlets and all state-designated nursery habitats as being of particular importance.

Identification of Habitat Areas of Particular Concern
Spot are strongly associated with the bottom as juveniles and adults and are seasonally dependent on estuaries. From Delaware to Florida, primary nursery habitat includes low salinity bays and tidal marsh creeks with mud and detrital bottoms. Juvenile spot are also found in eelgrass beds in the Chesapeake Bay and North Carolina. By late spring, juveniles are often more abundant in tidal creeks than in seagrass habitats. Estuaries, which are especially susceptible to alterations from human activities, are designated as Habitat Areas of Particular Concern (HAPCs) for spot.

Juvenile spot are associated with the estuarine or creek substrates (bottoms, which are often susceptible to degradation from human activities). Additionally, the loss of habitat due to hypoxia is a serious concern across the eastern U.S. (as well as globally), and numerous studies have reported the negative impacts on spot resulting from hypoxic events (Craig et al. 2007; Campbell and Rice 2014).

Present Condition of Habitat Areas of Particular Concern
A number of activities may affect the condition of the habitats utilized by spot. Estuaries are extremely sensitive to dredging, point and nonpoint source pollution, and destructive or unregulated practices in siliviculture, agriculture, or coastal development that contribute to increased turbidity. These activities may reduce the quantity and quality of spot habitat.

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of Spot

For reasons outlined previously in this section, hypoxia is likely the greatest threat to juvenile spot. Spot tend to do well in warm waters, so increased temperatures from climate change are not of immediate concern; however, other impacts of climate change (e.g., changes in precipitation and subsequently salinity) (Schaffler et al. 2013) are not well understood or forecasted.

Unknowns and Uncertainties

The early stages of spot have a ubiquitous distribution throughout estuarine ecosystems using a variety of habitats. However, it is not known if certain nursery habitats contribute more individuals to adult populations. Studies determining preferred nurseries habitats would help managers identify and conserve critical nursery habitats. In addition, spot forage within and along the sediment of the benthos, which concentrates hydrophobic toxicants, potentially increasing their exposure to these contaminants. Previous research has examined the physiological impacts on adult spot (Middaugh et al. 1980; Roberts et al. 1989), however, no known research has examined the impacts of toxicant exposure on early stage spot, which may have developmental or reproductive implications.

Another consideration for spot is the in the early stages, density-dependence is a major competitive force. With the loss of nursery habitats through anthropogenic factors and climate change, competition is expected to increase and the influence of this competitive force on recruitment dynamics is not currently understood.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Spot eggs exist in offshore habitats for a short time in winter and likely have no interactions with other fishery activities. It is not currently thought that any management actions are needed to modify habitat or survival of spot eggs. The following management recommendations were highlighted by the Omnibus Amendment to the ISFMP for Spanish Mackerel, Spot, and Spotted Seatrout (ASFMC 2012):

1. To effectively maintain habitat health, habitat areas of particular concern should be accompanied by minimization of non-point source and storm water runoff, prevention of significant increases in contaminant loadings, and prevention of the introduction of any new categories of contaminants into the area. Water quality should be monitored to ensure that quality standards are being met.

2. States should minimize loss of wetlands to shoreline stabilization, and monitor navigational dredging, bridge construction, dredged material disposal, and other coastal projects to minimize impact on habitat areas of concern.

3. The use of any fishing gear that is determined by management agencies to have a negative impact on spot habitat should be prohibited within habitat areas of particular concern.

4. States should identify dams that threaten freshwater flows to nursery and spawning areas, and target them for appropriate recommendations during FERC re-licensing.

5. States should continue support for habitat restoration projects, including oyster shell recycling and oyster hatchery programs as well as seagrass restoration, to provide areas of enhanced or restored bottom habitat.

Habitat Research Recommendations

From the Omnibus Amendment to the ISFMP for Spanish Mackerel, Spot, and Spotted Seatrout (ASMFC 2012). Particular attention should be directed toward what these data may indicate regarding habitat utilization and habitat condition (environmental parameters). A list of existing state and federal programs generating environmental data such as sediment characterization, contaminant analysis, and habitat coverage (marsh grass, oyster beds, SAV) should also be produced and those programs polled on a similar basis. Habitats utilized by this suite of species range from the fresh water dividing line out to, and likely beyond, the shelf break. Thus, virtually any study generating environmental data from estuarine or coastal ocean systems could be of value.

1. Identify critical habitats at all life stages and assess threats by: habitat alteration, dredging and dredge spoil placement, destructive or unregultated agricultural or coastal development, recreational boating, point and nonpoint source pollution.

2. Egg Stage: Investigations into cyclonic eddies and other offshore distributional processes is an active area of fisheries research (Govoni and Spach 1999; Govoni et al. 2013). Although threats to spot eggs (and the eggs of other coastal species with offshore, winter-spawned stages) are likely minimal or non-existent, continued efforts into understanding these large-scale processes will likely be informative toward understanding the distribution of subsequent life stages.

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CHAPTER 6: Spotted seatrout

Updated research for life stages. Populated with text from the Omnibus Amendment to the ISFMP for Spanish Mackerel, Spot, and Spotted Seatrout (ASFMC 2012)

Section I. General Description of Habitat

Overall, one issue with spotted seatrout is that the species is comprised of unique spatial populations, generally associated with an estuary. Little mixing goes on outside of adjacent estuaries. This means that it is not always safe to project the findings of one subpopulation onto the whole species, and this concern is amplified by the number of studies in the Gulf of Mexico or areas not comparable to the U.S. southeast Atlantic. For example, Powell (2003) presents good information on inferred spawning habitat and egg and larval distribution of spotted seatrout in Florida Bay (Powell et al. 2004). Florida Bay is a shallow, subtropical, oligohaline estuary without lunar tides, and considering that the spotted seatrout inhabiting this area are a unique subpopulation, it makes sense to limit the inference from a population like this onto both a distinct genetic and morphological stock in the Carolinas that inhabits a very different type of estuary (reiterated by Smith et al. 2008, which found growth differences among subpopulations). Research suggests salinity tolerances are genetic and that caution should be used when applying research to other populations.

Part A. Spawning Habitat

Geographic and Temporal Patterns of Migration

Many age-1 spotted seatrout are mature (L_{50}=292 for females; Ihde 2000) and all are mature by age-2. Consistent with the other life stages, spotted seatrout are generally restricted to their natal estuary (Kucera et al. 2002) and for spawning adults this means that spawning takes place often in the lower reaches of the estuary or nearshore just outside inlets.

Spawning seasons vary throughout the species range, and tend to lengthen as a function of warmer water. For example, spawning in Florida Bay has been reported to run from March to October (Powell 2003), while spawning in South Carolina is restricted from late April to early September (Roumillat and Brouwer 2004), and may not begin until May in North Carolina (Luczkovich et al. 2008) and the Chesapeake Bay (Smith et al. 2008). Adult Spotted Seatrout begin to spawn in March or April in southwest and west-central Florida estuaries (e.g., Tampa Bay and Charlotte Harbor; McMichael and Peters 1989) and in April or May in the more northerly Florida estuaries (e.g., northern Indian River Lagoon (Tabb 1961; Crabtree and Adams 1998). Specific estuarine spawning locations are not well documented, especially in Atlantic estuaries, although Luczkovich et al. (2008) recorded more spawning-associated calls near Bay River (western Pamlico Sound) than near Ocracoke Inlet (eastern Pamlico Sound). It is also worth mentioning that many of the environmental variables reported by Luczkovich et al. (2008) are in contrast with spawning habitat descriptions reported by Holt and others working in the Gulf of Mexico.

Salinity

Based on work in the Gulf of Mexico, Kucera et al. (2002) found differing egg characteristics from different Texas bays. Decreasing salinity resulted in increasing size and wet weight of eggs with the opposite true for increasing salinity. Eggs from spawners native to high salinity estuaries spawned at 20 ppt were not positively buoyant and died. Although it is difficult to generalize anything broadly applicable from this study, it does suggest that spawning salinity may be a locally-adapted trait.

Less work has reported on spawning salinities in the Atlantic, though Luczkovich et al. (2008) report spotted seatrout spawning-related drumming to take place in bottom salinities averaging 11.8 ppt (range 7.1 - 26.9 ppt), which is considerably less saline than reports from the Gulf of Mexico, but may also reflect the habitats investigated and not a uniform distribution of available salinities.

Substrate

It is unclear if spawning habitats are shared with adult habitats, and if so, what substrate preferences are. However, as eggs are pelagic, it is likely that substrate is less important than other environmental variables (such as temperature, salinity, tide, etc.).

Temperature

Spawning temperatures appear to be consistently high among all reports. For example, Louisiana spawning aggregations were highly associated with temperature 29.7 ± 0.31 °C (2 standard errors; Saucier and Baltz 1993), with Brown-Peterson et al. (1988) proposing a critical minimum spawning temperature of 23 °C. Others have suggested minima of 25.6 °C (Tabb 1966) and 26.3 °C (Rutherford et al. 1989). Similarly in the Atlantic, spotted seatrout did not drum below 23 °C (but one outlier), with most drumming occurring between 25 - 30 °C (Luczkovich et al. 2008). Hatch dates in the Chesapeake Bay have been dated to early May, yet it remains unclear if this northern distributional population has a lower spawning temperature tolerance.

Dissolved Oxygen

As with other life stages, dissolved oxygen (DO) has not been widely investigated or reported for spawning adults. Despite this paucity of data, the hydroacoustic results suggests that hypoxia did not limit spotted seatrout sound production; drumming has been recorded at DO levels as low as 0.05 mg L^{-1} (mean 6.1 mg L^{-1}, range 0.05 - 9.73 mg L^{-1}; Luczkovich et al. 2008)

Feeding Behavior

The protracted spawning season of spotted seatrout suggests that they do feed during the spawning season, and feeding patterns likely reflect the same as adult spotted seatrout.

Competition and Predation

No studies of competition or predation of spotted seatrout were found. Spotted seatrout are top predators in estuarine systems and are consumed by larger predatory fishes, ospreys, and other predatory birds.

Part B. Egg Habitat

Spotted Seatrout larvae use tidal flows to migrate into and within estuaries (Perret et al. 1980) where they settle in seagrass beds, shallow bays, and backwater creeks (McMichael and Peters 1989).

Geographic and Temporal Patterns of Migration

Along the Atlantic coast, spotted seatrout likely spawn in a variety of estuarine habitats. Spawning habitats are often located by identifying regions where spotted seatrout are drumming, a behavior characteristic of spawning. In a review of spotted seatrout, Johnson and Seaman (1986) report spawning habitat (and thus egg habitats) to range from non-tidal portions of estuarine tributaries, to outside of estuaries. Because eggs hatch 16 - 22 h after fertilization between (25 - 27 °C; Holt et al. 1985), the egg phase is relatively short in duration.

Salinity
Preferred salinities of spotted seatrout eggs are unknown but likely varies by spawning habitat. For example, Taniguchi (1981) reported from lab work an optimum salinity for hatching at 28.1 ppt. Gray et al. (1991) reported hatching success in treatments of 30 – 50 ppt but the highest hatching success was observed at 30 ppt and no hatching observed after 50 ppt.

Substrate
Due to the relatively short duration of the spotted seatrout egg phase and the neutral buoyancy needed to move eggs and provide oxygen, substrate is likely not an important habitat characteristic for this species at this stage.

Temperature
Preferred temperatures of spotted seatrout eggs vary. Using eggs from Texas fish, Fable et al. (1976) reared eggs at 25 °C that hatched 16 - 20 h after fertilization Taniguchi (1981) reported optimum temperature for hatching to be 28°C. While general trends may be applied to Atlantic stocks of spotted seatrout, these results should be used cautiously as they are based not only on artificial conditions (controlled laboratories), but using genetically different stocks that have adapted to different temperature and salinity regimes that exists in the Gulf of Mexico.

Dissolved Oxygen
No work has been conducted or reported having to do with DO and spotted seatrout eggs. Because eggs spawned in low salinities become demersal and die, it is thought that minimally normoxic conditions are required for adequate egg development.

Feeding Behavior
Spotted Seatrout eggs subsist entirely off the yolk sac prior to hatch.

Competition and Predation
Spotted Seatrout eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (and largely met by the oceanic or estuarine conditions). Predation of eggs undoubtedly occurs by a variety of oceanic and estuarine consumers, particularly gelatinous zooplankton (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

Part C. Larval Habitat

Geographic and Temporal Patterns of Migration
In the Gulf of Mexico, Holt and Holt (2000) found the most fish along the bottom during the day and similar numbers on bottom and surface at night, suggesting vertical migration. However, Lyczkowski-Schultz and Steen (1991) observed a reverse vertical behavior. Likely both studies are an accurate reflection of what the authors sampled, but that patterns of vertical distribution may be influenced by

spatial or temporal effects not included in the studies. In the Chesapeake Bay, post-settlement, late larvae are obligate seagrass residents in meso- and polyhaline areas (Dorval et al. 2007; Jones 2013).

Salinity
Spotted Seatrout are among the more euryhaline of larval sciaenid, as Rutherford et al. (1989) could only collect spotted seatrout from 8 - 40 ppt (mean 33.2 ± 1.7 ppt), which, along with other work (Banks et al. 1991) establishes high tolerances of salinity and high mortality at lower salinities. Tabb (1966) particularly notes that while the overall tolerance range may be wide but abrupt changes in salinity, such are from freshwater inflow resulting from precipitation, renders fish vulnerable. In the Gulf of Mexico, larvae have been collected in salinities ranging from 15 – 50 ppt, but most are collected at salinities >24 ppt. Low salinities reduce survival of larval spotted seatrout (Holt and Holt 2003).

Substrate
Spotted Seatrout larvae settle on a variety of substrates, though they prefer seagrass habitats when available (Dorval et al. 2005; Dorval et al. 2007; Jones 2013). In estuaries and areas lacking submerged aquatic vegetation, such as much of South Carolina, Georgia, and parts of North Carolina, larval spotted seatrout have been collected in shallow marsh habitats (Wenner et al. 1990).

Temperature
Larval spotted seatrout likely tolerate a wide range of temperatures but optimum temperatures from South Florida are 23 - 33 °C (Taniguchi 1981). In Florida Bay, most larvae were found in temperatures between temperatures 26 - 33 °C (Powell 2003).

Dissolved Oxygen
To date, no studies of DO requirements for larval spotted seatrout have been reported.

Feeding Behavior
The overall pattern of feeding is likely an effect of prey availability in specific estuaries, but larval diet is dominated by plankton, specifically copepods. From wild spotted seatrout larvae in Texas waters, calanoid copepods and bivalve larvae were the most important food items (Holt and Holt 2000).

Competition and Predation
Explicit studies of competitors and predators is lacking; however, larvae of other sciaenids and estuarine species likely compete for similar planktonic prey items. And consistent with other predators of larval sciaenids, gelatinous predators and larger fish are likely the dominant predators of larval spotted seatrout (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

Part D. Juvenile Habitat

Geographic and Temporal Patterns of Migration
Throughout their range, juvenile spotted seatrout are most often associated with seagrass habitats or submerged aquatic vegetation. This is certainly true in the Gulf of Mexico (Rooker et al. 1998) and in Florida Bay, where spotted seatrout abundance and distribution has been linked to seagrass communities (Chester and Thayer 1990). In the Florida Bay study, temperature and salinity were relatively constant among sampled areas and spotted seatrout are captured in basins more than channels. In Mississippi waters, spotted seatrout have high site fidelity (Comyns et al. 2008).

In the Atlantic, seagrass beds are likely important (Jones 2013), but surprisingly few studies report on this habitat type, and many are of short duration, limited temporally, or of only a single species. In the Chesapeake Bay, juvenile spotted seatrout are obligate seagrass residents in meso- and polyhaline areas (Dorval et al. 2005; Dorval et al. 2007; Jones 2013). Seagrass beds of Chesapeake Bay provide different growth conditions depending on precipitation and freshwater flow into the bay with higher salinities support faster growth (Smith et al. 2008).

Salinity
The majority of studies involving juvenile spotted seatrout provide varying ranges of tolerated salinities, typically with mean values between 15 - 25 ppt. Spotted seatrout were the only one of five common coastal fish that grew slower during high river discharge years in Florida (Purtlebaugh and Allen 2010). In the Chesapeake Bay, drought years have been linked to increases in growth (Smith et al. 2008).

Substrate
Juvenile spotted seatrout prefer seagrass (submerged aquatic vegetation) but use shallow tidal salt marsh habitats when submerged aquatic vegetation is unavailable. In Florida Bay, juvenile spotted seatrout were most often captured where seagrass density and species diversity was highest (Chester and Thayer 1990).

Temperature
Temperature requirements, particularly minimum temperatures in the northern distributional limits of the species, are similar throughout their range. Based on work in South Carolina, temperatures <5 °C are cause for concern as mortality begins to become a serious threat (Anweiler et al. 2014). In North Carolina, spotted seatrout experience approximately 86% mortality after being exposed to 5°C after 10 days (Ellis 2014). In North Carolina, 3.0 °C was determined to be a lethal threshold whereas 5°C represents a lethal limit if the exposure persists (Ellis 2014).

Dissolved Oxygen
To date, no studies of DO requirements for larval spotted seatrout have been reported.

Feeding Behavior
Juvenile spotted seatrout eat mysids and caridean shrimp whereas larger juveniles eat penaeid shrimp and fishes (Johnson and Seaman 1986; Able and Fahay 2010).

Competition and Predation
Studies of competitors and predators are lacking; however, juvenile spotted seatrout and other juvenile sciaenids compete for space in upper-estuary habitats, and food in years of limited prey production. However, these are generalities and not based on specific studies of spotted seatrout. Juvenile spotted seatrout are preyed upon by larger fishes, such as striped bass (*Morone saxatilis*), Atlantic croaker (*Micropogonias undulatus*), Atlantic tarpon (*Megalops atlanticus*), and barracuda (*Sphyraena barracuda*) (Mercer 1984; Able and Fahay 2010).

Part E. Adult Habitat

Adult and juvenile spotted seatrout occupy similar habitats (i.e., seagrass beds) but they do partition their foraging habitats through ontogenetic diet shifts (Deary 2015). As adult spotted seatrout increase in size, pelagic fishes and penaeid shrimp become increasingly important in their diet (Lorio and Schafer

1966; ASMFC 1984; Mercer 1984; Daniel 1988). Diet analysis of spotted seatrout in the lower Cape Fear River, North Carolina, revealed that spotted seatrout are mainly piscivorous after reaching age 1 (Tayloe and Scharf 2006).

Geographic and Temporal Patterns of Migration

Most individuals of adult spotted seatrout have high site fidelity and display limited movement. In Florida's Gulf of Mexico waters 9 - 72 cm TL fish were tagged and 95% of recaptures were found within 48.3 km of the original tagging site (Iversen and Tabb 1962). More recently, Hendon et al. (2002) reported similar findings in that 92% of recaptured spotted seatrout moved <10 km, 82% moved <3 km.

In the Atlantic, Music (1981) observed the vast majority of recaptures within the estuary of capture with a mean distance traveled of 8.9 km. In addition, genetic studies corroborate the findings of tagging studies with significant genetic differentiation among estuaries along the Atlantic coast (O'Donnell et al. 2014). There was some evidence of movement in and out of open sounds from creeks and rivers in fall and winter, and to beach habitat in spring and summer (Music 1981). While movement in and out of an estuary is reported range-wide in association with feeding, spawning, and avoidance of specific temperature or salinity conditions (Lorio and Perrett 1980; Johnson and Seaman 1986), seasonal movements out of Chesapeake Bay may be the only example of a true migration by any subpopulations of spotted seatrout (Mercer 1984; Wiley and Chapman 2003).

Salinity

Adult spotted seatrout are likely tolerant of seawater but less tolerant of freshwater.

Substrate

Adult spotted seatrout likely use a range of habitats including lower-estuary and nearshore beaches. However, adult substrate preferences have not been reported and throughout their range estuarine habitats likely vary (e.g., presence or absence of submerged aquatic vegetation) making a universal substrate designation unlikely. As with juveniles, submerged aquatic vegetation is likely preferred, but limiting in many estuaries.

Temperature

Experimental work on minimum temperatures in juvenile spotted seatrout are similar for adults (Anweiler et al. 2014), and as with other environmental parameters, estuarine or region specific preferences and tolerances should not be assumed to apply throughout the range.

Dissolved Oxygen

To date, no studies of DO requirements for adult spotted seatrout have been reported.

Feeding Behavior

Tabb (1961) reported Indian River, Florida spotted seatrout switching prey throughout the year based on prey availability, and consumed fishes include many common estuarine species (anchovies, pinfish, silverside, mullet, croaker, and others) (Johnson and Seaman 1986).

Competition and Predation

No studies of competition or predation of spotted seatrout were found.

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat
Spotted seatrout are an estuarine fish, which relies heavily on submerged aquatic vegetation throughout all life stages. They also utilize shallow, soft bottom estuarine habitats as nurseries and as foraging and refuge habitats. Spotted seatrout are also known to use marine soft bottom habitat during summer and winter estuarine temperature extremes (ASMFC 2012).

Identification of Habitat Areas of Particular Concern
The ASMFC lists submerged aquatic vegetation as a HAPC for spotted seatrout (ASMFC 1984). Spotted seatrout are commonly found in submerged aquatic vegetation, but it is yet to be determined whether it is an EFH.

Environmental conditions in spawning areas may affect growth and mortality of egg and larvae, as sudden salinity reductions cause spotted seatrout eggs to sink, thus reducing dispersal and survival (Holt and Holt 2003).

Winter water temperature dynamics are of particular importance to habitat quality for spotted seatrout. Generally, spotted seatrout overwinter in estuaries, only moving to deeper channels or to nearshore ocean habitats in response to water temperatures below 10 °C (Tabb 1966; ASMFC 1984). Sudden cold snaps have been found to stun and kill large numbers of spotted seatrout in estuarine habitats during winter (Tabb 1966; Perret et al. 1980; ASMFC 1984; Mercer 1984). These large mortality events are often associated with rapid declines (less than 12 h) in temperature, which numb fish before they can escape to warmer waters (Tabb 1958, 1966). It should be noted that cold stun events appear to have a large influence on spotted seatrout population dynamics and that cumulative degree day, which characterizes temperatures across time, are potentially more appropriate predictor of cold stress over large spatial scales (Ellis 2014). Periodic increases in mortality associated with cold stuns should be considered when implementing management measures as they are likely to continue to occur on a periodic basis and are largely unpredictable (NCDMF 2010).

Present Condition of Habitat Areas of Particular Concern
By nature, the extent of submerged aquatic vegetation coverage tends to fluctuate on a scale of days to decades, depending on species, physical conditions, and location (Fonseca et al. 1998). Globally, submerged aquatic vegetation habitat is declining. Rapid, large-scale submerged aquatic vegetation losses have been observed in the European Mediterranean, Japan, Chesapeake Bay, Florida Bay, and Australia (Orth et al. 2006). While threats to the stability of submerged aquatic vegetation health and distribution are many, water quality degradation, including nutrient enrichment and sediment loading, is the greatest threat (Orth et al. 2006). The impacts of nutrient enrichment and sediment loading, such as increased turbidity, increased epiphytic loads, and sedimentation, and increased concentrations of toxic hydrogen sulfide directly reduce submerged aquatic vegetation growth, survival, and production (Dennison et al. 1993; Fonseca et al. 1998; SAFMC 1998). The effects of eutrophication are most severe in sheltered, low flow areas with concentrated nutrient loads and large temperature fluctuations (Burkholder et al. 1994).

Once submerged aquatic vegetation habitat is lost, the associated sediments are destabilized, which can result in accelerated shoreline erosion and turbidity. These are conditions that are not favorable to vegetation recolonization and expansion in the affected area. Submerged aquatic vegetation in adjacent areas may also be impacted by the resulting increase of turbidity in surrounding habitats, increasing the total area affected (Durako 1994; Fonseca 1996). Losses of submerged aquatic vegetation on much larger scales are particularly problematic because the rate of recovery though propagation, recolonization, etc. is often much slower than the rate of loss (Fonseca et al. 1998). Nevertheless, recovery of submerged aquatic vegetation habitat may be possible with improvements to water quality as evidenced by the net gain of submerged aquatic vegetation acreage in Tampa Bay, Florida and Hervey Bay, Australia following strict water quality standards (Orth et al. 2006).

Dredging for navigational purposes, marinas, or infrastructure can directly impact submerged aquatic vegetation through large-scale removal or destruction of existing grass beds. Docks constructed over submerged aquatic vegetation and the associated shading can lead to the gradual loss of seagrass both beneath and adjacent to the structure (Loflin 1995; Shafer 1999; Florida Department of Environmental Protection, unpublished data). In addition to the impacts of shoreline development and dredging on submerged aquatic vegetation, the associated increase in boating activity can lead to increased prop scarring through vegetated areas. The propeller cuts leaves, shoots, and roots structures and makes a trench through the sediment. Recovery of submerged aquatic vegetation from prop scarring can take in upwards of 10 years, depending on species and local conditions (Zieman 1976). Wakes associated with increased in boating can lead to the destabilization of sediments, which, in turn, can increase turbidity and impact growth potential.

Use of bottom disturbing fishing gears also have the potential to damage or destroy vegetation. Although the damage from each gear varies in severity, shearing of leaves and stems, and uprooting whole plants are the most common impacts of bottom disturbing gears (ASMFC 2000). Shearing of leaves and stems does not necessarily result in mortality of seagrass, but in general, productivity is reduced (ASMFC 2000). Gears that result in below-ground disturbance may cause total loss of submerged aquatic vegetation and require months to years for the affected area to recover.

A newly emerging threat to submerged aquatic vegetation is the potential impacts of global climate change on this sensitive habitat. While climate change has occurred throughout history, the rate at which sea surface temperature, sea-level, and CO_2 concentrations are increasing is much faster than experienced in the last 100 million years (Orth et al. 2006). These changes may be occurring at a rate too fast to allow seagrass species to adapt. This leads to the potential for further large-scale losses of habitat globally. If submerged aquatic vegetation is indeed able to adapt to the pace of climate change, shoreline stabilization projects in many coastal areas impede the shoreward migration necessitated by rising sea-level (Orth et al. 2006). Additionally, the increased frequency and intensity of coastal storms and hurricanes, and the associated delivery of freshwater, nutrients, and sediments threaten to further degrade water quality in estuaries and coastal rivers, reducing the health and potential extent of submerged aquatic vegetation (Scavia et al. 2002; Orth et al. 2006).

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of Spotted Seatrout

Though largely estuarine, spotted seatrout may move into marine environments during summer and winter estuarine temperature extremes (ASMFC 2012). Another concern for the conservation of this species is the loss of seagrasses, which are a primary habitat for spotted seatrout and can affect their distribution within estuaries.

Unknowns and Uncertainties
The physiological tolerances of spotted seatrout to environmental variables (e.g., dissolved oxygen, temperature, salinity) have not been investigated throughout their range or at different life history stages. Without these data, it is difficult to predict the impact of environmental perturbations on spotted seatrout, which are necessary to sustainably manage this species. Unlike other sciaenids that are mobile, spotted seatrout have high site fidelity. In addition, not much data is available regarding inter- and intra-specific competition, which will become an increasingly common problem as the extent of seagrasses declines (Orth et al. 2006). Future habitat loss is associated with anthropogenic factors (i.e., nutrient enrichment, boating, dredging, etc.) as well as climatic drivers (sea level rise, warming, acidification), which will increase environmental stressors on spotted seatrout populations. Pollution, including mercury, may have negative health effects on spotted seatrout (Adams et al. 2010), and an array of contaminants have been detected in this species (Johnson-Restrepo 2005; Adams et al. 2003; Adams and Paperno 2012).

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations
As with spot, management recommendations for spotted seatrout have been highlighted by the Omnibus Amendment to the ISFMP for Spanish Mackerel, Spot, and Spotted Seatrout (ASFMC 2012):

1. To effectively maintain habitat health, habitat areas of particular concern should be accompanied by minimization of non-point source and storm water runoff, prevention of significant increases in contaminant loadings, and prevention of the introduction of any new categories of contaminants into the area. Water quality should be monitored to ensure that quality standards are being met.

2. States should minimize loss of wetlands to shoreline stabilization, and monitor navigational dredging, bridge construction, dredged material disposal, and other coastal projects to minimize impact on habitat areas of concern.

3. The use of any fishing gear that is determined by management agencies to have a negative impact on spotted seatrout habitat should be prohibited within habitat areas of particular concern.

4. States should identify dams that threaten freshwater flows to nursery and spawning areas, and target them for appropriate recommendations during FERC re-licensing.

5. States should continue support for habitat restoration projects, including oyster shell recycling and oyster hatchery programs as well as seagrass restoration, to provide areas of enhanced or restored bottom habitat.

Habitat Research Recommendations
The following research needs were recommended by the Omnibus Amendment to the ISFMP for Spanish Mackerel, Spot, and Spotted Seatrout (ASFMC 2012):

1. Identify essential habitat requirements.

2. Identify unique spawning location.

3. Evaluate the role of SAV on the spawning success of spotted seatrout.

4. Develop water quality criteria for spawning and nursery areas.
5. Evaluate the role of shell hash and shell bottom in spotted seatrout recruitment, particularly where SAV is absent.

6. Expand nursery sampling to include critical habitat (SAV) sampling in high and low salinity areas during the months of July through September.

7. Investigate the relationship between temperature and mortality of adults and juveniles.

8. Define overwintering habitat requirements.

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CHAPTER 7: Weakfish

Populated from Amendment 4 to the Weakfish FMP (2002)

Section I. General Description of Habitat

Weakfish are another sciaenid species that uses a variety of coastal and estuarine habitats throughout their life. Although spawning may take place closer to estuaries or in lower estuaries (as opposed to offshore), larval weakfish recruit to upper estuarine habitats but move down the estuary as they grow. Much work has been done on juvenile weakfish, particularly with respect to hypoxia, and like other sciaenids, weakfish exhibit a complex relationship with dissolved oxygen concentrations. Adults often move out of estuaries and spawn in nearshore habitats. Unlike other sciaenids, weakfish exhibit natal homing behaviors.

Part A. Spawning Habitat

Geographic and Temporal Patterns of Migration

The vast majority of age-1 weakfish are mature (Lowerre-Barbieri et al. 1996a; Nye and Targett 2008) and begin spawning in late winter in the south and progressively later in the spring in northern estuaries. Spawning typically peaks in May and June, and ends in the late summer, though temporal variability in eggs and larvae have been observed that suggest either multiple spawning peaks (Goshorn and Epifanio 1991) or an annual shift in peaks (Lowerre-Barbieri et al. 1996b). Regardless of the variability, weakfish are considered to have a protracted spawning period consisting of several months in most locations, with multiple reports of spawning (inferred from drumming) taking place in the evening (Connaughton and Taylor 1995; Luczkovich et al. 2008).

Spawning activities occur near the coast or within estuaries, many of which are natal estuaries (or adjacent estuaries) (Thorrold et al. 1998; 2001). In Delaware Bay, inshore, midwater, and offshore sites (all <6 km from shore) have reported spawning-associated drumming from mid-May to late-July (Connaughton and Taylor 1995). The drumming suggests the presence of large spawning aggregations in shallow waters earlier in the spawning season, with midwater and offshore drumming activity increasing later in the spawning season. It was hypothesized that the spawning aggregates were not just moving as a function of time, but as a function of increasing inshore temperatures, and that spawning may have continued past July in deeper waters than the study examined.

The spawning period in North Carolina is longer and begins in March and continues to September (Merriner 1976). This has led to clinal variability in life histories and reproduction (Shepherd and Grimes 1984). Weakfish that spawn in southern locations live shorter lives and reproduce at smaller sizes compared to weakfish living in northern locations. Shepherd and Grimes (1984) interpret this as ‘bet hedging’ (Stearns 1976) against cold spring waters that prevent weakfish egg from hatching. That is, northern weakfish have longer lives and more annual reproductive events because northern bays are more temperature variable, whereas southern bays are warm enough to ensure hatching. Unique spatial life histories combined with the strong evidence for natal homing suggests that while habitat for spawning and other life stages may be variable, spatial structuring exists, and estuary-specific habitat use and preference may be more important population-level structuring.

Salinity
Lower estuary and coastal spawning habitats experience moderate to high salinities. No studies have explicitly investigated salinity in relation to spawning habitat; however some studies have reported salinity values during inferred spawning events. Luczkovich et al. (1999) reported mean salinity to be 28.8 ppt (range 15.1 - 34.7 ppt). Another study found that weakfish were commonly heard in higher salinity habitats (mean 15.4 ppt, range 7.8 - 28.3 ppt).

Substrate
Although depth is considered an important spawning habitat variable (Luczkovich et al. 2008), no studies report on spawning habitat substrate. Additionally, weakfish eggs are pelagic and thus substrate and bottom features are considered minimally important during and after spawning.

Temperature
Photoperiod and temperature are thought to drive seasonal maturation (Epifanio et al. 1988), along with the hypothesized avoidance of cooler spring temperatures that pose a mortality threat to larval and juvenile weakfish (Shepherd and Grimes 1984). Luczkovich et al. (1999) reported weakfish drumming in a mean temperature of 20.7 °C (range 19.1 - 22.6 °C); another study reported bottom temperatures associated with weakfish drumming to average 25.3 °C (range 17 – 31 °C) (Luczkovich et al. 2008).

Dissolved Oxygen
Dissolved oxygen (DO) is not well reported in adult and spawning weakfish, and based on spawning locations (deep estuaries and nearshore) low DO and hypoxic conditions are likely rare. Luczkovich et al. (2008) did measure bottom and surface DO and reported means of 7.9 and 7.6 mg L^{-1}, respectively. In the same study, only one sonobuoy reported any drumming noises at <4.0 mg L^{-1} DO, although other sciaenids (spotted seatrout and silver perch) both exhibited spawning-associated noises at low DO, even hypoxic conditions.

Feeding Behavior
No studies have reported the feeding habits of spawning weakfish, though it might be safely inferred that adult feeding habits apply to spawners, particularly because the duration of the spawning season suggests that spawning is integrated into their adult lives, rather than a small, discrete period of time that may necessitate a different foraging strategy.

Competition and Predation
No studies have examined competition or predation on spawning weakfish, though it might be inferred that adult competition and predation descriptions apply to spawning adults. Adults are commonly preyed on by bluefish and other estuarine predatory fishes.

Part B. Egg Habitat

Nursery habitats are those areas in which larval weakfish reside or migrate after hatching until they reach sexual maturity (90% by age 1, 100% by age 2). These areas include the nearshore waters as well as the bays, estuaries, and sounds to which they are transported by currents and hatch.

Geographic and Temporal Patterns of Migration

Mature weakfish spawn in the nearshore ocean and lower reaches of large east coast estuaries. Egg hatching occurs about 36 - 40 h post-fertilization (Welsh and Breder 1923) at 20 - 21 °C. Spawning begins in the southern region of the distribution (e.g., North Carolina) early in the spring (March; Merriner 1976) and later in northern bays and estuaries. Because spawning can continue into the summer (July in the Mid Atlantic Bight) (Berrien and Sibunka 1999) and there are reports of two peaks in spawning (Delaware Bay: Thomas 1971; Goshorn and Epifanio 1991), it is likely that weakfish eggs experience a range of conditions and that local adaptation may influence differences in latitudinal environments. Additionally, Berrien et al. (1978) report weakfish larvae occurring from nearshore waters to 70 km offshore, suggesting that eggs may be found over a wide geographic area that extends away from the coast.

Salinity

Olney (1983) noted a distinct polyhaline distribution of sciaenid eggs, with high concentrations at the mouth of the Chesapeake Bay. Although he was not able to identify the eggs to the species level, the large number of eggs collected and the timing of collection strongly suggest that weakfish eggs were present, if not a substantial percentage of the sample. Olney (1983) reported that sampling across a range of salinities (11 - 31 ppt) resulted in 84% of sciaenid eggs collected in salinities >26 ppt. The Chesapeake Bay Weakfish and Spotted Seatrout Fishery Management Plan (Chesapeake Bay Program 1990) reports fertilized eggs collected between 12.1 and 31.3 ppt.

Substrate

Like many marine fish eggs, weakfish eggs are buoyant and the entire egg phase takes place in the pelagic zone of nearshore or lower estuarine waters, and thus substrate is not likely encountered.

Temperature

Minimum temperature is likely the main driver of weakfish reproduction and thus a necessary condition for egg development. Harmic (1958) reported a range of 12 - 16 °C necessary for successful hatching; however, weakfish eggs have been collected across a range of temperatures (17 - 26.5 °C) (Chesapeake Bay Program 1990), which likely reflects their broad geographic occurrence.

Dissolved Oxygen

DO is probably not an issue for short-lived weakfish eggs that remain buoyant and pelagic, and thus out of hypoxic and anoxic bottom waters. However, Harmic (1958) reported reduced hatching success at DO <4.3 mg L^{-1}.

Feeding Behavior

Weakfish eggs subsist entirely off the yolk sac prior to hatch.

Competition and Predation

Weakfish eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (and largely met by the offshore conditions). Predation of eggs undoubtedly occurs and is likely dominated by gelatinous zooplankton (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992). Although potentially large numbers of eggs are killed from predation, there is no initial reason to think that pelagic oceanic predators are targeting weakfish eggs over other, similar pelagic eggs.

Part C. Larval Habitat

Nursery habitats are those areas in which larval weakfish reside or migrate after hatching until they reach sexual maturity (90% by age 1, 100% by age 2). These areas include the nearshore waters as well as the bays, estuaries, and sounds to which they are transported by currents or in which they hatch.

Geographic and Temporal Patterns of Migration

Weakfish larvae are widely distributed and have been reported from nearshore waters to 70 km offshore (Berrien et al. 1978), as well as throughout estuaries. Wherever eggs hatch, larvae spend approximately 3 weeks moving toward or up estuaries. In both Delaware and Chesapeake Bays, larvae have been sampled throughout the estuary, suggesting relatively quick and even post-hatch dispersal, or substantial within-estuary reproduction. Additionally, the protracted spawning season, taking place over months in many locations, provides a constant source of larvae to estuarine habitats. Olney (1983) found weakfish larvae distributed throughout the lower Chesapeake Bay. Ribeiro et al. (2015) identified weakfish as a component of the summer larval fish assemblage in the York River estuary of the Chesapeake Bay.

Larval weakfish migration has been an active area of research. Rowe and Epifanio (1994a) report that in Delaware Bay larvae were more abundant at depth (2 and 7 m off the bottom) than at surface. They report no effect of tidal stage on yolk sac larvae, but greater abundance of post-yolk sac larvae during flood tide, suggesting that post-yolk sac may use selective tidal stream transport to migrate into upper estuarine regions. Rowe and Epifanio (1994b) report mean larval flux to be greater during flood phase for all early and late stage larvae, but not for yolk sac larvae. Together, these studies suggest that while yolk sac larvae are passively transported as part of general sub-tidal circulation, post-yolk sac larvae use selective tidal stream transport to migrate up estuaries.

Salinity

Owing to the wide distribution of weakfish larvae, a range of salinities is likely tolerated. In the lower Chesapeake Bay, Olney (1983) reported salinities during larval weakfish sampling to range from 11.2 to 31.5 ppt. Rowe and Epifanio (1994a) report salinities of migrating larvae to be 20.1 - 27.8 ppt.

Substrate

Larval weakfish are planktonic (Welsh and Breder 1923) and thus do not come in contact with the substrate over which they are dispersed.

Temperature

As with salinity, both Olney (1983) and Rowe and Epifanio (1994a) provide similar temperature ranges for larval weakfish, with a range of 18.1 - 28.1 °C and 16.8 - 22.9 °C, respectively.

Dissolved Oxygen

Due to the relatively short larval duration, the pelagic habitat, and the migratory behaviors of weakfish larvae, it is unlikely that they encounter any habitats in which DO imposes a limitation or threat currently.

Feeding Behavior

A number of studies have investigated the feeding behaviors of larval weakfish, both in laboratory settings as well as in the field. Goshorn and Epifanio (1991) found that larval weakfish began exogenous feeding 2 days post hatch at 20 °C and that invertebrate eggs and tintinnids were important prey (larvae <.5 mm notochord length, NL). Polycheate larvae were important for all size classes and dominant in weakfish >3.55 mm NL. Small copepods (*Acartia tonsa*) were also important for all weakfish larvae, but dominant at sizes >7.55 mm NL.

Competition and Predation

Little work has looked at competition and predation of larval weakfish. Some competition likely takes place when a high-density larval patch settles on limited habitat; however, the wide range of settled habitats and protracted spawning season suggest that widespread competition is unlikely. Furthermore, work on natal homing (Thorrold et al. 1998; 2001) suggests that adult weakfish return to natal estuaries to spawn, adding a level of population structure to mitigate against widespread competition.

No studies have explicitly reported on predation of larval weakfish, although larvae are likely subject to predation by a range of estuarine predators. Cowan et al. (1992) examined hydromedusa (*Nemopsis bachei*) and ctenphore (*Mnemiopsis leidyi*) predation on Black Drum (and Duffy and Epifanio 1994 reference gelatinous predators), suggesting that high densities of hydrozoans could impact larval weakfish abundance.

Part C. Juvenile Habitat

Juvenile weakfish inhabit deeper waters of bays, estuaries, and sounds, including their tributary rivers. They also use the nearshore Atlantic Ocean as nursery areas. In North Carolina and other states, juveniles are associated with sand or sand/seagreass bottom. They feed initially on zooplankton, switching to mysid shrimp and anchovies as they grow. In Chesapeake and Delaware Bays, they migrate to the Atlantic Ocean by December.

Geographic and Temporal Patterns of Migration

The general pattern of habitat use by juvenile weakfish is estuarine-wide, but often beginning in late spring and early summer in upper estuarine habitats (or even freshwater) (Massman 1954) and moving down estuary during the fall to nearshore habitats.

Able et al. (2001) found high abundance of weakfish in June throughout Delaware Bay tidal creeks, and the large numbers of fish were attributed somewhat to high recruitment and that higher abundances were observed in upper bay sites over lower bay sites. Paperno et al. (2000) also reported that juvenile weakfish recruited to all parts of Delaware Bay, but higher abundances were observed in lower salinities. Higher temperature and lowers salinity habitats are preferred by juveniles early in the season or for earlier cohorts (Lankford and Targett 1994).

In the York River, Virginia, juveniles were caught in spring and summer, to which Chao and Musick (1977) attributed water temperature and DO as the most important factor driving distribution. Weakfish were abundant in late summer and fall with age 1 fish returning in the spring but young-of-year individuals absent until late summer. Inshore and nearshore of the Chesapeake Bay, a pattern of similar habitat use in early and late summer was discovered when comparing inner continental shelf and estuarine habitats, with an expected strong shift to inner continental shelf habitat use over estuary by fall (Woodland et al. 2012). Growth rates between habitats were similar, suggesting no growth advantage in either habitat, but in late summer larger fish were concentrated in the inner continental shelf while smaller fish were in estuary. Pincin et al. (2014) examined weakfish abundance in coastal Maryland bays and found no effect of seagrass and Olney and Boehlert (1988) observed that larval weakfish are rare in seagrass sites.

Salinity

Juvenile weakfish salinity preferences likely increase with size and age and is broad since weakfish use oligohaline to polyhaline habitats throughout the first year of life. Lankford and Targett (1994) found salinity effects on specific growth rates and gross growth efficiencies were optimal 20 ppt for 40 – 50 mm fish. Feeding rate was significantly higher at 5 ppt than at 19 ppt salinity.

Substrate

Weakfish are pelagic predators (Chao and Musick 1977; Horodysky et al. 2008) that are not expected to interact with the benthos so substrate type is not an ecologically important environmental variable for weakfish.

Temperature

Juvenile weakfish likely tolerate a wide range of temperatures, though temperature is considered to be an important variable driving their distribution. Although temperature has been documented in a number of descriptive studies, Lankford and Targett (1994) examined temperature effects on specific growth rates and gross growth efficiencies, and found significant effects at 27 and 29 °C treatments. Overall, mean feeding rates increased with increasing temperature (from experimental treatments of 20 - 28 °C).

Dissolved Oxygen

A relatively large body of research has been done on the effects of DO levels on juvenile weakfish. Tyler and Targett (2007) reported low weakfish densities in early morning (during diurnal hypoxic conditions) but relatively high weakfish densities later in the day and an avoidance threshold of 2.0 mg L^{-1}. A lower threshold of avoidance (<1.4 mg L^{-1} DO) was reported for hypoxia-acclimated fish (Brady and Targett 2013), supporting the idea that not only are these fish less inclined to swim to avoid hypoxia, but they can tolerate lower levels than fish that have never been exposed to hypoxia. Stierhoff et al. 2009 reported avoidance of low DO (≤1 mg L^{-1}), but no preference to DO levels > 2.0mg/L, suggesting weakfish are tolerant of low DO conditions.

Feeding Behavior

Juvenile weakfish experience ontogenetic diet shifts (Chao and Musick 1977; Nemerson and Able 2004; Deary 2015). In the Delaware Bay, mysid shrimp (*Neomysis americana*) dominated the diet (Grecay and Targett 1996a). Larger juvenile weakfish (67 - 183mm) in the Chesapeake Bay consumed bay anchovy (*Anchoa mitchilli*) and mysid shrimp (*N. americana*) (Chao and Musick 1977), which highlights the transition from mysids to fish (piscivory) around 60 mm TL (Thomas 1971).

Competition and Predation

Due to the wide spatial distribution and extended temporal period of recruiting juvenile weakfish, it is unlikely that any large-scale competitive factors drive the population. Annual fluctuations in recruitment and micro-scale habitat and foraging competition probably result in patches of competition. Forage items are typically not limited, though in years of low prey abundance (and high turbidity) (Grecay and Targett 1996b) competition may result in decreased growth rates for less fit individuals.

Juvenile weakfish are likely preyed upon opportunistically by a range of estuarine and nearshore predators (fishes); however, Mancini and Able (2005) report silver perch and bluefish as the main documented predators. Large predators are typically less abundant or absent in oligotrophic, upper estuarine areas, yet as temperatures increase in summer, the interactions of temperature and salinity result in a suboptimal physicochemical environment (Lankford and Targett 1994; Lankford and Targett 1997).

Part D. Adult Habitat

Adult weakfish reside in estuarine and nearshore Atlantic Ocean habitats. Warming of coastal waters in the spring cues inshore migration and northward from the wintering grounds to bays, estuaries, and sounds. Larger fish move inshore first and tend to congregate in the northern part of the range. Catch data from commercial fisheries in Chesapeake and Delaware Bays and Pamlico Sound indicate that the larger fish are followed by smaller weakfish in summer. Shortly after their initial spring appearance, weakfish return to the larger bays and nearshore ocean to spawn. In northern areas, a greater portion of the adults spend the summer in the ocean rather than estuaries.

Weakfish form aggregations and move offshore as temperatures decline in the fall. They move generally offshore and southward. The continental shelf from Chesapeake Bay to Cape Lookout, North Carolina appears to be the major wintering ground at depths of 18 - 55 m. Some weakfish remain in inshore waters from North Carolina southward.

Geographic and Temporal Patterns of Migration

After juvenile weakfish overwinter in offshore environments, the vast majority (>90%) mature during their second year of life (age-1). The general pattern of adult habitat use is considered to be seasonal migrations south (toward Cape Hatteras, North Carolina) and offshore in fall and winter, and north and inshore during spring and summer (Able and Fahay 2010). Summer inshore habitats are shallow, averaging around 17 m, while offshore winter habitats average 59 m, but include depths up to 159 m (Able and Fahay 2010).

Off the New Jersey coast in the summer, weakfish occurred primarily inshore in shallow strata in coastal New Jersey (the Navesink River) during the summer. Tagged weakfish left the estuary when temperatures were above 28 °C and when freshwater discharge was low (<2 $m^3 s^{-1}$). Smaller weakfish were more like to have longer overall residence times, although even large individuals (>400 mm TL) demonstrated estuarine habitat use ≥40 d (with some >60 d residence). These tagged weakfish were also found to leave the estuary when temperatures decreased below 23 °C. Thorrold et al. (1998; 2001) concluded that 60 - 81% of weakfish exhibit estuarine fidelity as adults, despite the fact that the same fish from across the eastern U.S. were genetically panmictic.

Salinity

Adult weakfish occur primarily in nearshore or lower estuarine habitats where salinities are near full seawater. In a review of weakfish, Mercer (1989) report that adults were collected in salinities ranging from 6.6 - 32.3 ppt. Adult weakfish prefer higher salinities when inhabitating estuaries in the summer; Rountree and Able (1992) sampled adults in 22 - 32 ppt shallow sub- and intertidal marsh creeks in New Jersey. As with other habitat variables, salinity is probably tolerated at variable levels reflected in the variety of inshore and nearshore habitats populated by adult weakfish.

Substrate

In accordance with the variety of habitats used by adults, specific habitat use or habitat preference in adult weakfish has not been reported. Able and Fahay (2010) report the use of sandy or muddy substrates by adults in bays and estuaries, but substrates used are likely as variable as the overall habitats in which adult weakfish are found. In addition, weakfish are pelagic, open water foragers (Chao and Musick 1977; Horodysky et al. 2008), therefore substrate in not a significant environment variable.

Temperature
Temperature is likely a major driving in development of reproductive tissue and spawning behaviors in weakfish, though it is still an important habitat factor among resting (not reproductively active) adults. Weakfish have been captured in a wide range of temperatures (Mercer 1989). Contemporary studies of weakfish temperature occurrence or preference are lacking, likely due to their wide distribution, inferred tolerance for a range of temperatures, and the relatively high effort put into studying juvenile weakfish habitat. Temperatures above 28 °C but below 23 °C resulted in the egress of adult weakfish from coastal estuaries (Wuenschel et al. 2014).

Dissolved Oxygen
Adult weakfish likely experience normoxic conditions, as they typically avoid the upper estuary reaches inhabited by juvenile weakfish where hypoxia is most commonly reported. Without any explicit studies of adult weakfish DO tolerances or preferences, such values might be estimated from the extensive body of work conducted on juvenile weakfish. Later stage juvenile weakfish may have physiologies (and subsequent tolerances) similar to adults.

Feeding Behavior
Adult weakfish feed primarily between dawn and dusk on clupeid species, anchovies, blue crabs, and spot (Mercer 1989). More recent work has supported piscivory as the main adult weakfish feeding mode, but also note crustaceans, mollusks, shrimp, squid, and other common estuarine prey (Able and Fahay 2010). Overall diets vary in proportion to available prey but adult diets are relatively stable from June to October (Wuenschel et al. 2013).

Competition and Predation
Competition among adult weakfish is not well known. Silver perch and bluefish are commonly cited as the primary predators (Mancini and Able 2005), though predation of larger adults likely decreases with size and may include occasional larger coastal predators. Weakfish were consumed by summer flounder, bluefish, and other weakfish (Wuenschel et al. 2013). The same study noted that by October, summer flounder and bluefish predation was extensive (~25%).

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat
Habitats used by weakfish include spawning sites in coastal bays, sounds, and the nearshore Atlantic ocean, as well as nursery areas including the upper and lower portions of the rivers and their associated bays and estuaries (ASMFC 2002).

Identification of Habitat Areas of Particular Concern
There is no HAPC designation for weakfish.

Present Condition of Habitat Areas of Particular Concern

The quality of weakfish habitats has been compromised largely by impacts resulting from human activities. It is generally assumed that weakfish habitats have undergone some degree of loss and degradation; however, few studies quantify the impacts in terms of the area of habitat lost or degraded.

Loss due to water quality degradation is evident in the northeast Atlantic coast estuaries. The New York Bight is one example of an area that has regularly received deposits of contaminated dredged material, sewage sludge, and industrial wastes. These deposits have contributed to oxygen depletion and the creation of large masses of anoxic waters during the summer months.

Some losses have likely occurred due to the intense coastal development that has taken place during the last several decades, although no quantification has been done. Losses have likely resulted from dredging and filling activities that have eliminated shallow water nursery habitat.

Further functional losses have likely occurred due to water quality degradation from point and non-point source discharges. Intensive conversion of coastal wetlands to agricultural use also contributed to the functional loss of weakfish nursery area habitat. Other functional loss of riverine and estuarine areas may have resulted from changes in water discharge patterns due to withdrawals or flow regulation. Estuarine nursery areas for weakfish, as well as adult spawning and pre-spawning staging areas, may be affected by prolonged extreme conditions from inland water management practices.

Power plant cooling facilities continue to impact weakfish populations. The EPA estimates the number of weakfish age 1 lost as a result of entrainment at all transition zone cooling water intake structures in the Delaware Bay is over 2.2 million individuals. Other threats stem from the continued alteration of freshwater flows and discharge patterns to spawning, nursery, and adult habitats in rivers and estuaries. Additional threats arise from placement of additional municipal water intakes in spawning and nursery areas, although the impacts may be mitigated to some degree with proper screening (ASMFC 2002).

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of Weakfish

The following is taken from Amendment 4 to the Weakfish FMP, Section 1.4.2:

Habitat loss due to water quality degradation is evident in the northeast Atlantic coast estuaries. For example, the New York Bight has regularly received deposits of contaminated dredged material, sewage sludge, and industrial wastes, which has led to oxygen depletion and large masses of anoxic waters during the summer months. Some losses have likely occurred due to the intense coastal development in the last several decades, including dredging and filling activities in shallow nursery habitats, point and non-point source discharges, and intensive conversion of coastal wetlands for agricultural use (ASMFC 2002).

Flow regulation may have also contributed to functional loss of riverine and estuarine areas due to possible changes in water discharge patterns. Estuarine pre-spawning staging areas, spawning, and nursery areas may be affected by prolonged extreme conditions resulting from inland water management practices. Power plant cooling facilities continue to impact weakfish populations through the entrainment of larvae and juveniles.

Unknowns and Uncertainties

Weakfish are pelagic fishes in estuarine systems and more common in the main channel of bays, sounds, and tributaries (Chao and Musick 1977). Therefore, perturbations to substrate and seagrass habitats through dredging, coastal development, and boating are not going to impact weakfish as much as benthic sciaenids. However, weakfish are visual predators (Horodysky et al. 2008) and human activities (e.g., dredging, eutrophication, sediment runoff) that increase turbidity are likely to reduce foraging efficiency for weakfish at all life stages. In addition, individuals are attracted to spawning aggregations through drumming but humans are increasing underwater noise pollution in coastal estuaries, which can increase stress and reduce the effectiveness of acoustic calls needed to initiate spawning (Slabbekoorn et al. 2010). It is not known how weakfish respond to increasing noise pollution and particular attention is needed in regards to the impacts of noise pollution on spawning adults as well as estimates of egg production.

Although weakfish are tolerant of low dissolved oxygen conditions (Stierhoff et al. 2009), other environmental variables are changing due to climate change. For weakfish, increasing acidification may be the more significant than other climate driven environmental changes since reduced pH decrease responsiveness to sensory cues, which can reduce foraging efficiency and predator avoidance (Dixson et al. 2010). Additional work, needs to be conducted to understand how ocean acidification may impact weakfish in estuarine systems at different life history stages.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

The following research recommendations are from Amendment 4 to the Weakfish FMP, Section 6.1.1 and ranked by high priority (H), medium priority (M), and low priority (L):

1. Collect catch and effort data including size and age composition of the catch, determine stock mortality throughout the range, and define gear characteristics. In particular, increase length-frequency sampling, particularly in fisheries from Maryland and further north. (H)

2. Derive estimates of discard mortality rates and the magnitude of discards for all commercial gear types from both directed and non-directed fisheries. In particular, quantify trawl bycatch, refine estimates of mortality for below minimum size fish, and focus on factors such as distance from shore and geographical differences. (H)

3. Update the scale – otolith comparison for weakfish. (H)

4. Define reproductive biology of weakfish, including size at sexual maturity, maturity schedules, fecundity, and spawning periodicity. Continue research on female spawning patterns: what is the seasonal and geographical extent of "batch" spawning; do females exhibit spawning site fidelity? (M)

5. Conduct hydrophonic studies to delineate weakfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc.) and enable quantification of spawning habitat. (M)

6. Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent. (M)

7. Identify stocks and determine coastal movements and the extent of stock mixing, including characterization of stocks in overwintering grounds (e.g. tagging). (L)

8. Biological studies should be conducted to better understand migratory aspects and how this relates to observed trends in weight at age. (L)

9. Document the impact of power plants and other water intakes on larval, post larval and juvenile weakfish mortality in spawning and nursery areas, and calculate the resultant impact to adult sock size. (L)

10. Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially. (L)

11. Develop a coastwide tagging database. (L)

12. Develop a spawner recruit relationship and examine the relationships between parental stock size and environmental factors on year-class strength. (L)

Habitat Research Recommendations

The following research recommendations are from Amendment 4 to the Weakfish FMP, Section 6.1.4:

1. Conduct hydrophonic studies to delineate weakfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc.) and enable quantification of spawning habitat.

2. Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent.

3. Document the impact of power plants and other water intakes on larval, post larval and juvenile weakfish mortality in spawning and nursery areas, and calculate the resulting impacts on adult stock size.

4. Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially.

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CHAPTER 8: Northern kingfish

Section I. General Description of Habitat

Northern kingfish are found in estuaries and coastal areas from Maine to the Yucatan, Mexico (Irwin 1971) and are more common in the Mid Atlantic Bight than in the South Atlantic Bight (Hildebrand and Schroeder 1928; Schaefer 1965; Ralph 1982). Northern kingfish prefer habitats in close proximity to inlets and in the ocean to depths up to 20 meters (Welsh and Breder 1923; Bearden 1963; Irwin 1971; Ralph 1982). Juvenile northern kingfish inhabit shallower waters than the adult northern kingfish and were typically found in the surfzone and rivers (Bearden 1963; Ralph 1982).

Part A. Spawning Habitat

Geographic and Temporal Patterns of Migration

Northern Kingfish are thought to migrate inshore and northward from their overwintering habitats during the spring and summer while spawning is occurring (Hildebrand and Cable 1934). Fish in spawning condition have been observed from March through September based on macroscopic inspection of gonads for fish in North Carolina (Collier in prep) and from June through August based on the size distribution of young of the year fish (Welsh and Breder 1923; Schaefer 1965; Miller et al. 2002). Spawning is thought to occur in the nearshore-ocean or within inlets in deep channels (Irwin 1971; Ralph 1982).

Salinity

Adult northern kingfish are thought to spawn in lower estuary and coastal habitats with moderate to high salinities (Ralph 1982). Spawning is occurs along the bottom (Ralph 1982).

Substrate

The spawning habitat has not been described for northern kingfish but they are typically found over sandy bottoms (Welsh and Breder 1923; Hildebrand and Cable 1934; Bearden 1963) with some reports of northern kingfish around oysters and hard bottom (Irwin 1971). It is expected that northern kingfish spawn over sandy or muddy bottoms in the ocean and in deeper channels.

Temperature

Northern Kingfish migrate based on temperature and will remain in the lower estuary and nearshore ocean during the spawning season. Spawning adults have been observed in temperatures ranging from 7.8 - 35.8 °C (Irwin 1971). The temperature range is likely to vary with latitude with northern kingfish from the Mid-Atlantic experiencing lower temperatures than fish inhabiting the South Atlantic and Gulf of Mexico.

Dissolved Oxygen

Preferences for dissolved oxygen (DO) have not been reported for adult and spawning northern kingfish. Based on suspected spawning locations (deep estuaries and nearshore) low DO and hypoxic conditions are likely rare.

Feeding Behavior

Diets of northern kingfish were reported during the summer months, which includes the spawning season. The diet of northern kingfish is comprised of penaeid shrimp, polycheate worms, and amphipods in the South Atlantic Bight (Welsh and Breder 1923; Bearden 1963) and shrimp, crabs, and squids in northern latitudes (Irwin 1971).

Competition and Predation

Competitors of northern kingfish include other sciaenids including its congeners, southern and gulf kingfishes, spot, Atlantic croaker, red drum, and black drum, due to diet and habitat overlap (Ralph 1982). No studies have reported on competition or predation of spawning northern kingfish, though it might be safely inferred that adult competition and predation descriptions apply to spawners, particularly because the duration spawning season suggests that spawning is integrated into their adult lives, rather than a small, discrete period that may necessitate a different behavioral strategy.

Part B. Egg and Larval Habitat

The eggs of northern kingfish are buoyant and the water column is the primary habitat. Eggs have been reported in the water column of the nearshore-ocean and in estuaries. Larvae are defined as kingfish <25 mm SL although the size of transition is not clearly defined (Welsh and Breder 1923). It is likely the nursery habitats for northern kingfish extend from the nearshore ocean into upper reaches of estuaries due to tidal transport. The greatest concentration of larvae northern kingfish occur in the nearshore ocean and lower estuaries (Irwin 1971; Ralph 1982).

Geographic and Temporal Patterns of Migration

Mature northern kingfish spawn in the nearshore ocean and lower reaches of deep estuaries. Egg hatching occurs about 46-50 hours post-fertilization at 20 -21 °C (Welsh and Breder 1923). Spawning begins in the southern region of the distribution (e.g., North Carolina) early in the spring and likely begins later in the spring in northern latitudes (Irwin 1971). Eggs are likely subjected to a variety of environmental conditions due to a protracted spawning season and broad geographic distribution from Florida to Maine in euryhaline areas similar to Southern Kingfish (Bearden 1963).

Northern kingfish larvae are widely distributed and have been reported in nearshore ocean waters and throughout estuaries (Bearden 1963; Irwin 1971; Ralph 1982). It is likely the larval transport of northern kingfish is similar to the larval transport of other sciaenids using tidal stream transport (e.g., weakfish, souther kingfish) given the general overlap in spawning season and location.

Salinity

Although salinity has not been reported, eggs and larvae of kingfishes (some studies do not differentiate among species) are concentrated near ocean near inlets and the lower parts of estuaries where salinities are higher (Ralph 1982; Flores-Coto et al. 1999; Reiss and McConaugha 1999).

Northern kingfish larvae likely tolerate a wide range of salinities based on their wide distribution but are most common in waters with salinities greater than 20 ppt, similar to southern kingfish (Bearden 1963). As northern kingfish grow, they are found in higher salinity waters (Ralph 1982). Although northern kingfish larvae are distributed over a range of salinities, it is not known if rapid changes in salinity impact survival.

Substrate

Like many marine fish eggs, northern kingfish eggs are spherical, buoyant, and have a relatively short phase. In addition, the entire egg phase takes place in the pelagic zone of nearshore or lower estuarine waters, and thus substrate is not likely encountered (Welsh and Breder 1923).

Temperature
Minimum temperature is likely the main driver of northern kingfish reproduction and thus a necessary condition for egg development. Welsh and Breder (1923) spawned northern kingfish at 20 - 21 °C and based on average ocean temperatures for months listed as spawning times, northern kingfish likely spawn at temperatures between 18 - 27 °C.

Dissolved Oxygen
DO is probably not an issue for short-lived northern kingfish eggs that remain buoyant and pelagic, and thus out of hypoxic and anoxic zones.

Feeding Behavior
Northern kingfish eggs subsist entirely off the yolk sac prior to hatch. The feeding behaviors of larval northern kingfish have not been described. However, they likely consume zooplankton prey, such as copepods, decapods, and polychaetes (Able and Fahay 2010), similar to other sciaenids.

Competition and Predation
Northern Kingfish eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (and largely met by the offshore conditions). Predation of eggs undoubtedly occurs but has not been well studied or reported. Although potentially large numbers of eggs are killed from predation, there is no initial reason to think that pelagic oceanic predators are targeting northern kingfish eggs and larvae over other species. In the early stages (eggs and larvae), gelatinous zooplankton are likely the main predators of northern kingfish (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

No study has looked at competition and predation of larval northern kingfish but the larvae likely compete with gulf and southern kingfishes and other sciaenids including spot, Atlantic croaker, red drum, and black drum (Ralph 1982) as well as Florida pompano and silversides in the surfzone (Bearden 1963). Some competition likely takes place when a high-density larval patch settles on limited habitat; however, the wide range of settled habitats and protracted spawning season suggest that widespread competition is unlikely.

Part C. Juvenile Habitat

Juvenile northern kingfish are between 25 and 150 or 230 mm SL. The upper size varies between sexes due to the differential size at maturity. Juvenile northern kingfish inhabit the nearshore ocean and surfzone and the deeper waters of bays, estuaries, and sounds, including their tributary rivers. Northern kingfish are summer estuarine residents of estuarine beaches (Miller et al. 2002).

Geographic and Temporal Patterns of Migration
The general pattern of habitat use by juvenile northern kingfish is estuarine-wide beginning in late spring and early summer in lower estuarine and nearshore habitats. Juveniles move to deeper, more saline waters in the fall (Ralph 1982; Miller et al. 2002). Northern kingfish tend to remain in localized areas throughout the summer (Miller et al. 2002).

Salinity

Juvenile northern kingfish migrate to deeper more saline waters as they get larger. By the fall most northern kingfishes migrate out of the shallow estuarine and nearshore oceanic habitats to the deeper ocean habitats to overwinter (Bearden 1963; Ralph 1982; Miller et al. 2002). Growth rates were compared among different habitats and no significant differences were detected indicating that salinity does not impact growth rates Miller et al. 2002). The fish tended to leave the estuarine beaches at smaller sizes than at oceanic beaches (165 total length (TL) vs. 230 TL).

Substrate

Juvenile northern kingfish are typically observed over sandy sediment in shallow estuarine and surfzone environments and can be found over mud environments (Welsh and Breder 1923; Irwin 1971; Ralph 1982). There are reports of northern kingfish being caught over hard substrate including oyster shell (Irwin 1971; Ralph 1982).

Temperature

Juvenile northern kingfish likely tolerate a wide range of temperatures and it is considered to be an important variable driving their distribution. They are rarely seen in temperatures below 20 °C and migrate out of shallow waters in September and October (Ralph 1982; Miller et al. 2002). In a tank experiment, they avoided temperatures above 30 °C.

Dissolved Oxygen

Little has been reported on the impact of DO levels on juvenile northern kingfish. The lower estuary and surfzone environments may have fewer occurrences of hypoxic and anoxic events compared to upper estuarine habitats. However, northern kingfish do have a relatively fast growth rate (1.8 - 2.4 mm d^{-1} as juveniles) (Miller et al. 2002), which could be attributed to the elevated metabolic rate of the species (Horodysky 2011).

Feeding Behavior

Juvenile northern kingfish are benthic foragers (Chao and Musick 1977). They use their single barbel to detect prey. The juvenile diet consists of nematodes, polychaete worms, mysid shrimp, penaeid shrimp, isopods, amphipods, copepods, fishes, and detritus (Ralph 1982).

Competition and Predation

No study has looked at competition and predation of juvenile northern kingfish but the juveniles likely compete with gulf and southern kingfishes, other benthic foraging sciaenids (spot, Atlantic croaker, red drum, and black drum) (Ralph 1982), and Florida pompano and silversides in the surfzone (Bearden 1963).

Part D. Adult Habitat

Adult northern kingfish are schooling fish that reside in both estuarine and nearshore Atlantic Ocean habitats. Adult are found over clean sandy sediment with some reports of northern kingfish around hard substrate. Warming of coastal waters in the spring is a cue for a migration inshore and northward from the wintering grounds to nearshore ocean, bays, estuaries, and sounds. Northern kingfish migrate offshore and southward as temperatures decline in the fall.

Geographic and Temporal Patterns of Migration
Most northern kingfish mature after their first winter (Schaefer 1965; Collier et al. in prep). The general pattern of adult habitat use includes a seasonal migrations south and offshore in fall and winter and north and inshore during spring and summer (Irwin 1971; Ralph 1982; Miller et al. 2002). Summer inshore habitats extend from the estuaries to continental shelf in depths less than 18 m (Ralph 1982). Although it is not clear the depth where overwintering occurs, northern kingfish have been captured in depths of 36 m in the late fall off North Carolina with the deepest record being 128 m (Irwin 1971).

Salinity
Adult northern kingfish occur primarily in nearshore-ocean or lower estuarine habitats where salinities are at or near full seawater.

Substrate
In accordance with the variety of habitats used by adults, specific habitat use or habitat preference in adult northern kingfish has not been reported. Northern kingfish are typically found over sandy or muddy-sand substrates in the ocean, bays, and estuaries, but substrates used are likely as variable as the overall habitats in which adults are found. Some reports indicate that northern kingfish are found among hard substrate (Irwin 1971; Ralph 1982) and, anecdotally, fishermen indicated catches of northern kingfish are typically higher in close proximity to hard substrates.

Temperature
Temperature appears is driving factor in the movement of northern kingfish. They have reported temperature tolerances of 7.8 - 35.8 °C. In areas south of Cape Hatteras, northern kingfish are rarely seen in temperatures <20 °C. Adults have been reported dying due to cold stun in the northern part of their range (Irwin 1971). They have an upper thermal limit of 35 °C and avoid temperatures >31 °C (Ralph 1982).

Dissolved Oxygen
Adult northern kingfish likely experience normoxic conditions, as they typically are found in lower estuary or nearshore ocean. Without any explicit studies of adult northern kingfish DO tolerances or preferences, values can be inferred from other sciaenids that have overlapping habitat occurrences. It should be noted that the metabolic rate for northern kingfish was significantly higher than spot and Atlantic croaker (Horodysky et al. 2011), which suggests that northern kingfish may be more sensitive to hypoxia than other sciaenids.

Feeding Behavior
Adult northern kingfish are benthic feeders and use single barbel on the chin to detect the prey. Northern kingfish have been observed to consume shrimp, amphipods, mysids, and polychaete worms (Welsh and Breder 1923; Woodland et al. 2011).

Competition and Predation
Competition among adults is not well known. As with other life stages, northern kingfish overlap in their distribution with southern and gulf kingfishes, suggesting a potential for competition among these species. However, the diet on gulf kingfish appears to be more specialized than the other two species

and the diets of southern and northern kingfishes indicated niche segregation (Woodland et al. 2011). Other potential competitors include other sciaenids and Florida pompano.

Kingfish spp. otoliths have been observed in the stomachs of cetaceans (Tyner 2004) and likely predators include larger sciaenids and coastal sharks.

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat

Northern kingfish use a variety of habitats in lower reaches of estuaries and nearshore oceanic habitats. They are observed over sand and mud substrate in nearshore ocean, bays, estuaries, and sounds. Some studies have reported around hard substrate (Welsh and Breder 1923; Irwin 1971; Ralph 1982).

Identification of Habitat Areas of Particular Concern

There is no HAPC designation for northern kingfish.

Present Condition of Habitat Areas of Particular Concern

The quality of northern kingfish habitats has been compromised largely by impacts from human activities. It is generally assumed that these habitats have undergone some degree of loss and degradation; however, few studies quantify the impacts in terms of the area of habitat lost or degraded.

Habitat loss due to water quality degradation is evident in the northeast Atlantic coast estuaries. The New York Bight, for example, has regularly received deposits of contaminated dredged material, sewage sludge, and industrial wastes. These deposits have contributed to oxygen depletion and the creation of large masses of anoxic waters during the summer months.

Some losses have likely occurred due to the intense coastal development that has occurred during the last several decades, although no quantification has been done. Losses have likely resulted from dredging and filling activities that have eliminated shallow water nursery habitats. Further functional losses have likely occurred due to water quality degradation from point and non-point sources. Intensive conversion of coastal wetlands to agricultural use also is likely to have contributed to functional loss of northern kingfish nursery area habitat, particularly estuarine beaches.

Other functional loss of riverine and estuarine areas may have resulted from changes in water discharge patterns resulting from withdrawals or flow regulation. Estuarine nursery areas for northern kingfish, as well as adult spawning and pre-spawning areas, may be affected by prolonged exposure to extreme conditions from inland water management practices.

Beach renourishment projects are likely to have an impact on northern kingfish. Kingfishes utilize the surfzone to different degrees as they develop. Juveniles are residents of the surfzone and lower estuaries (Miller et al. 2002). Northern kingfish densities were highest during a beach renourishment project, suggesting that individuals were attracted to the bioturbated region (Wilber et al. 2003). Short-term and long-term monitoring on the effects of beach renourishment is needed to better understand the impacts on kingfish.

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of northern kingfish

The timing of seasonal and spawning migrations appear to be linked to temperature, as well as their overall distribution within estuarine and coastal ecosystems. As temperatures cool in the fall, northern kingfish move south and offshore to deeper water that is more stable in temperature. They return to northern, inshore habitats as temperatures increase again in the spring and summer (Irwin 1971; Ralph 1982; Miller et al. 2002). In the summer, individuals use sand and mud bottomed habitats in lower estuaries and along the continental shelf in depths less than 18 m (Ralph 1982).

Unknowns and Uncertainties

Little research has been conducted on northern kingfish at any life stage and a comprehensive coastwide study that covers their geographic range is needed. The impacts of dredge and fill projects including renourishment projects cannot be fully assessed without additional research to understand habitats that are essential fish habitat.

In addition, it is often difficult to distinguish the early stages of kingfish spp., which adds confusion when investigating and determining physiological tolerances to environmental conditions. More research is required in the biology and life history of northern kingfish following a revision of the diagnostic characters used to identify northern kingfish in larval and juvenile collections.

Another consideration for northern kingfish is that they forage within and along the sediment of the benthos, which concentrates hydrophobic toxicants, potentially increasing their exposure to these contaminants. No known research has examined the impacts of toxicant exposure on early stage northern kingfish, which may have developmental or reproductive implications.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Currently, northern kingfish is not managed through the Interstate Fisheries Management Program (ASMFC 2014). The following recommendations are based on recommendations made in NCDMF 2007 and FMPs for other sciaenids:

1. Protect known nursery areas from activities likely to negatively impact northern kingfish.

2. Integrate beach and inlet management plans into a coastwide plan that minimizes impacts to the habitat of kingfishes and other estuarine fishes.

3. Require beach renourishment and dredge and fill projects adhere to state, regional, or national policies and require robust monitoring before and after dredge, renourishment, and fill activities.

4. Modify stormwater rules or policies to more effectively reduce the volume and pollutant loading of stormwater runoff entering coastal waters.

5. Minimize contamination of bottom sediments through protection and enhancement of wetlands utilizing regulatory and non-regulatory measures, such as land use planning, land acquisition, vegetated buffers, and permitting regulations.

6. Implement and enforce sediment compatibility criteria for beach nourishment projects.

Habitat Research Recommendations

Currently, northern kingfish is not managed through the Interstate Fisheries Management Program (ASMFC 2014). The following recommendations are based on recommendations made in NCDMF 2007 and FMPs for other sciaenids to improve our understanding of the biology, habitat use, and potential stressors of northern kingfish.

1. Conduct studies to delineate northern kingfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc.) and enable quantification of spawning habitat.

2. Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent.

3. Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially.

4. Recommend BACI studies for beach renourishment projects to describe the impact/benefit of renourishment.

5. Develop consistent methods for studying impact of beach renourishment to allow for comparison spatially and temporally.

6. Determine impact of beach stormwater outfalls on kingfish populations.

7. Determine impact of bottom disturbing gear on kingfish spawning, nursery, and feeding habitats.

8. Assess the distribution, concentration, and threat of heavy metals and other toxic contaminants in freshwater and estuarine sediments and identify the areas of greatest concern to focus water quality improvement efforts.

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CHAPTER 9: Southern kingfish

Section I. General Description of Habitat

Southern kingfish are found in estuaries and coastal areas from Long Island, New York to Buenos Aires, Argentina (Irwin 1971) and are more common in the South Atlantic Bight than Mid Atlantic Bight (Hildebrand and Schroeder 1928; Smith and Wenner 1985). Southern kingfish prefer habitats close to inlets and in the ocean at depths ranging from 5 - 27 m (Bearden 1963; Harding and Chittenden 1987). Juvenile southern kingfish inhabit shallower waters than the adult southern kingfish and were found in waters less than 16 m whereas adults are found in waters less than 23 m (Bearden 1963; Crowe 1984; Harding and Chittenden 1987).

Part A. Spawning Habitat

Geographic and Temporal Patterns of Migration

Southern Kingfish are thought to migrate southward during the winter and northward prior to the spawning season (Hildebrand and Cable 1934; Smith and Wenner 1985; Beresoff and Schoolfield 2002).

Salinity

Adult southern kingfish are spawn in lower estuarine and coastal habitats in waters that have moderate to high salinities (Bearden 1963; Irwin 1971; Dahlberg 1972; Smith and Wenner 1985). They are found in higher salinity waters than juveniles (>20 ppt) (Bearden 1963; Irwin 1971; Crowe 1984).

Substrate

The spawning habitat has not been described for southern kingfish but they are typically found over sandy and muddy bottoms in the ocean or in deeper channels (Welsh and Breder 1923; Hildebrand and Cable 1934; Bearden 1963).

Temperature

Southern Kingfish migrate based on temperature and will remain in the lower estuary and nearshore ocean during the spawning season. They have been observed in temperatures from 8 - 37 °C (Crowe 1984). The temperature range is likely to vary with latitude with southern kingfish from the Mid Atlantic experiencing lower temperatures than fish inhabiting the South Atlantic and Gulf of Mexico.

Dissolved Oxygen

Preferences for dissolved oxygen (DO) have not been reported for adult and spawning southern kingfish. Based on suspected spawning locations (deep estuaries and nearshore ocean) low DO and hypoxic conditions are likely rare.

Feeding Behavior

Diets of southern kingfish were typically reported during the summer months, which include the spawning season. The diet varied and was often comprised of fished (including silversides, anchovies, star drum, and tonguefish), *Squilla*, *Crangon*, penaeid shrimp, mysids, polycheate worms, and copepods in the South Atlantic Bight (Irwin 1971; Woodland et al. 2011).

Competition and Predation

Competitors of southern kingfish likely include other sciaenids (northern kingfish, gulf kingfish, spot, Atlantic croaker, red drum, and black drum) due to diet and habitat overlap. One study reported dietary overlap between southern kingfish, Clearnose Skate, and Smooth Dogfish (Woodland et al. 2011). Few studies have reported on competition or predation of spawning southern kingfish, though it might be safely inferred that adult competition and predation descriptions apply to spawners, particularly because the prolonged spawning season, which suggests that spawning is integrated into the ecology of adults.

Part B. Egg and Larval Habitat

The eggs of southern kingfish are buoyant and the water column is the primary habitat. Eggs have been reported in the water column of the nearshore ocean and in estuaries.

Larvae of southern kingfish are defined as kingfish <25 mm SL although the size of transition is not clearly defined (Welsh and Breder 1923). It is likely the nursery habitats for southern kingfish extend from the nearshore ocean into upper reaches of estuaries due to tidal transport. The greatest concentration of larvae southern kingfish occur in the nearshore ocean and lower estuaries (Irwin 1971; Ralph 1982; Flores-Coto et al. 1999; Reiss and McConaugha 1999; Markovsky 2009).

Geographic and Temporal Patterns of Migration

Mature southern kingfish spawn in the nearshore ocean and lower reaches of deep estuaries (NCDMF 2007). Spawning begins in the southern region of the distribution (e.g., Florida) early in the spring and likely begins later in the spring at northern latitudes (Irwin 1971). Eggs are likely subjected to a variety of environmental conditions due to the protracted spawning season and broad geographic distribution from Florida to Maine in euryhaline areas (Bearden 1963).

Southern Kingfish larvae are widely distributed and have been reported in nearshore ocean waters and throughout estuaries (Bearden 1963; Irwin 1971; Crowe 1984). This wide distribution is driven by the use of currents to migrate into nurseries.

Salinity

Salinity has not been reported but eggs and larvae of kingfishes (some studies do not differentiate) indicate they are concentrated in the ocean near inlets and the lower parts of estuaries where salinities are higher (Flores-Coto et al. 1999; Reiss and McConaugha 1999; Markovsky 2009).

Southern Kingfish larvae likely tolerate a wide range of salinities based on their wide distribution but are most common in waters with salinities >20 ppt (Bearden 1963). As southern kingfish grow, they are increasing found in higher salinity waters (Bearden 1963; Crowe 1984).

Substrate

Like many marine fish eggs, southern kingfish eggs are buoyant, and have a relatively short phase (compared to other life stages) with the entire egg phase taking place in the pelagic zone of nearshore or lower estuarine waters, and thus substrate is not likely encountered.

Larval southern kingfish are likely planktonic and then benthic after settlement (Hildebrand and Cable 1934). The likely substrates include sandy, muddy, and shell substrate in shallow estuarine and surfzone environments (Hildebrand and Cable 1934).

Temperature
Minimum temperature is likely the main driver of southern kingfish reproduction and thus a necessary condition for egg development. Based on observations for larvae, southern kingfish were observed in temperatures from 24 - 30 °C in the Gulf of Mexico (Crowe 1984). This range of temperatures might be narrower than the temperature tolerance in the Atlantic based on reported months of spawning from March to September (20 - 30 °C).

Dissolved Oxygen
Due to a likely short larval duration similar to southern kingfish and the pelagic habitat, it is unlikely that they encounter any habitats in which DO imposes a limitation or threat.

Feeding Behavior
Southern kingfish eggs subsist entirely off the yolk sac prior to hatch. The feeding behaviors of larval southern kingfish has been described as more general than adults in that the early stages are consuming planktonic prey (Chao and Musick 1977).

Competition and Predation
Southern Kingfish eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (and largely met by the offshore conditions). Predation of eggs undoubtedly occurs but has not been well studied or reported. Although potentially large numbers of eggs are killed from predation, there is no initial reason to think that pelagic oceanic predators are targeting weakfish eggs over other, similar pelagic eggs. As with other marine fishes, eggs and larvae are susceptible to predation by gelatinous zooplankton (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

No study has looked at competition and predation of larval southern kingfish but they likely compete with gulf and northern kingfishes and other members of the sciaenid family including spot, Atlantic croaker, weakfish, red drum, and black drum (Ralph 1982) as well as Florida pompano and silversides in the surfzone (Bearden 1963). Some competition likely takes place when a high-density larval patch settles on limited habitat; however, the wide range of settled habitats and protracted spawning season suggest that widespread competition is unlikely.

Part C. Juvenile Habitat

Juvenile southern kingfish are generally between the sizes of 25 and 120 or 180 mm SL, due to different size at maturing between the sexes. Juvenile southern kingfish inhabit the nearshore ocean and surfzone and the deeper waters of bays, estuaries, and sounds, including their tributary rivers.

Geographic and Temporal Patterns of Migration
The general pattern of habitat use by juveniles is estuarine-wide and begins in late spring and early summer in lower estuarine and nearshore habitats. In the fall, juveniles move to deeper, more saline waters (Crowe 1984). Southern kingfish are summer residents of the surfzone and estuaries (Dahlberg 1972; Crowe 1984).

Salinity

Juvenile southern kingfish migrate to deeper more saline waters as size increases. By the fall most southern kingfish migrate out of the shallow estuarine and nearshore ocean environment to the deeper ocean habitats to overwinter (Bearden 1963; Harding and Chittenden 1987). The fish tended to leave the estuarine beaches at smaller sizes than oceanic beaches (160 mm TL vs. 200 mm TL) (Harding and Chittenden 1987). It is not known if salinities impact growth rates.

Substrate
Juveniles are observed over sandy, muddy, and shell substrates in shallow estuarine and surfzone environments (Bearden 1963; Irwin 1971; Harding and Chittenden 1987). In the fall, the most juvenile southern kingfish will migrate into the ocean (Hildebrand and Cable 1934; Smith and Wenner 1985; Harding and Chittenden 1987). However, some individuals will remain in the estuary throughout the winter (Bearden 1963).

Temperature
Juvenile southern kingfish tolerate a wide range of temperatures. They are rarely seen in temperatures below 15 °C and migrate out of shallow waters in September and October (Crowe 1984; Harding and Chittenden 1987).

Dissolved Oxygen
Little has been reported on the impact of DO levels on juvenile southern kingfish. The lower estuary and surfzone environments may have fewer occurrences of hypoxic and anoxic events compared to upper estuarine habitats. However, southern kingfish do have a relatively fast growth rate (Hildebrand and Cable 1934; Bearden 1963; Crowe 1984) and likely contributes to the elevated metabolic rate (Horodysky et al. 2011) and increased oxygen consumption.

Feeding Behavior
Juveniles are benthic foragers and use a single barbel to detect prey. The juvenile diet consists of nematodes, polychaete worms, mysid shrimp, penaeid shrimp, isopods, amphipods, copepods, fishes, and detritus (Welsh and Breder 1923; Bearden 1963).

Competition and Predation
No study has looked at competition and predation of juvenile southern kingfish but the juveniles likely compete with gulf and northern kingfishes and other sciaenids (spot, Atlantic croaker, red drum, and black drum) (Ralph 1982) as well as Florida pompano and silversides in the surfzone (Bearden 1963).

Part D. Adult Habitat

Adults are schooling fish that reside in both estuarine and nearshore Atlantic Ocean habitats. Adult southern kingfish are typically found over clean, sandy sediment with some reports of southern kingfish found over muddy and shell bottoms. Warming of coastal waters in the spring keys migration northward from the wintering grounds (Smith and Wenner 1985). Southern kingfish migrate generally southward as temperatures decline in the fall (Smith and Wenner 1985).

Geographic and Temporal Patterns of Migration
Most southern kingfish mature after their first winter (Smith and Wenner 1985; Collier et al. in prep). Adults undertake seasonal migrations south and offshore in fall and winter and north and inshore during

spring and summer (Irwin 1971; Smith and Wenner 1985; Beresoff and Schoolfield 2002). Summer inshore habitats are from the estuary to continental shelf in depths between <5 - 30 m (Harding and Chittenden 1987). Although it is not clear at which depth overwintering occurs, southern kingfish have been captured in depths up to 54 m in the late fall (Bearden 1963).

Salinity
Adult southern kingfish occur primarily in nearshore ocean or lower estuarine habitats and salinities are near full seawater.

Substrate
Southern kingfish are typically found over sandy or muddy-sand substrates in the ocean, bays, and estuaries (Irwin 1971; Harding and Chittenden 1987).

Temperature
Temperature appears to be a driving factor in the movement of southern kingfish. They have reported temperature tolerances of 7 - 33 °C (Irwin 1971; Crowe 1984). In areas south of Cape Hatteras, southern kingfish are more commonly seen in temperatures >15 °C (Irwin 1971).

Dissolved Oxygen
Adults likely experience normoxic conditions, as they typically are found in lower estuary or nearshore ocean. Without any explicit studies of adult southern kingfish DO tolerances or preferences, DO requirements might be inferred from other sciaenids with overlapping habitat occurrences southern kingfish have high metabolic rates (Horodysky et al. 2011) and may be more sensitive to low DO conditions.

Feeding Behavior
Adult southern kingfish are benthic feeders that consume fishes (including silversides, anchovies, star drum, and tonguefish), *Squilla*, *Crangon*, Penaeid shrimp, mysids, polycheate worms, and copepods in the South Atlantic Bight (Irwin 1971; Woodland et al. 2011).

Competition and Predation
Competition among adults is not well known. Based on reports, southern kingfish overlap their distribution with northern and gulf kingfishes; however the diet of gulf kingfish appears to be much more specialized. The diet of southern and northern kingfishes indicate niche segregation is present. However, southern kingfish diets did overlap with smooth dogfish and clearnose skates (Woodland et al. 2011). Other potential competitors include other members of the sciaenid family and Florida pompano.

Kingfish spp. otoliths have been observed in the stomachs of cetaceans (Tyner 2004) and likely predators include larger sciaenids and coastal sharks.

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat
Unlike northern kingfish, southern kingfish are more abundant in the South Atlantic Bight in slightly deeper waters (27 m vs. 20 m for northern kingfish) (Welsh and Breder 1923; Bearden 1963; Schaefer 1965; Harding and Chittenden 1987; Miller et al. 2002). However, both species are found near inlets and

nearshore ocean habitats, although the peak range of abundance is spatially separated, there is a high degree of habitat overlap between northern and southern kingfishes.

Southern kingfish use a variety of habitats in lower reaches of estuaries and nearshore oceanic habitats. They are observed over sand, mud, and shell substrates in the surfzone, nearshore ocean, bays, estuaries, and sounds (Bearden 1963; Harding and Chittenden 1987).

Identification of Habitat Areas of Particular Concern
There is no HAPC designation for southern kingfish.

Present Condition of Habitat Areas of Particular Concern
The quality of southern kingfish habitats has been compromised largely by impacts resulting from human activities. It is generally assumed that these habitats have undergone some degree of loss and degradation; however, few studies quantify the magnitude of habitat lost or degradation.

Loss due to water quality degradation is evident in the northeast Atlantic coast estuaries. The New York Bight, for example, has regularly received deposits of contaminated dredged material, sewage sludge and industrial wastes. These deposits have contributed to oxygen depletion and the formation of large masses of anoxic waters during the summer months, which may reduce the habitat available to southern kingfish.

Some losses have likely occurred due to the intense coastal development that has occurred during the last several decades, although no quantification has been done. Losses have likely resulted from dredging and filling activities that have eliminated shallow water nursery habitat. Further functional losses have likely occurred due to water quality degradation resulting from point and non-point discharge sources. Intensive conversion of coastal wetlands to agricultural use also is likely to have contributed to functional loss of southern kingfish nursery area habitat. Other functional loss of riverine and estuarine areas may have resulted from changes in water discharge patterns resulting from withdrawals or flow regulation. Estuarine nursery areas for southern kingfish, as well as adult spawning and pre-spawning areas, may be affected by prolonged exposure to extreme conditions from inland water management practices.

Beach renourishment projects are likely to have an impact on southern kingfish. Kingfish utilize the surfzone to different degrees as they progress through their life stages. Juveniles are localized-residents of the surfzone and lower estuaries (Miller et al. 2002). Southern kingfish were observed to increase in density during a beach renourishment project, potentially attracted to the bioturbation (Wilber et al. 2003). Short-term and long-term monitoring on the effects of beach renourishment is needed to better understand the impacts on kingfish.

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of southern kingfish
The timing of seasonal and spawning migrations appear to be linked to temperature, as well as their overall distribution within estuarine and coastal ecosystems. As temperatures cool in the fall, southern kingfish move south and offshore to deeper water that is more stable in temperature. They return to northern, inshore habitats as temperatures increase again in the spring and summer (Hildebrand and

Schroeder 1928; Bearden 1963; Smith and Wenner 1985; Harding and Chittenden 1987). In the summer, individuals use deeper habitats than northern kingfish over sand, mud, and shell bottomed habitats in lower estuaries and along the continental shelf in depths less than 27 m (Bearden 1963; Harding and Chittenden 1987).

Unknowns and Uncertainties

Little research has been conducted on southern kingfish at any life stage and a comprehensive coastwide study that covers their geographic range is needed. The impacts of dredge and fill projects including renourishment projects cannot be fully assessed without additional research to understand habitats that are essential fish habitat.

In addition, it is often difficult to distinguish the early stages of kingfish spp., which adds confusion when investigating and determining physiological tolerances to environmental conditions. Slight differences in diet and habitat have been described among kingfishes but more work is needed to fully resolve these ecological differences so that they can be implemented into a management perspective.

Another consideration for southern kingfish is that they forage within and along the sediment of the benthos, which concentrates hydrophobic toxicants, potentially increasing their exposure to these contaminants. No known research has examined the impacts of toxicant exposure on early stage southern kingfish, which may have developmental or reproductive implications.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Currently, southern kingfish is not managed through the Interstate Fisheries Management Program (ASMFC 2014). The following recommendations are based on recommendations made in NCDMF 2007 and FMPs for other sciaenids:

1. Protect known nursery areas from activities likely to negatively impact southern kingfish.

2. Integrate beach and inlet management plans into a coastwide plan that minimizes impacts to the habitat of kingfishes and other estuarine fishes.

3. Require beach renourishment and dredge and fill projects adhere to state, regional, or national policies and require robust monitoring before and after dredge, renourishment, and fill activities.

4. Modify stormwater rules or policies to more effectively reduce the volume and pollutant loading of stormwater runoff entering coastal waters.

5. Minimize contamination of bottom sediments through protection and enhancement of wetlands utilizing regulatory and non-regulatory measures, such as land use planning, land acquisition, vegetated buffers, and permitting regulations.

6. Implement and enforce sediment compatibility criteria for beach nourishment projects.

Habitat Research Recommendations

Currently, southern kingfish is not managed through the Interstate Fisheries Management Program (ASMFC 2014). The following recommendations are based on recommendations made in NCDMF 2007 and FMPs for other sciaenids to improve our understanding of the biology, habitat use, and potential stressors of southern kingfish.

1. Conduct studies to delineate southern kingfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc.) and enable quantification of spawning habitat.

2. Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent.

3. Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially.

4. Recommend BACI studies for beach renourishment projects to describe the impact/benefit of renourishment.

5. Develop consistent methods for studying impact of beach renourishment to allow for comparison spatially and temporally.

6. Determine impact of beach stormwater outfalls on kingfish populations.

7. Determine impact of bottom disturbing gear on kingfish spawning, nursery, and feeding habitats.

8. Assess the distribution, concentration, and threat of heavy metals and other toxic contaminants in freshwater and estuarine sediments and identify the areas of greatest concern to focus water quality improvement efforts.

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CHAPTER 10: Gulf kingfish

Section I. General Description of Habitat

Gulf kingfish are found in coastal areas from Chincoteague, Virginia to Rio Grande, Brazil and is most common south of Cape Hatteras and in the Gulf of Mexico (Irwin 1971). This species prefers surfzone habitats and oceanic habitats <10 m deep (Welsh and Breder 1923; Bearden 1963; Irwin 1971). Gulf kingfish are rarely found in habitats other than the nearshore-ocean unlike southern and northern kingfishes which utilize estuarine habitats along with the nearshore ocean.

Part A. Spawning Habitat

Geographic and Temporal Patterns of Migration

Gulf kingfish are thought to migrate inshore and northward from their overwintering habitats during the spring and summer while spawning is occurring (Hildebrand and Cable 1934). Fish in spawning condition have been observed from April through September in North Carolina (Collier in prep; Hildebrand and Cable 1934; Bearden 1963; Modde 1980). Spawning occurs in the shallow nearshore ocean (Irwin 1971; Braun and Fontoura 2004).

Salinity

Adult gulf kingfish spawn in the nearshore-ocean where the waters are at full salinity (Braun and Fontoura 2004).

Substrate

The spawning habitat has not been described for gulf kingfish but spawners are typically found over sandy bottoms (Hildebrand and Cable 1934; Bearden 1963).

Temperature

Gulf Kingfish migrate based on temperature and nearshore ocean during the spawning season. They have been observed in temperatures from 10 - 31 °C (Irwin 1971). Little research has been conducted on temperature preferences for spawning gulf kingfish but based on the temperatures where juveniles are observed spawning likely occurs between 18 and 30 °C.

Dissolved Oxygen

Preferences for dissolved oxygen (DO) have not been reported for adult and spawning gulf kingfish. Based on suspected spawning locations, low DO and hypoxic conditions are likely rare.

Feeding Behavior

Diets were described during the summer months, which includes the spawning season. The diet of gulf kingfish is more specialized than northern and southern kingfishes likely due to their more limited habitat range and molar-like pharnygeal teeth. Gulf kingfish diet includes mole crabs, *Donax*, polychaetes, brachyurans, stomatopod, *Squilla*, and fishes (Bearden 1963; McMichael and Ross 1987).

Competition and Predation

Competitors likely include other members of sciaenid family, especially other benthic sciaenids (southern and northern kingfishes, spot, Atlantic croaker, red drum, and black drum) based on diet and habitat overlap. No studies have reported on competition or predation of spawning gulf kingfish, though adult competition and predation descriptions apply to spawners, particularly because the long spawning season.

Part B. Egg and Larval Habitat

The eggs of gulf kingfish are likely buoyant and water column is the primary habitat. Research has not been conducted on egg and larval development.

Larvae of gulf kingfish are defined as kingfish <25 mm SL although the size of transition is not clearly defined (Hildebrand and Cable 1934). It is likely the nursery habitats for gulf kingfish extend from the nearshore ocean to the surfzone since the greatest concentration of larvae occur in the these areas (Bearden 1963; Irwin 1971; Modde 1980).

Geographic and Temporal Patterns of Migration
Mature gulf kingfish spawn in the nearshore ocean (Braun and Fontoura 2004). Eggs are likely subjected to a variety of environmental conditions due to the protracted spawning season and broad geographic distribution from Florida to Virginia (Bearden 1963).

Gulf kingfish larvae are widely distributed in nearshore-ocean waters and surfzone (Bearden 1963; Irwin 1971). It is likely the larval transport of gulf kingfish is through longshore currents.

Salinity
Salinity preferences/tolerances have not been reported for gulf kingfish eggs but larvae and juveniles of gulf kingfish are rarely reported in areas other than nearshore ocean and surfzone. It is not known if eggs can tolerate salinities less than full strength seawater, but larvae and juvenile gulf kingfish are rare in lower salinity estuarine systems. Larvae likely tolerate a narrow range of salinities based on their primarily oceanic distribution (Bearden 1963).

Substrate
Like many marine fish eggs, gulf kingfish eggs are pelagic and found in nearshore or lower estuarine waters, and thus substrate is not likely encountered. When larvae are planktonic, the larvae would not come in contact with the substrate over which they are dispersed but when larvae settle, they likely settle on sand substrate similar to the substrate used by juveniles.

Temperature
Minimum temperature is likely the main driver of gulf kingfish reproduction and thus a necessary condition for egg development. Gulf kingfish are uncommon under 20°C (Bearden 1963) in the nearshore ocean, which is the spawning location (Braun and Fontoura 2004). Based on average ocean temperatures for months listed as spawning times, gulf kingfish likely spawn at temperatures between 18 - 27 °C, which is the likely preferred temperature range for eggs and larvae.

Dissolved Oxygen
DO is probably not an issue for short-lived gulf kingfish eggs that likely remain buoyant and pelagic, and thus out of hypoxic and anoxic zones. Due to the likely short larval duration and oceanic habitat, it is unlikely that they encounter any habitats in which DO imposes a limitation or threat.

Feeding Behavior

Gulf Kingfish eggs subsist entirely off the yolk sac prior to hatching. The feeding behaviors of larvae have not been described. Additional research is needed, but the behaviors are likely similar to other sciaenids in that they feed on planktonic organisms, primarily copepods.

Competition and Predation

Gulf Kingfish eggs likely do not enter into any meaningful ecological competition, as their habitat demands are basic (and largely met by the offshore conditions). Predation of eggs undoubtedly occurs but has not been well studied or reported. Although potentially large numbers of eggs are killed from predation, there is no initial reason to think that pelagic oceanic predators are targeting gulf kingfish eggs over other, similar pelagic eggs. Gelatinous zooplankton are the likely predators of gulf kingfish eggs and larvae (Purcell 1985; Olney and Boehlert 1988; Cowan et al. 1992).

No study has examined competition and predation of larval gulf kingfish but the larval probably compete with northern and southern kingfishes (McMichael and Ross 1987) and other sciaenids including spot, Atlantic croaker, red drum, and black drum (Ralph 1982) as well as Florida pompano and silversides in the surfzone (Bearden 1963). Some competition likely takes place when a high-density larval patch settles on limited habitat; however, the wide range of settled habitats and protracted spawning season suggest that widespread competition is unlikely.

Part C. Juvenile Habitat

Juveniles are between the sizes of 25 and 150 or 230 mm SL (upper size varies between sexes). Juvenile gulf kingfish inhabit the nearshore ocean and surfzone. Gulf kingfish are summer residents of the surfzone (Ross and Lancaster 2002; Felix et al. 2007; Branson 2009).

Geographic and Temporal Patterns of Migration

Juvenile gulf kingfish use the surfzone in late spring and early summer and move to deeper waters as temperatures cool (Braun and Fontoura 2004). Gulf kingfish tend to remain in localized areas throughout the summer (Ross and Lancaster 2002; Felix et al. 2007; Branson 2009).

Salinity

Juveniles migrate to deeper waters as they get larger (Braun and Fontoura 2004). By the fall most gulf kingfish migrate out of the nearshore ocean environment to the deeper ocean habitats to overwinter (Bearden 1963) and therefore remain at full marine salinity. There are also few reports of gulf kingfish being caught in estuaries (Bearden 1963; Irwin 1971; Branson 2009).

Substrate

Juveniles are typically observed over sandy sediment in surfzone environments (Hildebrand and Cable 1934; Irwin 1971; Ross and Lancaster 2002).

Temperature

Juvenile gulf kingfish tolerate a wide range of temperatures. Juvenils are rarely found in temperatures below 20 °C and migrate out of shallow waters in September and October (Bearden 1963; Modde 1980).

Dissolved Oxygen

Little has been reported on the impact of DO levels on juvenile gulf kingfish. The surfzone environment may have fewer occurrences of hypoxic and anoxic events compared to estuarine habitats.

Feeding Behavior
Juvenile gulf kingfish are typically described as benthic foragers. They use their barbel to detect prey and their molar-like pharyngeal teeth to crush shells. The juvenile diet consists of bivalve siphon tips, cumaceans, copepods, mysids, and amphipods, and polychaetes (Bearden 1963; McMichael and Ross 1987). Juveniles appear to atrophy their swimbladder at smaller size than other kingfishes and likely switch to a more benthic diet at smaller sizes.

Competition and Predation
No study has looked at competition and predation of juvenile gulf kingfish but the juveniles compete with northern and southern kingfishes (McMichael and Ross 1987) and other sciaenids such as spot, Atlantic croaker, red drum, and black drum (Ralph 1982) as well as Florida pompano and silversides in the surfzone (Bearden 1963).

Part D. Adult Habitat

Adult gulf kingfish reside in nearshore Atlantic Ocean habitats. Adults are typically found over clean sandy sediment with few reports of gulf kingfish found in estuarine habitats. Most gulf kingfish mature after their first winter (Collier et al. in prep). Warming of coastal waters in the spring keys migration inshore and northward from the wintering grounds. Adults migrate generally offshore and southward as temperatures decline in the fall.

Geographic and Temporal Patterns of Migration
Adults undergo seasonal migrations south and offshore in fall and winter and north and inshore during spring and summer (Irwin 1971). Although it is not clear the depth at which overwintering occurs, gulf kingfish have been captured in depths of 27 m in the Gulf of Mexico during the winter (Irwin 1971). Adults migrate inshore from deeper habitats for spawning (Braun and Fontoura 2004).

Salinity
Adult gulf kingfish occur primarily in nearshore ocean habitats where salinities are near full seawater.

Substrate
Gulf Kingfish are typically found over sandy substrates in the nearshore ocean and surfzone.

Temperature
Temperature appears to be a driving factor in the movement of gulf kingfish. Gulf kingfish have reported temperature tolerances of 10 - 31 °C (Irwin 1971) and are rarely observed in temperatures <20 °C (Bearden 1963).

Dissolved Oxygen
Adults likely experience normoxic conditions, as they are found in the nearshore ocean. Without any explicit studies of adult gulf kingfish DO tolerances or preferences, values might be inferred from other sciaenids that have overlapping habitat occurrences. Like other kingfishes, gulf kingfish have high

metabolic rates (Horodysky et al. 2011), which suggests that they are more sensitive to low DO than other sciaenids.

Feeding Behavior

The diet has been reported to include: whole *Donax*, polychaetes, *Emerita*, brachyurans, *Squilla*, and fishes (Bearden 1963; McMichael and Ross 1987).

Competition and Predation

Competition among adult gulf kingfish is not well known. Based on reports, gulf kingfish overlap their distribution with southern and northern kingfishes (McMichael and Ross 1987); however the diet of gulf kingfish appears to be much more specialized than the other kingfishes. Other potential competitors include other members of the sciaenid family and Florida pompano. Kingfish spp. otoliths have been observed in the stomachs of cetaceans (Tyner 2004) and likely predators include larger sciaenids and coastal sharks.

Section II. Essential Fish Habitats and Habitat Areas of Particular Concern

Essential Fish Habitat

Unlike northern and southern kingfishes, gulf kingfish are more abundant in surfzone habitats and rarely venture into the lower reaches of estuaries in depths less than 10 m (Welsh and Breder 1923; Bearden 1963; Irwin 1971). Gulf kingfish are observed over sand substrates almost exclusively in the surfzone (Hildebrand and Cable 1934; Irwin 1971; Branson 2009).

Identification of Habitat Areas of Particular Concern

There is no HAPC designation for gulf kingfish.

Present Condition of Habitat Areas of Particular Concern

The quality of gulf kingfish habitats has been compromised largely by impacts resulting from human activities. It is generally assumed that these habitats have undergone some degree of loss and degradation; however, few studies quantify the impacts of habitat loss or degradation.

Some losses have occurred due to the intense coastal development that has occurred during the last several decades, although this has not been quantified. Losses have resulted from dredging and filling activities that have eliminated shallow water nursery habitats. Further functional losses have occurred due to water quality degradation due to discharges from point and non-point sources.

Beach renourishment projects are likely to have an impact on gulf kingfish. Kingfishes utilize the surfzone to different degrees as they progress through their life stages. Juveniles are localized-residents of the surfzone (Ross and Lancaster 2002; Felix et al. 2007) and are found in few other habitats. Short-term and long-term monitoring on the effects of beach renourishment is needed to better understand the impacts on kingfish.

Section III. Threats and Uncertainties

Significant Environmental, Temporal, and Spatial Factors Affecting Distribution of gulf kingfish

The timing of seasonal and spawning migrations appear to be linked to temperature. As temperatures cool in the fall, gulf kingfish move south and offshore to deeper water that is more stable in temperature. They return to northern, inshore habitats as temperatures increase again in the spring and summer (Irwin 1971). When gulf kinfish are nearshore, they remain in the coastal surfzone full marine salinity and rarely move into estuarine environments (Bearden 1963; Irwin 1971). Gulf kingfish prefer sandy substrates (Irwin 1971; Ross and Lancaster 2002).

Unknowns and Uncertainties

Little research has been conducted on gulf kingfish at any life stage and a comprehensive coastwide study that covers their geographic range is needed. The impacts of dredge and fill projects including renourishment projects cannot be fully assessed without additional research to understand which habitats are essential fish habitat.

In addition, it is often difficult to distinguish the early stages of kingfish spp., which adds confusion when investigating and determining physiological tolerances to environmental conditions. Slight differences in diet and habitat have been described among kingfishes but more work is needed to fully resolve these ecological differences so that they can be implemented into a management perspective.

Another consideration for gulf kingfish is that they forage within and along the sediment of the benthos, which concentrates hydrophobic toxicants, potentially increasing their exposure to these contaminants. No known research has examined the impacts of toxicant exposure on early stage gulf kingfish, which may have developmental or reproductive implications.

Section IV. Recommendations for Habitat Management and Research

Habitat Management Recommendations

Currently, gulf kingfish is not managed through the Interstate Fisheries Management Program (ASMFC 2014). The following recommendations are based on recommendations made in NCDMF 2007 and FMPs for other sciaenids:

1. Protect known nursery areas from activities likely to negatively impact gulf kingfish.

2. Integrate beach and inlet management plans into a coastwide plan that minimizes impacts to the habitat of kingfishes and other estuarine fishes.

3. Require beach renourishment and dredge and fill projects adhere to state, regional, or national policies and require robust monitoring before and after dredge, renourishment, and fill activities.

4. Modify stormwater rules or policies to more effectively reduce the volume and pollutant loading of stormwater runoff entering coastal waters.

5. Minimize contamination of bottom sediments through protection and enhancement of wetlands utilizing regulatory and non-regulatory measures, such as land use planning, land acquisition, vegetated buffers, and permitting regulations.

6. Implement and enforce sediment compatibility criteria for beach nourishment projects.

Habitat Research Recommendations

Currently, gulf kingfish is not managed through the Interstate Fisheries Management Program (ASMFC 2014). The following recommendations are based on recommendations made in NCDMF 2007 and FMPs for other sciaenids to improve our understanding of the biology, habitat use, and potential stressors of gulf kingfish.

1. Conduct studies to delineate gulf kingfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc.) and enable quantification of spawning habitat.

2. Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent.

3. Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially.

4. Recommend BACI studies for beach renourishment projects to describe the impact/benefit of renourishment.

5. Develop consistent methods for studying impact of beach renourishment to allow for comparison spatially and temporally.

6. Determine impact of beach stormwater outfalls on kingfish populations.

7. Determine impact of bottom disturbing gear on kingfish spawning, nursery, and feeding habitats.

8. Assess the distribution, concentration, and threat of heavy metals and other toxic contaminants in freshwater and estuarine sediments and identify the areas of greatest concern to focus water quality improvement efforts.

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Chapter 11: Threats to Atlantic Sciaenid Habitats

Section I. Identification of Threats

The habitat threats that are outlined below pertain to the Atlantic sciaenids outlined in this document, although certain species and life stages may be more impacted than others. All of the Atlantic sciaenids have life stages that are estuarine-dependent, as nurseries or seasonal foraging areas (Murdy and Musick 2013; Deary and Hilton 2016).

Threat 1: Beach renourishment

Source of Threat: Human activities to contribute more sediment to recreational beaches and provide material for infill. The threats of beach renourishment on sciaenids is from removal of preferred substrate (particularly sediment size), burial of individuals and potential prey, changes in prey community (Irlandi and Arnold 2008), increased turbidity (Green 2002; Peterson and Bishop 2005), and release of toxicants buried in sediments. Although beach renourishment can impact all sciaenids through increased turbidity, which can decrease the visual abilities of sciaenids, but renourishment projects probably affect benthic associated sciaenids (red drum, spot, Atlantic croaker, kingfishes, black drum) since they spend most of their lives associated with the benthos.

Rank of Threat (ex. Low, Medium, High): According to the ASMFC's Interstate Fishery Management Plan for Red Drum (2002), the impacts of beach renourishments were ranked as **Medium**.

Threat 2: Degradation of water quality (Pollutants, nutrient enrichment, sediment loading, hypoxia)

Source of Threat: Human activities in many cases are the sources of water quality degradation. Industrial waste accumulates in bottom sediments and can be disturbed during dredging and beach renourishment projects (Riggs et al. 1991). Many coastal estuarine systems due to their proximity to industrial areas and sediment characteristics are susceptible to toxicant contamination (Street et al. 2005). In Atlantic croaker, toxicants have been noted to significantly reduce growth rates and condition (Burke et al. 1993), which are likely to be observed in other sciaenids exposed to toxicants. In larval fishes, certain toxicants are known to result in heart failure in developing embryos (Ballachey et al. 2003).

Pollutants and nutrient enrichment can originate from point and non-point discharge sources. Nutrient enrichment is a major threat to estuarine ecosystems, particularly forestry practices, agriculture, pesticides, and fertilizers (ASMFC 2002; NSCEP 1993). In polluted areas, pathogens can start proliferating and cause disease in red drum and other estuarine fishes (Conway et al. 1991). Nutrient enrichment can also reduce the extent and species diversity of submerged aquatic vegetation (Dennison et al. 1993; Fonseca et al. 1998; SAFMC 1998). The effects of nutrient enrichment are also most pronounced in sheltered, low flow areas susceptible to large temperature fluctuations (Burkholder et al. 1994). Sediment loading can also reduce the coverage of submerged aquatic vegetation through reduced light penetration in shallow, estuarine systems (Dennison et al. 1993; Fonseca et al. 1998; SAFMC 1998).

Eutrophication can also lead to depleted bottom oxygen conditions (Street et al. 2005). Many sciaenids are mobile and able to move out of hypoxic conditions, which can increase densities in shallow habitats and subsequent competition and density-dependence in these habitats (Craig et al. 2007; Campbell and Rice 2014). For example, under hypoxic conditions, Atlantic croaker will move out of these areas to shallower areas (Eby and Crowder 2002).

Rank of Threat (ex. Low, Medium, High): According to the ASMFC's Interstate Fishery Management Plan for Red Drum (2002), water quality degradation was ranked as **Medium**.

Threat 3: Coastal Development (Altered shorelines, urbanization, altered hydrology, habitat loss)

Source of Threat: Coastal development and the infrastructure needed to support human inhabitation of coastal ecosystem have greatly altered aquatic ecosystems through altered flow regimes (damming, increased runoff), channelization, port and marina construction, and boating. In many cases, these alterations to aquatic ecosystems have led to declines in coastal and estuarine habitats that serve as nurseries and foraging grounds for sciaenids, as well as other fishes.

Channelized streams have reduced species diversity, decreasing productivity in these systems (Tarplee et al. 1971; Hawkins 1980; Schoof 1980). The construction of docks and marinas perturb shallow, nearshore habitats and for example reduce the number of Atlantic croaker in these disturbed habitats (Peterson et al. 2000). Shoreline stabilization projects can alter local hydrology and change the physical processes the transport larvae into estuarine systems (Miller et al. 1984; Miller 1988). Activities associated with urbanization can alter freshwater flows and subsequently increase the exposure of fishes to sudden salinity changes (Sefray et al. 1997), which can influence the abundance and distribution of organisms within estuarine ecosystems (Holland et al. 1996).

Increased boating activity leads to increases in underwater noise pollution, seagrass scarring, and increased marina and dock construction. Together, boating can increase stress on fishes and lead to habitat loss seagrass beds that can take at least a decade for recovery to occur (Zieman 1976).

Rank of Threat (ex. Low, Medium, High): **High**

Threat 4: Navigation and Dredging

Source of Threat: Dredging activities are associated with the construction and maintenance of ports and marinas. Many of the impacts of dredging related activities are from the direct removal of sediment, which degrades many different habitats including soft and hard substrates and submerged aquatic vegetation (SAFMC 1998; ASMFC 2002). Dredging activities also resuspend sediments, which increases local turbidity and exposure to contaminants. In addition, dredging activities can initiate hypoxic events as well as bury organisms (ASMFC 2002).

Rank of Threat (ex. Low, Medium, High): According to the ASMFC's Interstate Fishery Management Plan for Red Drum (2002), the impacts of navigation and dredging were ranked as **Medium.**

Threat 5: Fishing

Source of Threat: In addition to losses of abundance as target and bycatch, some fishing gears, particularly dredges and trawls, can impact sciaenid habitats (Essential Fish Habitat Steering Committee

2002). These gears remove epifauna, alter bathymetry, reef distribute substrates, and change organism assemblages. Habitat loss by fishing gears can take months to years to recover.

Rank of Threat (ex. Low, Medium, High): **Medium**

Threat 6: Climate change

Source of Threat: Climate change involves a complex set of factors such as increasing temperature, sea level rise, increasing carbon dioxide levels, and changing precipitation regimes. Warming of oceanic temperatures can result in fishes spawning earlier than previously reported (USFWS 2011). Increasing temperatures can also expand species ranges, increasing competition in estuarine ecosystems. Rising sea level can flood shallow nursery habitat and accelerate the loss of submerged aquatic vegetation (Orth et al. 2006; IPCC 2007). Altered precipitation can also change the delivery of freshwater to aquatic ecosystems and can rapidly change salinity in estuarine areas (USFWS 2011).

Rank of Threat (ex. Low, Medium, High): **High**

Section II. Effects of Habitat Degradation on Sciaenid Populations

The above mentioned threats are expected to decrease the spawning and nursery habitats required for sciaenid populations to persist. Disturbed habitats reduce growth likely through increased competition, reduced shelter, and reduced prey availability. In addition, disturbed habitats and increased stress can increase the susceptibility of sciaenids to disease. Since sciaenids are estuarine-dependent fishes (Murdy and Musick 2013), many of their habitats have been disturbed and are in close proximity to urbanized regions.

Section III. Recommendations to Mitigate Threats to Sciaenid Habitats

The following recommendations to mitigate threats to sciaenid habitats have been collated from the Habitat Management Recommendations section found in each species profile within this report (ASMFC 2002, 2012) and the North Carolina Coastal Protection Plan (NCDEQ 2015). In many instances, common recommendations were identified among species.

1. HAPCs locations should be accompanied by requirements that limit degradation of habitat, including minimization of non-point source and specifically storm water runoff, prevention of significant increases in contaminant loadings, and prevention of the introduction of any new categories of contaminants into the area.

2. States should coordinate and enhance the monitoring of water quality and habitat from tributaries to the nearshore ocean. Part of this monitoring should also assess the effectiveness of already established rules that protect these coastal habitats in each state.

3. States should minimize loss of wetlands to shoreline stabilization by using the best available information, incorporating erosion rates, and promoting incentives for use of alternatives to vertical shoreline stabilization measures (e.g., sea walls), commonly referred to as living shorelines projects.

4. Each State should establish windows of compatibility for activities known or suspected to adversely affect sciaenid life stages and their habitats, with particular emphasis to avoid spawning season. Activities may include, but are not limited to, navigational dredging, bridge construction, and dredged material disposal, and notify the appropriate construction or regulatory agencies in writing.

5. The use of any fishing gear that is determined by management agencies to have a negative impact on sciaenid habitat should be prohibited within HAPCs. Further, states should protect vulnerable habitat from other types of non-fishing disturbance as well.

6. States should conduct research to evaluate the role of submerged aquatic vegetation and habitats in the spawning success, survival, growth, and abundance of sciaenids. This research could include regular mapping of the bottom habitat in identified areas of concern, as well as systematic mapping of this habitat where it occurs in estuarine and marine waters of the states.

7. Restoration efforts should be enacted to restore critical habitats of sciaenids including oyster reefs, riparian wetlands, submerged aquatic vegetation habitats, barrier island systems, and soft bottom areas.

8. Federal and state fishery management agencies should take steps to limit the introduction of compounds which are known or suspected to accumulate in sciaenid tissues and which pose a threat to human or sciaenid health.

9. Each state should establish windows of compatibility for activities known or suspected to adversely affect sciaenid life states and their habitats, such as navigational dredging, bridge construction and dredged material disposal, and notify the appropriate construction or regulatory agencies in writing.

10. States should identify dams that threaten freshwater flows to nursery and spawning areas, and target them for appropriate recommendations during FERC re-licensing.

11. States need to expand education and outreach activities that explain management measures in place for sciaenids to stress the value of sciaenids and their critical habitats for their sustainability. Emphasis should be used to describe threats from land use and other challenges that sciaenid species face in each state.

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Chapter 12: Future Habitat Research Information Needs for Sciaenid Species

Section I: General Research Needs for Atlantic Sciaenids

Many of the research needs for Atlantic sciaenids revolve around understanding changes in habitat use through development. For example, black drum use a variety of habitats as larvae and juveniles, which may buffer them from the effects of habitat degradation, but it is unknown if certain habitats are more critical for black drum (i.e., enhanced growth, decreased mortality) and contribute more to the adult population. In addition, not much is known about the effects of habitat degradation on early life history stages (egg through juveniles), which are often the life stages that are most sensitive to perturbations. Individual research needs for each sciaenid species are outlined in the next section. Research needs for Atlantic sciaenids includes:

1. More research needs to identify the location and habitat characteristics of spawning grounds.

2. Determine the physiological tolerances and preferences to environmental variables (temperature, salinity, dissolved oxygen) for each life stage that maximize hatching success, growth, and survival. With these data, predict regions, species, and life stages that will be most susceptible to climate change.

3. Asses the impacts of perturbations to environmental variables on each life stage to understand how water quality degradation may affect spawning, hatching success, growth, and survival. With these data, determine acceptable and unacceptable water quality parameters for spawning and essential habitats.

4. Assess population connectivity along the coast to determine if local extirpation is an issue and if so, identify the species that are most susceptible.

5. Identify essential habitats as well as habitat requirements for each life stage to prioritize areas for conservation.

6. Examine the impacts of toxicant exposure and harmful algal blooms.

7. Assess impacts of habitat alterations from coastal development (urbanization, shoreline armoring, beach renourishment, and dredging) on Atlantic sciaenids at all life stages, particularly examining the effects of increased turbidity, burial, prey availability, and contaminant release on the health, growth, and survival of all life history stages.

Section II: Species-Specific Research Needs

Atlantic croaker

1. Assess the impact of hypoxia on the foraging and overall health

Black drum

1. Expand the temporal and spatial coverage of fishery independent surveys to include black drum habitats.

2. Conduct otolith microchemistry studies to identify recruitment contributions of various regions and habitats.

Red drum

1. Quantify relationships between red drum productivity and habitat at all life stages.

2. Assess the impact of alter freshwater flow regimes on red drum nursery and other essential larval and juvenile habitats.

Spot

1. Examine potential offshore, pelagic nursery habitats (eddies) and physics the influence the hatching success and distribution of larvae.

Spotted seatrout

1. Quantify the relationship between submerged aquatic vegetation and spawning success. In areas where submerged aquatic vegetation is sparse or absent, identify alternative spawning and nursery habitats.

2. Define overwintering habitat requirements of early stages and adults since this species exhibits high site fidelity.

Weakfish

1. Examine the impact of water intakes on larval and juvenile mortality in spawning and nursery areas.

2. Quantify the relationship between weakfish productivity and spawning habitat.

Northern kingfish

1. Determine life history characteristics and diagnostic characters to distinguish among the kingfishes in the early stages in order to determine environmental preferences for each essential habitat from field collections.

2. Monitor the impacts of beach renourishment on northern kingfish at all life stages.

3. Assess competition among kingfishes and other benthic sciaenids.

Southern kingfish

1. Determine life history characteristics and diagnostic characters to distinguish among the kingfishes in the early stages in order to determine environmental preferences for each essential habitat from field collections.

2. Monitor the impacts of beach renourishment on southern kingfish at all life stages.

3. Assess competition among kingfishes and other benthic sciaenids.

Gulf kingfish

1. Determine life history characteristics and diagnostic characters to distinguish among the kingfishes in the early stages in order to determine environmental preferences for each essential habitat from field collections.

2. Monitor the impacts of beach renourishment on gulf kingfish at all life stages.

3. Assess competition among kingfishes and other benthic sciaenids.

State Coastal Regulatory Plans in Response to Climate Change Report

Background

The Atlantic States Marine Fisheries Commission's (Commission) Habitat Committee (Committee), a branch of the Interstate Fisheries Management Program, was developed to identify, enhance, and cooperatively manage vital fish habitat for conservation, restoration, and protection, and support the cooperative management of the Commission and jointly managed species. In 2016 the Committee has been focused on Goal 4 of the current Commission Action Plan: to 'Protect and enhance fish habitat and ecosystem health through partnerships and education.'

This document addresses a task identified in the 2016 Action Plan to identify ongoing practices in the state coastal regulatory planning that address climate change impacts. It contains information on climate change initiatives, as well as links to documents and websites, as reported by each within the Commission's boundaries. This information is the first step towards identifying gaps and making recommendations for improving coastal preparedness and resiliency to climate change.

Maine

In 2013, the State of Maine established the Environmental and Energy Resources Working Group to identify administrative and strategic opportunities to improve Maine's ability to respond and adapt to changing physical conditions in the environment due to climatic influence. The Working Group was led by the Commissioner of the Department of Environmental Protection, and included the Director of the Governor's Energy Office, and the Commissioners of the Departments of Transportation; Marine Resources; Agriculture Conservation and Forestry; and Inland Fisheries and Wildlife. The report, Monitoring, Mapping, Modeling, Mitigation and Messaging: Maine Prepares for Climate Change, presents current programs and activities and contains 32 recommendations. In general, the recommendations are to continue the interdepartmental cooperation; as well as current monitoring, mapping, modeling, and mitigation activities.

The Department of Environmental Protection's Sustainability Division is developing mechanisms for cross agency partnerships, information sharing, efficiencies, and streamlining. These efforts will provide specific and identifiable tools to assist decision-makers. The Adaptation Toolkit, in development, will aid climate adaptation efforts by providing a centralized source for information needed to design and implement resiliency practices, as well as information on important regulations and standards to integrate into project or planning process, and opportunities to connect with state and other engaged practitioners for technical expertise.

In 2015, the Maine Department of Inland Fisheries and Wildlife collaborated with over 150 public and non-profit Conservation Partner groups (including private landowners, conservation organizations, sporting groups, scientists, and governmental agencies) to draft Maine's 2015 Wildlife Action Plan. The Action Plan addresses the full array of Maine's wildlife across all taxa groups and habitats, as well as identifies 378 Species of Greatest Conservation Need and provides species-specific and habitat-based actions to help prevent further species declines over the next ten years. In an effort to understand which of Maine's species and habitats are most vulnerable to climate change impacts, the Department of Inland Fisheries and Wildlife collaborated with the Manomet Center for Conservation Science and other partners on a climate change vulnerability assessment. The report, Climate Change and Biodiversity in Maine: Vulnerability of Habitats and Priority Species, classifies the vulnerability of the species and habitats to climate change.

The Maine Stream Connectivity Work Group and Maine's Aquatic Resources Management Strategy are working to minimize the impacts of road crossings on Maine's aquatic systems, which are becoming stressed by more frequent and severe storms.

The Department of Marine Resources continues to implement a wide range of fisheries research monitoring activities for stock assessments; however, the time series will also be useful for understanding changing environmental conditions.

The Department of Marine Resources has maintained an Environmental Monitoring Program in Boothbay Harbor for over a century. The observations began in March 1905 and constitutes one of the longest running, continuous series of sea temperature observations for any point on the North American Atlantic Coast. Currently, observations of air temperature, barometric pressure, sea surface temperature, relative humidity, wind speed, and wind direction are recorded at daily intervals.

New Hampshire

The New Hampshire Fish and Game Department is addressing climate change through four different avenues: planning, science, outreach, and communication.

The 2015 Wildlife Action Plan Update specifically recognized climate change as a risk factor for both habitats and species. Because of this, species and habitat profiles include their sensitivity to climate change-related parameters, and the weighted risk of those species and habitats in regards to impacts such as sea level rise (SLR), changes in precipitation, increased storm activity, changes to air and sea temperature, and more.

The Great Bay National Estuarine Research Reserve (part of New Hampshire Fish and Game Department) continuously monitors salt marsh distribution and condition along with information about the salinity of pore water and marsh elevation. Over time, this information will help inform if and how SLR is impacting salt marsh health at three sites around Great Bay.

New Hampshire Fish and Game Department also has detailed habitat maps for Great Bay (and will have them for the whole coastal region by next fall). These maps are considered baselines from which to compare future changes. The National Estuarine Research Reserve is also installing a tide gauge in the southern reach of Great Bay to monitor water level over time. The Sea Level Affecting Marsh Migration Model was run for all of coastal New Hampshire as a part of the Wildlife Action Plan, predicting how salt marsh distribution is likely to change under different SLR scenarios and where there is potential for migration. This information was combined with current condition information to determine where the highest quality marsh is likely to migrate, and where restoration opportunities are likely to be valuable in light of potential SLR.

A National Estuarine Research Reserve representative serves as co-chair of the Coastal Adaptation Workgroup – a group of outreach professionals that coordinate to bring local communities the best climate-related science. Much of this revolves around wise planning to protect both natural and built assets. The National Estuarine Research Reserve hosts a Climate Summit each spring (topics this year included: living shorelines, presentations about the Wildlife Action Plan, fisheries impacts in the Gulf of Maine, impacts on groundwater along the coast, culvert assessment work, dune restoration, city planning case studies, etc.). New Hampshire Fish and Game Department is also incorporating climate-related messages into our K-12 and teacher education programs. This summer they will host a teacher training workshop focused on how protected places can be observed to determine climate-related impacts over time; and the department will be hosting an intern who will be developing a volunteer phenology program for the center.

New Hampshire Fish and Game Department has two representatives on the Coastal Risks and Hazards Commission, a state-wide legislatively-directed commission that was charged with providing guidance and consistent information to state agencies and municipalities on how to assess and prepare for coastal storms, SLR, and increased precipitation. A draft report and recommendations on "Preparing New Hampshire for Projected Storm Surge, Sea-level Rise, and Extreme Precipitation" has been prepared. Because of the recommendations from the report, each state agency is going to be asked to review its rules and regulations in light of the science and recommendations provided by the commission. The legislation is pending now, and if passed would likely go into effect next year.

Additional Links:
The State of New Hampshire website: http://www.nh.gov/climate/
The New Hampshire Department of Environmental Services:
http://des.nh.gov/organization/divisions/air/tsb/tps/climate/

Massachusetts

In 2008 Massachusetts passed a global warming solutions act to reduce emissions, increase green infrastructure, and to analyze strategies for adapting to predicted changes in climate. The Massachusetts Climate Change Adaptation Report released in September 2011 by the Executive

Office of Energy and Environmental Affairs includes an overview of anticipated impacts and key adaptation strategies to increase resilience and preparedness.

Regarding fisheries, Massachusetts sits on the boundary of two biogeographic provinces, the Gulf of Maine and the Mid-Atlantic Bight. The state is already seeing shifts in species range distributions (black sea bass, American lobster, northern shrimp). The Division of Marine Fisheries collects bottom temperature data, every two hours at 60-70 sites across the state. Bottom temperature data is stored in an in-house database containing over 2 million readings dating back as far as 1986 for some sites. The Division of Marine Fisheries also has trawl data back to the 1970's.

In 2007 the mayor of Boston passed an Executive Order Relative to Climate Action, which called for a plan every three years. The first update was produced in 2014 (summary here: http://www.cityofboston.gov/images_documents/Greenovate%20Boston%202014%20CAP%20Update_Summary_tcm3-49733.pdf), and includes a variety of proposals, addressing open space, education, renewable energy, etc.

Rhode Island

In July 2014, the Rhode Island General Assembly approved the Resilient RI Act (RIGL §42-6.2), which formally established the Executive Climate Change Coordinating Council, as well as set specific greenhouse gas reduction targets, and incorporated consideration of climate change impacts into the powers and duties of all state agencies. The Coordinating Council is comprised of Directors and Commissioners from nine state agencies/offices and is supported by an Advisory Board and Science and Technical Advisory Board. It is charged with leading and coordinating state agencies in responding to the challenges posed by climate change in a timely and effective manner, focusing in particular on:

- assessing, integrating and coordinating efforts throughout state agencies to reduce greenhouse gas emissions, strengthen the resilience of communities, and prepare for the impacts of climate change;
- improving our understanding of the effects climate change will have in RI;
- working in partnerships to identify, develop and implement strategies to be better prepared, and reduce risk and losses.

There are several projects underway that will provide information to support future Coordinating Council recommendations. A few coastal related projects include the following. As first step in helping to reduce Rhode Island's greenhouse gas emissions is the completion of the 30 Megawatt Block Island Offshore Wind Project. This will be the first offshore wind project in the country. Located approximately three miles southeast of Block Island, the system is expected to be commercially operational by the end of 2016. The spatial planning and fisheries-related research and monitoring used to guide this work may provide a blueprint for other states and coastal communities.

To assess the effects climate change in Rhode Island the Executive Council's Science and Technical Advisory Board prepared a brief synopsis of the state of knowledge of the following manifestations of climate change: SLR, warming air temperatures, warming water (marine and fresh) temperatures, storm frequency and intensity, biodiversity (changes in species and habitats), and precipitation and inland flooding. The information summarized in this report will assist state agencies, decision-makers, and the public in understanding the real impacts RI is already experiencing due to a changing climate.

The Coastal Resources Management Council continues work on the Shoreline Change Special Area Management Plan, developing scientifically-based data and tools to aid in coastal hazard adaptation planning. The Management Council has completed revised Shoreline Change Maps for the south shore communities, showing how Rhode Island's shoreline has changed over time due to erosion, and how we might expect it to change in the future. Additional tools and other key resources are available from the website to aid the state and municipalities in supporting sound policy decisions which address coastal erosion, SLR, and storm surge inundation problems.

The Department of Environmental Management has also addressed considerations related to climate change throughout the recently updated State Wildlife Action Plan. In short, the Wildlife Action Plan reviewed vulnerability assessments for several species of great concern, identified threats to species and their habitats, and proposed actions to reduce these threats. In addition, the Division of Fish and Wildlife's Marine Fisheries Section continues to conduct long-term monitoring programs and collaborate on several local and regional research projects investigating the effects of climate change on managed species and the state's marine resources. State Wildlife Action Plans also have to specifically take into account climate change adaptation. Climate change is primarily in Chapters 1 (species), 2 (habitats), 3 (threats), and 4 (actions to abate threats to species and habitats).

In October 2015, the State Planning Council voted to adopt Rhode Island's new State Energy Plan "Energy 2035" as an element of the State Guide Plan, codifying the Plan as the state's formal long-term, comprehensive energy strategy. The Plan, produced by the Office of Energy Resources in collaboration with the Division of Planning, represents Rhode Island's first data-driven energy planning and policy document. Its vision is to provide energy services across all sectors—electricity, thermal, and transportation—using a secure, cost-effective, and sustainable energy system

In early 2016, OER launched the state's first ever electric vehicle rebate program to support adoption of electric vehicles by Ocean State drivers: Driving RI to Vehicle Electrification (DRIVE). The program made $200,000 available for qualified RI residents interested in purchasing or leasing an electric vehicle to apply for a financial rebate of up to $2,500, based upon vehicle battery capacity. Modeled closely on existing rebate programs offered in other states, DRIVE offers the potential to increase the total number of EVs on RI roadways by 20-35%.

Connecticut

The Connecticut Climate Change Action Plan was initiated in 2005 with the goal of reducing greenhouse gas emissions to achieve regional goals set by the New England Governors/Eastern Canadian Premiers. The Action Plan addresses quantification of benefits and costs of greenhouse gas reductions using existing analytical measures and a new desktop modeling tool developed under the direction of the Environmental Protection Agency (EPA). As the first state to utilize this new tool, Connecticut was able to identify benefits previously not quantified. To successfully meet the requirements of the Action Plan, a Governor's Steering Committee established working committees at both the agency head and staff level to develop, implement, and track progress on recommended actions.

Additional legislation passed in following years, and complementary to the Action Plan, Connecticut adopted California emissions standards; promoted hybrid fuel cars through tax incentives; set efficiency standards for products and appliances; and promoted the purchase of "Connecticut Grown" foods. A Governor's Executive Order requires the state to purchase renewable energy in increasing amounts, leading to 100% clean energy by 2050. Legislation also simplified the permitting process in ways that encourage implementation of 'living shorelines' in place of shoreline armoring.

Additional monitoring programs include:

Long Island Sound Study Sentinel Monitoring for Climate Change: A multidisciplinary scientific approach to provide early warning of climate change impacts to Long Island Sound ecosystems. This program is conducted jointly by EPA Regions 1 & 2, Connecticut Department of Energy and Environmental Protection, New York Department of Environmental Conservation, and several academic institutions.

Connecticut Institute for Resilience and Climate Adaptation: Established in 2013 under the direction of the Department of Energy and Environmental Protection and the University of Connecticut to conduct research, outreach, and education projects as well as guide the development of technologies and regulatory provisions that increase the protection of ecosystems, coastal properties, other lands, and attributes of the state that are subject to the effects of rising sea level.

New York

New York has an Office of Climate Change within the New York Department of Environmental Conservation (DEC) that coordinates efforts relating to climate change. The New York State Energy Research and Development Authority developed the Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State report that includes the impacts of climate change and recommendations.

New York developed a Sea Level Rise Task Force Report in 2009, which includes impacts and recommendations. The report led to the 2014 Community Risk and Resiliency Act. This Act:

1) Incorporates state-adopted SLR projections as regulation by Jan. 1, 2016 (DEC) and establishes a new New York Community Risk and Resiliency (Part 490), Projected Sea-level Rise (Part 490). Part 490 will establish projections of SLR in three specified geographic regions over various time intervals, but will not impose any requirements.

2) Adds mitigation of SLR, storm surge, and flooding to Smart Growth Public Infrastructure Policy Act criteria and guidance by Jan. 1, 2017 (DEC, Department of State).

3) Models local laws to enhance resiliency by Jan. 1, 2017 DEC, Department of State).

4) Considers SLR, storm surge, and flooding in 19 programs (facility-siting regulations, permits and funding) by Jan. 1, 2017 (DEC, Department of State), including a checklist on how to consider SLR, storm surge, and flooding in permitting decisions.

5) Requires guidance on implementation of the Community Risk and Resiliency Act and the use of natural resiliency measures to reduce risk by Jan. 1, 2017 (DEC, Department of State), while considering the ability of natural resiliency measures to provide for storm-related and other benefits.

New York also has guidance on flood risk management standards, culvert sizing, living shorelines, nature-based shorelines, and wetland migration. The Office of Climate Change also has a greenhouse gas emissions initiative, which develops caps, performance standards for CO_2 emissions, Climate Smart Communities programs – certifying communities for climate-friendly actions, greenhouse gas emissions targets, and grants to assist in implementation.

The New York State Energy Research and Development Authority conducts environmental research and analysis and provides technical expertise and support to New Yorkers in order to increase renewable energy usage and efficiency. They are currently studying atmospheric deposition and impacts on natural resources. New York also has a Climate Change Science Clearinghouse, which provides New York State-related climate change data and information to inform decision making.

New York is involved in National Estuary Programs and National Estuarine Research Reserve sites, which conduct research monitoring, the results of which are integrated in all climate change management plans and state wildlife action plans, ultimately affecting how we manage resources. Vulnerability assessments are being conducted – these assess at-risk natural resources and infrastructure, develop adaptation strategies, support low impact development and green infrastructure, and include wetland migration pathway modeling to advise management decisions.

Finally, New York also has monitoring networks (climate sentinel monitoring projects, sediment elevation tables, water quality, is developing wetland rapid assessments, and conducting marsh loss trend assessments). Restoration efforts support habitat connectivity, large scale wetland restoration, and focus on managing threats to trust species.

New Jersey

There are many efforts underway in New Jersey to mitigate and respond to the impacts of climate change including: substantial investment in clean energy initiatives such as renewable energy production from solar, wind, and geothermal sources; improving energy efficiency; and reducing overall energy use and intensity. In addition, the State of New Jersey has taken significant steps in creating climate change-related community preparedness programs with a focus on resiliency and adaptation efforts at the local and state level. These programs involve strong interaction with local governments at the land use planning level as well as efforts to protect critical infrastructure and ecosystems, and new suites of regulations related to the design of buildings, roads, and bridges (www.globalchange.gov).

Following Superstorm Sandy, New Jersey State Departments and Agencies have incorporated resiliency strategy and planning into every aspect of the recovery process in an effort to rebuild better and more resilient than before. Many of these initiatives will serve to make New Jersey more resilient to the adverse effects of future climate change. Among the initiatives are: beach and dune projects, acquisition of properties in repetitive flood loss areas, energy resilience at critical facilities throughout the State, and actions to address emergency fuel – highlighted during Superstorm Sandy by building resilience in fuel supply and distribution. As part of the long-term recovery strategy, New Jersey has committed to rebuilding by focusing on implementing *resilient* infrastructure projects and mitigation opportunities to prevent future damage, and utilizing construction techniques and materials that will better withstand future weather events. The State will continue to leverage existing federal and state resources to pursue these long-term strategic priorities and empower local governments to revitalize their communities. New Jersey has also focused its efforts on future emergency response programs. For more detailed information, please visit the Governor's Office of Recovery and Rebuilding website at http://nj.gov/gorr/.

The continued development of a long-term comprehensive statewide adaptation plan needs to involve the input and action of many parties, including federal, state and local governments; non-governmental organizations; academia; private industry; and the citizens of New Jersey. Safeguarding New Jersey's residents, its built and natural environment, and ensuring that the State continues to grow in a manner that is both sustainable and resilient to the adverse effects of climate change will require adaptation planning. More information on New Jersey's Adapting to a Changing Environment Program is available at http://www.nj.gov/dep/aqes/adapting.html.

Additionally, Rutgers University formed the New Jersey Climate Adaptation Alliance in 2011 (http://njadapt.rutgers.edu). The Climate Adaptation Alliance is described as *"a network of policymakers, public and private sector practitioners, academics, and NGO and business leaders designed to build climate change preparedness capacity in New Jersey…The Alliance is focused* *on climate change preparedness in key impacted sectors (public health; watersheds; rivers and coastal communities; built infrastructure; agriculture; and natural resources).”* The ultimate goal of this initiative is to assess climate vulnerability and preparedness needs for critical sectors in New Jersey and to develop capacity for response implementation in New Jersey. One of the important products of the Climate Adaptation Alliance was the development of the New Jersey Climate Adaptation Directory. According to the Climate Adaptation Alliance, *“the directory was created to provide resources that assist in guiding practitioners in New Jersey through the adaptation planning process. This directory brings together geographic data, tools, reports, model policies and ordinances, case studies, and current projects focused on evaluating vulnerabilities and developing and implementing climate change adaptation plans and strategies. The resources included are aimed at professionals in a range of fields, including but not limited to infrastructure, public health, emergency management, hazard mitigation, natural resources, economic development, agriculture, and land use planning.”* This resource can be found here: http://njadapt.rutgers.edu/resources/climate-adaptation-directory#.

Pennsylvania

The Pennsylvania Climate Change Act of 2008 required the Department of Environmental Protection to produce a report on the anticipated climate change impacts in Pennsylvania and also a Climate Change Adaptation Strategy. Both are to be updated every three years. The original reports were produced in 2009 and have both been updated in 2013 and 2015 (http://www.dep.pa.gov/Business/Air/BAQ/AdvisoryGroups/CCAC/Pages/default.aspx#.VyJQWYLD-po). The report addresses freshwater tidal waterfront on page 197. From the report: Pennsylvania has approximately 56 miles of coastline on the Delaware Estuary that is largely freshwater and home to diverse flora and fauna. This includes approximately 1200 acres of freshwater tidal wetlands. Impacts to these habitats include decreased dissolved oxygen concentrations, SLR, and salinity intrusion. The potential for loss of these wetlands is high if accretion rates do not keep up with SLR. There is a low potential for wetland migration due to development. Further discussion on typical climate change impacts and strategies is extensive in these documents.

The Department of Conservation and Natural Resources has developed the DCNR and Climate Change: Planning for the Future document describing climate change’s current and projected impacts on the state parks and forests, and their approach to adapt to these impacts. The 2015-2025 Pennsylvania Wildlife Action Plan offers a review of threats posed by climate change. This plan includes species with declining or imperiled populations, or with secure populations, but substantial environmental threats, and their habitats. Among the primary climate change information sources in this plan include the Northeast Climate Science Center (Staudinger et al. 2015), and state documents produced by the Department of Environmental Protection. Climate change is identified as a threat to 29.5% (196 species of a total 664) of the Species of Greatest Conservation Need in the plan, which also discusses vulnerability and associated risk of those species and habitats to climate change (2015-2025 Pennsylvania Wildlife Action Plan, Chapter 3, pp. 29-70 and 95-107). The Plan (Chapter 4, pp 85-101) also includes conservation actions to address climate change, including regional (Staudinger et al. 2015) and national adaptation strategies (National Fish Wildlife Plants Climate Adaptation Partnership 2012).

Maryland

Maryland has developed the Climate Change Maryland website to educate citizens about climate change and the actions that the state is taking to reduce its carbon footprint. This program includes participation from over 12 states agencies. It contains information on the Greenhouse Gas Reduction Plan, which was written in 2012 (and updated in 2015) to address the 2009 Greenhouse Gas Emissions Reduction Act. The Greenhouse Gas Reduction Plan's goals are to reduce greenhouse gas emissions by 25% by 2020 by reducing all sectors' (energy, transportation, agriculture, etc.) carbon footprint. It has more than 150 programs and initiatives to address carbon emissions related to energy, construction, fisheries, forestry, etc.

The state also has a two phase plan to reducing Maryland's vulnerability to climate change. Phase I was published in 2008 and addresses SLR and coastal storms. Phase II was completed in 2011 and focuses on building societal, economic, and ecological resilience.

In 2012 the Climate Change and CoastSmart Construction Executive Order was signed to ensure all new and reconstructed state structures have minimal to no flood risk based on improved planning and construction.

Virginia

The Governor's Commission on Climate Change published A Climate Change Action Plan in 2008, which includes the effects of climate change (on the built environment, insurance, natural systems, etc.), recommendations, and commission deliberations. In December of 2014, the state published Virginia Accomplishments Since the 2008 Climate Action Plan Release. According to the executive summary, Virginia has taken many mitigation and adaptation actions in regards to climate change, but these changes were not necessarily in response to particular recommendations or carried out in a coordinated manner. One year later, in December 2015, the Governor Terence R. McAuliffe's Climate Change and Resiliency Update Commission published the Report and Final Recommendations to the Governor, which includes the top five recommendations to address climate change in the state. These include: i.) establishing a climate change and resilience resource center, ii.) creating a new Virginia bank for energy and resiliency, iii.) establishing a renewable energy procurement target for Commonwealth agencies, iv.) adopting a zero emission vehicle program, and v.) leveraging federal funding to make coastal communities more resilient. During the 2016 legislative session Virginia created the Commonwealth Center for Recurrent Flooding Resiliency, a joint venture of Old Dominion University, the College of William & Mary and the Virginia Institute of Marine Science. With an initial budget allocation of $2 million in state support these institutions will work together to provide critical research, policy, and outreach resources to protect natural resources and create resilient communities across the Commonwealth.

North Carolina

In 2015, the North Carolina Coastal Resource Commission Science Panel completed their five-year update of their 2010 Report and the 2012 Addendum as mandated by the General Assembly in Session Law 2012-202. This update incorporated the most recent science and uses a 30-year projection for SLR. The report emphasized the different rates of SLR across the coast of North Carolina. These differences were attributed to subsidence and the effects of water movements within the ocean itself. The panel recommended that the report continue to be updated every five years.

The 2016 update of North Carolina's Coastal Habitat Protection Plan addresses SLR and climatic changes in several locations with recommendations specifically to the protection of wetlands and buffers to help offset the expected rise. The Source Document for the Coastal Habitat Protection Plan, and the Plan itself, can be accessed at: http://portal.ncdenr.org/web/mf/habitat/chpp/downloads.

The Albemarle-Pamlico National Estuary Partnership, through its 2012-2022 Comprehensive Conservation and Management Plan incorporates climatic impacts throughout, but has three actions focused on climate change and SLR. Two actions address the impacts of SLR and climate change on the regional ecosystem as well as supporting research on adapting to those impacts. The third action supports engaging state, regional, and local governments and assisting them with incorporating SLR and climate change into their planning processes.

Both the North Carolina National Estuarine Research Reserve and the U.S. Fish and Wildlife Service have incorporated significant aspects of SLR and climate change research into their strategic plans. With several extensive National Wildlife Refuge systems on North Carolina's coast and four National Estuarine Research Reserve sites in eastern North Carolina, significant research is being done in those locations. Much of the research deals with hydrologic restoration and the study of wetlands and their mitigating impacts on SLR.

South Carolina

In 2013, the South Carolina Department of Natural Resources compiled a report titled "Climate Change Impacts to Natural Resources in South Carolina." The following two sentences from the report highlight the goal the agency had in writing it: "The Department of Natural Resources is taking a lead role among South Carolina state agencies to advance the scientific understanding of the vulnerability of South Carolina's vital natural resources during an era of changing climate. This will enable the agency, its partners, constituents, and all Palmetto State citizens to avoid or minimize the anticipated impacts while protecting South Carolina's natural resources." The report identifies a number of concerns for the state's natural resources including SLR, ocean acidification, and temperature rise effects. The state has a high proportion of the coastline that is comprised of marshes, barrier islands, and hammock islands. Many of these lands are owned by state and federal entities. The document has various strategies for research and for developing and protecting land to provide for migration.

Other scientists, such as Dr. James Morris from the University of South Carolina, are conducting research evaluating the fate of marshes due to potential SLR. The recent thousand-year rain event in the state and King Tides are raising public awareness of what SLR will probably entail.

Georgia

In Georgia, most of the authority for responding to climate change rests with the local governments. There is not a statewide plan or regulatory measures in place. The State Wildlife Action Plan, however, does address climate change. With that in mind, there aren't any vulnerability assessments regarding fisheries. NOAA Fisheries Science Centers are working on assessing climate vulnerabilities for many species at the federal level.

Georgia is home to Gray's Reef National Marine Sanctuary, and NOAA is taking a three-pronged approach to address climate change: they are using Gray's Reef as a sentinel site, responding to change through adaptive management, and increasing climate change communication. Climate change links for Gray's Reef and other National Marine Sanctuaries include:
http://sanctuaries.noaa.gov/science/sentinel-site-program/climate-change-ocean-acidification.html
http://marineprotectedareas.noaa.gov/sciencestewardship/climatechangeimpacts/
http://sanctuaries.noaa.gov/science/sentinel-site-program/grays-reef/climate-change-ocean-acidification.html

Florida

The Florida Fish and Wildlife Commission led a stakeholder summit on Climate Change in 2008. A report was generated in 2009 from this summit entitled "Florida's Wildlife: On the front line of climate change." As a result of this summit and due to the resulting recommendations, the Fish and Wildlife Commission established a Climate Change Oversight Team and developed adaptive strategies to address identified climate change threats to fish and wildlife and their habitats. Climate change considerations have been integrated into Florida's State Wildlife Action Plan, and funding has been provided to aquatic habitat projects supporting climate change adaptive strategies, such as living shoreline projects and regional climate change effects mitigation planning efforts. Funding opportunities for aquatic habitat restoration and enhancement projects supported by the Fish and Wildlife Commission ensure evaluation of climate change adaptation in all project proposals submitted. The state follows guidance in Adapting to Climate Change: A Planning Guide for State Coastal Managers, a 2010 report from NOAA.

The Florida Oceans and Coastal Council published The Effects of Climate Change on Florida's Ocean and Coastal Resources in 2009, and updated the report in December 2010. These reports were written for the Florida Energy and Climate Commission and the residents of Florida. The original report included information on the 2007 Intergovernmental Panel on Climate Change Report, the impacts of climate change on Florida's infrastructure, human health, and economy, the effects of the 'drivers' of climate change, and research priorities, while the update focused on SLR effects and research priorities.

Florida has also worked with partner organizations, such as The Nature Conservancy, to implement projects addressing resiliency and plan for coastal climate change. This has been a key focus of south Florida, which is generally recognized as being one of the most vulnerable regions in the Commission management region to SLR. Partners have developed shoreline resiliency and coral reef teams including the Shoreline Resiliency Working Group and Southeast Florida Coral Reef Initiative, which are focused on assessing and addressing the effects of climate change on coastal habitats. The Governor's South Atlantic Alliance recently sponsored (April 2016) a southeast U.S. Living Shorelines Summit in Jacksonville, Florida, which specifically addressed coastal habitat resiliency in the face of accelerated SLR. This effort has resulted in the development of a number of different regional resources, including a living shoreline training academy, which provides managers and the public with a certification in living shoreline design and implementation.

Atlantic States Marine Fisheries Commission

Atlantic Herring Section

October 27, 2016
10:45 a.m. – 12:15 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order (*R. White)*	10:45 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from February 2016	10:45 a.m.
3.	Public Comment	10:50 a.m.
4.	Elect Vice-Chair **Action**	10:55 a.m.
5.	Review and Discuss White Paper on Fishery Performance and Alternative Management Tools (*A. Harp & R. White*) **Possible Action**	11:00 a.m.
6.	Set the 2017 Atlantic Herring Specifications for Area 1A **Final Action**	12:05 p.m.
7.	Other Business/Adjourn	12:15 p.m.

The meeting will be held at the Harborside Hotel; 55 West Street; Bar Harbor, ME; 207.288.5033

MEETING OVERVIEW

Atlantic Herring Section Meeting
October 27, 2016
10:45 a.m. – 12:15 p.m.
Bar Harbor, Maine

Chair: Ritchie White (NH) *Assumed Chairmanship 2/16*	Technical Committee Chair: Renee Zobel	Law Enforcement Committee Michael Eastman
Vice Chair: VACANT	Advisory Panel Chair: Jeff Kaelin	Previous Section Meeting: February 2, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ (7 votes)		

2. Section Consent

- Approval of Agenda
- Approval of Proceedings from February 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Section Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Section Chair may allow limited opportunity for comment. The Section Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Elect Vice-chair (10:55 – 11:00 a.m.)

5. Review and Discuss White Paper on Fishery Performance and Alternative Management Tools (11:00 a.m. – 12:05 p.m.)
Background • This white paper provides an overview of Area 1A Atlantic herring management, landings and alternative management tools for consideration. It is being brought forward by a subset of the Section (member states of Maine, New Hampshire and Massachusetts) to elevate to the full Section issues that were identified during recent days out discussions. In particular, the accelerated pace of Area 1A Trimester 2 landings and the increasingly dynamic nature of days out measures to control Trimester 2 effort that have varied across states. The list of identified alternative management tools to address these issues is not a comprehensive list and should be

viewed as topics to discuss, not pre-determined pathways.

- 2015 fishing season concern: In Area 1A the rate of landings accelerated in August such that the seasonal quota was exceeded on August 28; triggering a zero landing day scenario for all of September.
- 2016 fishing season concern: Above-average landings at the start of the season, and thereafter, led to emergency restrictions for vessels landing in Maine (on behalf of Maine DMR), which were more restrictive than those of the Commission.
- **White Paper in Briefing Materials**

Presentation

- Summary of the white paper by A. Harp

6. Set 2017 Area 1A Sub-ACL Specifications (12:05 – 12:15 p.m.)

Background

- At the 2015 Annual Meeting, the Section approved the Area 1A sub-ACL as part of the 2016-2018 Atlantic herring specifications. The Area 1A sub-ACL of 30,300 metric tons (mt) represents 28.9% of the stockwide ACL (104,800 mt).
- Since 2009, the Section has split the Area 1A sub-ACL into trimesters, where 0% is allocated from January 1-May 31, 72.8% is allocated from June 1 – September 30 and 27.2% is allocated from October 1- December 31.

Board Actions for Consideration at this Meeting

- Set the seasonal splitting of the Area 1A sub-ACL, quota rollovers and sub-ACL trigger.

7. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC HERRING SECTION

The Westin Alexandria
Alexandria, Virginia
February 2, 2016

These minutes are draft and subject to approval by the Atlantic Herring Section
The Section will review the minutes during its next meeting

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INDEX OF MOTIONS

1. **Motion to approve agenda** by Consent (Page 1).

2. **Motion to approve proceedings of November, 2015** by Consent (Page 1).

3. **Move to adopt *Option C.* GSI-based forecast system for Section 4.2.6.1 - Spawning Area Closure Monitoring System.** (Page 11). Motion by Terry Stockwell; second by Dennis Abbott. Motion carried (Page 13).

4. **Move to select under Section 4.2.6.1 the trigger value of the 80th Percentile (GSI30 Trigger = 25), and default date of sub-option C2** (Page 13). Motion by Doug Grout; second by Bill Adler. Motion carried (Page 14).

5. **Move to select under 4.1.3 Option A; status quo: Maintain the current spawning areas** (Page 14). Motion by Pat Augustine; second by Ritchie White. Motion carried (Page 14).

6. **Motion to select under Section 4.2.6.4 spawning closure period, Option A status quo, four weeks** (Page 14). Motion by Doug Grout; second by Terry Stockwell. Motion passes unanimously (Page 15).

7. **Motion to select under Section 4.2.6.4 spawning closure period reclosures protocol Option B, define protocol** (Page 15). Motion by Doug Grout; second by Terry Stockwell. Motion carried (Page 16).

8. **Motion to select under Section 4.2.7.2 fixed gear set-aside provision adjustment, Option A status quo** (Page 16). Motion by Doug Grout; second by Bill Adler. Motion failed (Page 17).

9. **Motion to select under Section 4.2.7.2 fixed gear set-aside provision, Option B** (Page 17). Motion by Terry Stockwell; second by Mark Gibson. Motion carried (Page 18).

10. **Motion to select under Section 4.2.8, empty fish hold provision Option C1; federal/state empty fish hold provision for select vessels** (Page 18). Motion by Doug Grout; second by David Pierce. Motion carried (Page 18).

11. **Motion to have an implementation date of June 1, 2016** (Page 18). Motion made by Doug Grout; second by Bill Adler. Motion passes (Page 19).

12. **Motion to recommend to the Full Commission to approve Amendment 3 as modified** (Page 19). Motion by Bill Adler; second by Steve Train. Motion carried (Page 19).

13. **Motion to adjourn** by Consent (Page 19).

ATTENDANCE

Section Members

Terry Stockwell, ME, proxy for P. Keliher (AA)
Sen. Brian Langley, ME (LA)
Steve Train, ME (GA)
Doug Grout, NH (AA)
G. Ritchie White, NH (GA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Rep. Sarah Peake, MA (LA)
David Pierce, MA (AA)
Bill Adler, MA (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
David Borden, RI (GA)
Mark Gibson, RI, proxy for J. Coit (AA)
Dave Simpson, CT (AA)
Dr. Lance Stewart, CT (GA)
Pat Augustine, NY, proxy for Sen. Boyle (LA)
Emerson Hasbrouck, NY (GA)
Steve Heins, NY, proxy for J. Gilmore (AA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Tom Fote, NJ (GA)
John Bullard, NMFS
Wilson Laney, USFWS

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Jeff Kaelin, Advisory Panel Chair
Renee Zobel, Technical Committee Chair

Staff

Robert Beal
Toni Kerns
Ashton Harp
Mike Waine

Guests

Kelly Denit, NMFS
Michael Pentony, NMFS
Peter Burns, NMFS
Mike Ruccio, NMFS
Allison Murphy, NMFS
Jason McNamee, RI DEM
Patrick Paquette, MSBA
Joseph Gordon, PEW
Shaun Gehan, Ad-hoc Pelagics, DC
Michael Hall, Narragansett, RI
Raymond Kane, CHOIR

The Atlantic Herring Section of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, February 2, 2016, and was called to order at 1:42 o'clock p.m. by Chairman Ritchie White.

CALL TO ORDER

APPROVAL OF AGENDA

CHAIRMAN G. RITCHIE WHITE: *(Introduction and Approval of Agenda not recorded.)*

APPROVAL OF PROCEEDINGS

CHAIRMAN WHITE: Secondly, approval of the proceedings from November, 2015, is there any changes or additions to the minutes of November, 2015? Seeing none; approved by consent.

PUBLIC COMMENT

CHAIRMAN WHITE: Is there any public comment on items not on the agenda? Ray.

MR. RAYMOND KANE: Thank you, Mr. Chairman, Raymond Kane; commercial fisherman, Chatham Massachusetts. I would like to commend the commission on the hard work they put in for this amendment. I guess we'll see the outcome by the end of the day. But there is still an elephant in the room, and that elephant is we have no spawning protections still to this day on Georges Bank and Nantucket Shoals.

I've been here for years, I saw the white paper and I've also heard the lack of funding. But this will be directed towards the New England directors, they are each sitting at this table, and this will eventually affect New Jersey and New York with landings. As God as my judge, I don't know how they can come out with these assessments.

We're supposed to believe in the science and yet we don't know what is going on with the spawning biomass on Georges Bank and Nantucket Shoals. I know I'll probably hear back from this commission that we don't have a place in that. You're talking federal waters. But we have all directors here from the New England Council and I wish they would make a concerted effort in the future in addressing this issue. Thank you.

CHAIRMAN WHITE: Thank you, Ray. Any other public comment on items not on the agenda?

DRAFT AMENDMENT 3 TO THE ATLANTIC HERRING FMP

REVIEW OPTIONS AND PUBLIC HEARING SUMMARY

CHAIRMAN WHITE: Seeing none; we'll move on to Draft Amendment 3, the Atlantic Herring Fishery Management Plan, Final Action, Review of the Options; Ashton.

MS. ASHTON HARP: Okay so I'm going to go through the public comment summary for Draft Amendment 3 for the Atlantic Herring Fishery Management Plan. Before I begin I want us to just go over our brief timeline of the recent actions that were taken for this document this past year.

In August, 2015 the board tasked the TC with revising a spawning area efficacy options with the goal to protect spawning fish by prohibiting the landing of Atlantic herring caught within a specific spawning area. The PDT took this information and revised the spawning area efficacy options. We were going to produce a whole entire draft amendment at the November meeting. However, upon further review of the document we noticed that there were some other changes. Therefore, we brought forward a public hearing document at the annual meeting. The Section subsequently approved the public hearing document, which was a segment of the larger document; so basically just had the management area options in there and description of the resource.

This public hearing document was taken to public comment in December of 2015 through January of 2016. As you can see we had four public hearings in Maine, New Hampshire, Massachusetts and Rhode Island; and we received nine written comments from organizations. During this time while we were going out to public hearing the PDT was also pulling together the complete Draft Amendment 3, which you saw was released first via the briefing materials.

Then it was subsequently revised and it was released again in the supplemental materials. As you can see in the supplemental materials there are a couple of changes that were highlighted in yellow. I'll just note them now. The stock assessment section was revised and more figures were added.

A paragraph was added in 2.7, Resource Community Aspects, simply to note that the fishery is restricted to purse seine and fixed gear during the summer months, and there are no gear restrictions after October 1st. Lastly the fixed gear section was changed to specifically note that the fixed gear set aside is up to 500 metric tons. However, the current specifications set it at 295 metric tons.

Here in front of you today is the full document. Note that all sections were reviewed and/or edited by the PDT. I also submitted in briefing materials the decision document, which is basically a summary of this presentation that I am going to give today. The management options that we are considering are Issue 1, Spawning Area Efficacy, underneath that it encompasses spawning area monitoring system, default closures dates and trigger values, spawning area boundaries, spawning closure period and then a reclosure period.

A second issue is Fixed Gear Set Aside. The third issue is Empty Fish Hold Provision. I will note that the empty fish hold provision was brought about in conjunction with New England Fisheries Management Council's Framework 4. However, they are still preparing the final rule, so we do not know if NMFS will approve or not approve the empty fish hold provision.

Now I am going to just jump right into the public comment period. At first just the structure, I am going to go through each management option and just kind of give a brief explanation of it. Then I will go through the public comments that you can see are in red. For the spawning area closure monitoring system, this is a technical aspect of when to issue a spawning area closure.

It is based on the female gonadalsomatic index, commonly known as GSI. For Option A, status quo, as we all know two commercial catch samples that were taken within seven days of each other, a sample size is defined as 100 adult fish within two separate size class triggers will initiate a spawning area closure.

Option B is essentially the same thing as status quo, except there are two main differences. Samples can come from fisheries independent or dependent sources. Right now it is only commercial catch samples. Also there was a sentence that was added that says, the fishery will remain open if sufficient samples are available, but they do not contain ripe female herring. The PDT did want to draw caution to this one specific sentence, because not all states have independent sampling programs for Atlantic herring. Therefore, if sufficient samples were collected but didn't show spawning herring, maybe because of gear biases, then that area would not close.

Option C is the GSI30 based forecast system. A little bit of background on this one. This is the new one. The PDT, really the Technical Committee developed this option based on review of 8,000 GSI observations over a 12 year period of time. They determined that this forecasting system would be better, because it would more accurately predict when spawning fish were in the area and therefore when to close spawning areas.

There is a common concern that spawning areas were being closed too early, and therefore they weren't encompassing the full time period of when herring were spawning. For this example you would have three samples comprised of at least 25 female herring in gonadal stages 3 through 5 will comprise a sample, and from there a date would be forecasted within five days.

This would give more time for the industry to know when a spawning area would close. Now for the public comment, so for Option A, status quo, there were two written comments. One person felt that a pilot program should parallel the existing system for at least a year before we were locked into a new system via this amendment.

Another comment said they wanted it to be ground truthed before it becomes the standard method. Another person said that they liked the status quo and they thought it worked reasonably well. They just noted that there were some issues with the default dates. There was a discussion about that and for GSI Option C, it was said that we would hopefully be relying less on default dates.

For Option D there was one person in favor of this. It wasn't so much that they were in favor of the entire Option D, it is just that they felt that samples should come from fisheries independent or dependent sources; we shouldn't be limited to one. For Option C, you can see that we have the majority of those are in favor of Option C during the public hearing process, and people just felt that if science shows that it will more accurately close the spawning area closures then that is the one that we should use.

People also liked it because it relied on a forecasting method, and they would have more advanced warning of when areas will close. There was one concern that says they were concerned about the sample size. Right now it is three samples of 25 female herring in gonadal stages 3 through 5.

People thought maybe that was low considering the current sample size is 100. However, there is a difference because right now it is 100 adult sized fish, whereas in the revised method it would be 25 female herring in gonadal stages 3 through 5. It is a little bit more specific. There is also no upper bound on how many in a sample we would have to have; it just says a minimum of 25. There is no maximum.

Now moving into the default closure dates, so these are directly linked to the spawning area closure monitoring system, these are the only spawning area options that are linked together. For Option A, status quo, this is the same default dates that we've always had; the same for Option B as well. Option C is where there are different trigger values as you can see, based on if you want the forecasting method. There is Sub-Option C1, which is a 70th percentile. It closes the fishery earlier to protect maturing fish.

There is Sub-Option C2, this is a later closing. It would protect fish at the later stages of maturity. There is Sub-Option C3, the 90th percentile which would close the fishery just prior to spawning. We have one in favor of status quo. For Option C1 there were two people in favor of this one. They viewed it as the most conservative and therefore most likely to protect pre-spawning of mature fish.

Two were in favor of C2, because it was determined to be in the middle. Also people felt that default dates that are shown here more closely aligned to the actual spawning times. They felt that it would protect the majority of spawning fish. They also specifically noted that they felt that C3 was far too late for our default date.

Those in favor of Sub-Option C3 you can see there are 17. The majority of the Maine public hearing is what kind of bumped up those numbers. They felt that it would minimize the ongoing concerns of the spawning area closing prematurely. They also felt that this would kind of allow a little bit of a spawning tolerance as well.

For the spawning area boundaries we have Option A; status quo. Maintain the current spawning area boundaries. There are three spawning area boundaries. There is also Option B, combine the western Maine and Mass/New Hampshire spawning areas. GSI analysis suggests that western Maine and Mass/New Hampshire do not have significantly different spawning times. Therefore, it was suggested that they should be combined.

The majority of the public comments were in favor of status quo Option A, so just remaining the three areas that we have now, people felt comfortable with them. People also didn't want to run the risk of merging two areas together and then having a large section of the coast being closed at one time.

Two people were in favor of Option B, because they felt it had the potential to increase sample sizes, and therefore we could more accurately close a spawning area if we have more sample sizes for one area. For the spawning closure period there is Option A; four weeks, status quo. There is Option B, six weeks, and this was suggested based on the literature review that herring typically spawn for approximately 40 days.

The public comments stated that the majority felt comfortable with the four week time period that is currently proposed. It was seen as protecting the majority of spawning fish. Option B had support from three written comments. They just felt that it was based on the literature review that was provided in the Technical Committee report and that if it is a spawning area closure and that is how long they spawn for, then that is how long the area should be closed for.

The spawning reclosure period, we have Option A; status quo. Sampling happens for two weeks after an area is reopened. If a sample contains 25 percent or more mature herring then it would initiate a reclosure. Then there is Option B, which is a more defined protocol. This one says in addition to other language, one sample can be taken in the last week of the initial closure or in the first week after the area is reopened. It defines the sample as 100 adult sized fish, and then goes on to say that if 25 percent or more in a sample would initiate a reclosure. It just kind of gives a little bit of more specifics around the status quo that we already have, defining what the sample is and also allowing samples to be taken in the last week of the initial closure.

There is also Option C, no reclosure protocol. This one was developed only to be linked with the six week initial closure period. It was felt that six weeks encompasses the entire spawning period of herring, therefore there would need to be no reclosure protocol. For the public comment two were in favor of status quo.

As you can see, Option B defined protocol. The majority, which is mostly made up of Maine are for the defined protocol. People are interested in sampling in the last week of the initial closure. One comment wanted the text to actually be reworded so that sampling has to occur in the last week of the initial closure.

However, I just wanted to note that like I said before, no state has an independent sampling program. We do rely a lot on commercial catch samples. Therefore, it might be a little tricky to have the wording so narrowly defined as only in the last week. One was in favor of no reclosure. This person felt that a four week period was viewed as enough time. That concludes the spawning area efficacy options and the public comment that we received on those options.

For Issue 2, the fixed gear set-aside rollover, we have Option A; status quo. Right now the Area 1 Sub-ACL 295 metric ton is set aside for the fixed gear fishery. They have that to use until November. If they have not used it then it is rolled over into the rest of the fishery, so mobile gear can then use the 295 metric tons; any part of it that has not been previously used.

There is also Option B, which is to remove the rollover provision. The 295 metric tons will never roll over into Area 1A mobile gear fishery; it will always be allotted to the fixed gear fishery for the entire year. We had one that was in favor of Option A; status quo. They said that any changes will make the state and federal FMPs inconsistent.

We also had one person say that they wanted the fixed gear set aside removed entirely. Then we also had four people that were in favor of Option B. They felt that the fixed gear fishery has had limited access to the resource, and therefore they felt that they were entitled to any amount of set aside that they could have.

This is Issue 3, the Empty Fish Hold Provision, and like I said before this was originally brought about because it is also in the council's Framework 4. I am going to walk through this one through a couple of slides, because there are five different options and they can be quite confusing if shown all at once.

For the Empty Fish Hold Provision, Option A, status quo, no empty fish hold provision; the vessels can leave the dock without anyone inspecting the vessel. Then we have two different wordings that we took to public comment. The Empty Fish Hold Provision the first one on the top mirrors what is in Framework 4.

It simply says that this option would require the fish holds on Category A and B vessels to be empty of fish before leaving the dock on any trip when declared into the Atlantic herring fishery.

The commission had subsequent meetings with the Advisory Panel last year and they made a little bit of a different wording to what is in Framework 4. The other language says this language would only apply to vessels with the ability to pump fish. Specifically it says; this option will require the fish holds on Category A and B vessels with the ability to pump fish are empty of fish before leaving the dock on any trip when declared into the Atlantic herring fishery.

This was a little bit of background. This was brought about because there were some fishermen in Rhode Island who have freezer vessels, so when they come into the dock, so basically they process at sea. If there is any reason for them to come into the dock, be it mechanical failure, some kind of whether circumstance.

They don't want to empty their fish hold unless it's full, because it is a fee they have to pay in order to empty. They would rather just take care of the problem at the dock and then go right back out and continue to fish and process fish until the fish hold is completely full. That is how it originally came to have the second option and wording.

Next we have contingent on federal adoption, just meaning if NMFS approves this then we would move forward with it. We also have language that says, regardless of what happens in Framework 4, Final Rule, the states would move forward with this option regardless; meaning that states would have to supply the resources to check Category A and B vessels each time they go into the fishery.

Now we're ready to show all five of the options all at once. Okay so now you can see Option A; status quo, an empty fish hold provision. Option B1 is basically what is in Framework 4 and it just says that if Framework 4 passes then we'll move forward with Option B1. B2 is the state empty fish hold provision so it is not contingent on federal adoption.

We would move forward with this using the language that is in Framework 4, regardless. C1 is the federal/state empty fish hold provision for select vessels. The C options are the wording that was changed by the commission to only apply to vessels that pump. C1 is contingent on federal adoption, but it would only apply to vessels that pump.

C2 is not contingent on federal adoption. The states would move forward with this regardless, but it is only applied to vessels that pump. Now I'll go through the public comment for this one. There were two in favor of status quo. They felt the act of checking vessels prior to departure was seen as too restrictive, because it affects how and when fishermen sell their fish.

There was also concern that inspection of each vessel prior to departure might delay trips. There was one in favor of Option B1. They were in favor of the empty fish hold provision as written in Framework 4, and only if Framework 4 was adopted. There were multiple people from Maine, which are about eight people in addition to two written comments that are in favor of B2.

This would use the same language that is in Framework 4, but we would move forward with it regardless of what NMFS did. The states would move forward with this. There were three people in favor of C1, so this is the language that says that it is only for select vessels that can pump, but it is contingent on federal adoption. There were also three people in favor of the state empty fish hold provision for select vessels not contingent on federal adoption, so the states would move forward with it regardless. I just want to mention for the language that says it would only apply to vessels that pump. It was originally brought about because of the freezer vessels that process at sea. However, during the public comment period we also heard that there are some vessels that do not have pumps and when they come in from sea they have maybe 10,000 ton, and a truckload is 40,000. They felt that they would lose out on business opportunities if they only had 10,000 yet they couldn't go out to sea, but they couldn't put their fish into a truck because a truck is not going to come down just for 10,000 tons.

They felt that this measure would be really restrictive for them; therefore they specifically felt that having the language that says only vessels that pump would comply would work for them, because they don't pump fish. I know that might be a little confusing, so any questions on that feel free to ask. There were also other comments. For the fixed gear fishery they just said that the fixed gear fishery should be open in April or May time period, basically they wanted to be opened earlier than June.

They felt that June was far too late, they didn't see any fish in the fixed gear fishery and they felt it was unequal. There is also a comment that the 20 percent spawning tolerance should be reinstated, if not for the entire fishing year then at least until October 1st. I will take questions now on the public comment.

CHAIRMAN WHITE: Thank you, Ashton, thorough and well presented; any questions?

MR. DAVID PIERCE: That was a good summary. I might have missed it, were there any comments during the public hearings relative to the nature of fishery independent samples that would be used to judge whether the fisher were still spawning? I don't think we have in the document anything that describes what that means. Were there any comments to that affect?

MS. HARP: You are asking about fishery independent samples, and I trailed off right there.

MR. PIERCE: We say that the fisheries dependent or fisheries independent samples could be taken to judge where the spawning was still continuing. Fisheries dependent is kind of obvious, but fisheries independent, were there any questions asked by those at the hearings regarding what that would entail, what that would mean? What actually would be looked at?

MS. HARP: No there was not. More people felt that if any samples can be available then they should be used. They just felt that we shouldn't discriminate and only use commercial catch samples. There were never any questions as to where the fishery independent samples would come from or what they would be used for.

MR. PIERCE: Okay thank you and just one other thing. Regarding the public hearings, I chaired the one in Gloucester to give those present an indication of the nature of the comments that occurred in Gloucester and it is an important location of course; because of one of the major processors present in Gloucester.

I would just refer the section to a couple of comment letters that do a real good job describing what was said in favor of different options and opposed to different options. That would be one letter being the one from Pew, Pew Charitable Trusts, where they describe their different positions on all of the elements such as spawning area efficacy and then the other one would be from Shaun Gehan, representing Cape Seafoods and others in Gloucester. He on behalf of those groups provided the perspective that was highlighted frequently by Jerry O'Neil, who was the manager of Cape Seafood. Again, for those wanting to know what happened in Gloucester, those two letters characterized the nature of the discussion very well.

MR. DOUGLAS E. GROUT: I wanted to ask a question about some of the revisions that were made to Amendment 3 that is outlined in our supplemental materials, and specifically the revision that was made in Section 2.7; Resource Community Aspects.

There is a statement here that says the summer restrictions on Area 1A to fix gear and purse seines is said to have led to a significant increase in price of herring for bait, which has a potentially major impact on the lobster fishery. Notably mid-water pair trawlers are not allowed in Area 1A until October 1. Where did this addition come from and what was the reason for it? I have a couple concerns about it, so I would like to hear why it was put in and where this wording came from.

MS. HARP: The intent of that section was simply to note that the summer fishery is restricted to fixed gear and purse seine gear types, and then after October 1st it is open to all gear types. The first sentence that says, is said to have, that came from a council document.

MR. GROUT: Well, my concern here, one is our document saying something like, is said to have led to, but more importantly there are other things that have occurred during that same period that could have also impacted the increase in prices of herring. Most specifically we've had some substantial quota reductions.

If you all remember back prior to 2006, the quota for the herring fishery was around 150,000 metric tons. Then around the time of the implementation of Amendment 1, we went down to about 140 to 143,000 metric tons. Then in 2010 when we had to implement our specifications based on the revised Magnuson Act, we had a further substantial reduction in quota for herring to around 90 to 93,000 metric tons.

My economics class on supply and demand is, if you're reducing the supply that can also drive up your pricing. On top of that my other concern with that statement is the fact that throughout that period with the exception of one year that Area 1A quota has been fully utilized, and the only year it wasn't fully utilized was a year in which the other three areas went over their quota. The fishery as a whole had to shut down before the fishery in 1A had taken its harvest.

I have a concern about this having a suggestion of a cause and effect here of the fixed gear, purse seine or only seasonal restriction having an impact on the seasonal prices. My suggestion to the board is, I think we need to remove this particular statement from here, because I don't think it has a good solid basis of fact. If we need a motion to remove it, I was looking at this as you've added something to it and you were looking for concurrence with the board to add these sections to it. Is that the case or not?

MS. HARP: Feel free to revise any part of the document. If you would like to, those changes can be made.

CHAIRMAN WHITE: I think when we get to consideration on the document then I think a motion would be in order.

MR. TERRY STOCKWELL: Just a follow up to David Pierce's question about whether or not there is discussion about fishery independent data. There was in fact at the Maine public hearing a fair amount of discussion; some comments in support of inclusion of fishery independent data, particularly in reference to any work that was done by either states or academic research felt that any data was good data as long as it was vetted through the TC.

CHAIRMAN WHITE: Any other questions from the board? Seeing none; Jeff, Chair of the AP had a question for Ashton.

MR. JEFF KAELIN: I appreciate the board allowing me to speak. My question was, I think when you were talking about, and this is on Issue 3 the empty fish hold provision, Options B2 and C2, which wouldn't require federal adoption. I think you said that the sates would be in a position where they would have to inspect every fish hold on every trip before people left.

I don't think that that is really what is being considered on the federal side. I think it is more of a spot check kind of a situation. I'm not sure where you got the information that every trip would be inspected, but I think that is an issue that needs to be clarified.

MS. HARP: Thank you for clarifying that, Jeff.

CHAIRMAN WHITE: Emerson.

MR. EMERSON C. HASBROUCK: I do have a couple of questions. We're looking at a species that is about 200 percent over the target for spawning stock biomass, right? I'm looking at the problem statement here, which talks about spawning area efficacy and whether we're timing that properly; and then the empty fish hold provision as well.

I am wondering how important are these issues really to the resource as it currently exists? The other thing is, and I may have missed it at the beginning of your presentation, if so I apologize. The status quo provisions, when were they implemented and how long have those status quo provisions been in effect, and are they not helping us to reach our goal with this resource?

CHAIRMAN WHITE: Renee, do you want to answer that?

MS. RENEE ZOBEL: Yes I was just going to go back to the document that you all have in front of you. There is a history of the management in this fishery, and I don't have the page in front of me at the moment. If you bear with me one moment I can find it and then refer people to it.

But it has the history of the different management options and which amendment or addendum they were implemented with. Some of these have been in place longer than others. As far as the spawning closures, I'll have to go back to the document. Let me find that page and I can reference it and we can potentially get it up on the screen as well.

CHAIRMAN WHITE: Any other questions while Renee is searching for that?

MS. ZOBEL: Okay sorry for the delay on that. There have been extensive measures in this fishery over time. On Page 36 and 37 of the document it gives a little bit of a history of the different management that has occurred in the herring fishery, all the way from the original FMP, which was implemented. The spawning closures as they stand now were modified slightly, which was a time when I was very new to this fishery. In Addendum 5 they were slightly modified to where they are today; that was 2012. The spawning measures have been in place since 2012 as they stand today.

CHAIRMAN WHITE: Follow up.

MR. HASBROUCK: They've been in place since 2012 and then if I follow down on Page 38, in terms of the goals to achieve on a continuing basis optimum yield for the United States fishing industry to prevent overfishing, et cetera. Then second objective is to provide for the orderly development of the offshore and inshore fisheries, taking in to account the viability of the current participants in the fishery.

I apologize if much of this has been hashed out in the New England Council, but we don't have much of a herring fishery in New York, so I haven't been following that. But my question is, if the status quo has been in place since 2012, has the status quo been doing an adequate job in helping us to reach and maintain those two goals?

MS. ZOBEL: The Technical Committee and PDT specifically tasked this body with giving us specific goals, because that was somewhat a question of ours as well. We wanted to know last year if individuals remember at this meeting we said, is the purpose of us looking again at the spawning to protect spawning fish or to protect the act of spawning?

Essentially the answer was both. We've had a lot of feedback that the spawning closures are not adequate, they haven't been working correctly, they are at the wrong time, and they need to be revisited. That allowed us as a technical body to go back and look at now a decade's worth of data to come forth with a presentation of a new methodology that we believe will do a much more adequate job protecting spawning fish and spawning that is occurring.

CHAIRMAN WHITE: One more follow up?

MR. HASBROUCK: I don't want to get into a protracted debate about this, so just one quick follow up. My question still remains though, have the status quo been adequate, have we maintained our goals adequately with the status quo? That is kind of a yes or no.

MS. ZOBEL: I don't know that that is a yes or a no answer. We've been tasked to look at this specific item, because it has been believed that it has not been effective based on the goals of the board. Whether that is correct or not, we've been asked to look at this time and time again, and now we've been able to take a look at many years of data in order to do that.

CHAIRMAN WHITE: I think to add to that too is the concern is even though we have a good healthy stock we want to maintain that and continue it in that situation. That is part of this effort as well. Any other questions?

MR. PATRICK AUGUSTINE: It always begs the question of when is enough, enough. I don't need an answer; it is kind of a rhetorical thing. We seem to want to get more and more and more, and the question always is at the expense of whom? We continue to do single species management. We worry about the impact on other fisheries. In the meantime the economic value goes up or down and the folks who are living on this, their income go down. It is a Catch 22, Mr. Chairman.

ADVISORY PANEL REPORT

CHAIRMAN WHITE: Ashton now is going to give us the AP report. The AP has not met since the last meeting so to try to save some time she is just going to go ahead and give the recommendations that the AP gave to us at the last meeting.

MS. HARP: Okay as was stated I just have two slides here for the AP report. I did give the AP a chance to respond and maybe change their opinions if those had changed in the two months. It had not, so I will review what was presented at the annual meeting in a quick summary. For the spawning area monitoring system, there was general consensus in favor of Option C, the GSI30 based forecast system.

It was believed that it will improve accuracy and when the spawning area should close, and also it provided more advanced warning, which they were in favor of. There was one person in favor of Option A, status quo for default closure dates. There was no general consensus on the default closure dates. That was due to what they felt was the uncertainty of the outcome of picking a trigger.

But if they had to then they said five were in favor or Option C1, 70th percentile, they felt like it would provide additional protection, so fishing just prior to spawning would not happen. One person opposed the 70th percentile, because they felt it would require a longer closure period. For the spawning area boundaries there was general consensus in favor of status quo, maintaining the three spawning area boundaries.

They did not want a large coastal shut down if areas were combined. For the spawning closure period, seven were in favor of status quo. Some felt that there was not enough social and economic data to justify a six week closure at this time, and they felt like the four weeks was sufficient.

Three were in favor of Option B, six weeks. The spawning reclosure period, three were in favor of Option A; status quo, two were in favor of the defined protocol. Moving beyond the spawning area options, for the fixed gear set aside they were unanimously in favor of Option A; status quo. Keep the 295 metric ton set aside and it will rollover on November 1st.

The empty fish hold provision; they preferred the C options, which were the adjusted language options. This meant that the empty fish hold provision would only apply to vessels that can pump. Five were in favor of C2, meaning it is not contingent on federal adoption. The commission would move forward with it regardless of what Framework 4 final rule says. Two were in favor of only applying it to vessels that can pump, but only if it is contingent on federal adoption. That concludes the Advisory Panel summary. Any questions?

CONSIDER FINAL APPROVAL OF AMENDMENT 3

CHAIRMAN WHITE: Any questions for Jeff or Ashton on that report? Okay seeing none; we will move into final adoption. I have a number of motions that people have already requested to make. I have decided to take each of these items individually as opposed to taking a suite of motions. I'll alternate between members making motions that have already made the motions, and I'll also look for hands if people want to make separate motions as well. I'll start with Terry.

MR. STOCKWELL: I do want to quickly respond to Emerson's question about the task, the work of the TC. I want to strongly respond. The TC did exactly what the Section requested that they do, which was to review the efficacy of the spawning areas. This request was in part an issue that the state of Maine raised with some questions we had about the default days in the eastern Gulf of Maine.

Our question was, are we doing the best job or aren't we? They had the opportunity to review multiple years of spawning closures and data, and came up with a new way of doing things; which to me was exactly what we tasked them to do, and I appreciate all the work that they did. **To that point, I am going to move to adopt Option C, GSI based forecast system for Section 4.2.6.1; the spawning area closure monitoring system.**

This system will be implemented for one year and will be reviewed by the Technical Committee in the Section for effectiveness. If the GSI-based system is effective it can be continued either indefinitely or for a time certain by a majority vote of the Herring Section. If the Section deems the GSI-based system to not be effective a spawning area closure monitoring system will automatically revert to Option B. If I get a second I will give my rationale.

CHAIRMAN WHITE: Second, Mr. Abbott.

MR. STOCKWELL: Thank you, Dennis. Option C was favored by the AP and a number of the public comments. As I just stated, I continue to support the work of the TC and I am attracted to a completely new concept that better targets closures to a period of time when a majority of the fish are spawning. At this point I favor the advanced warning system and that samples come from both independent and dependent sources.

Allowing the system to be reviewed after one year addresses the public comments expressing concern that we may have done too much too quickly. Should the TC or Section not support extending the forecast system, then Option B reinstates the status quo sampling program, addresses the concerns raised concerning sufficient sampling by adjusting to include both fishery dependent and independent data. I thank the TC. I think you did a great job.

CHAIRMAN WHITE: Any discussion?

MR. PIERCE: Yes, I also believe the TC did a great job on this. It's been long in development. Yes indeed it is a bit of a, well it is new, a new approach but it is worthy of our trying and Terry's motion is to that effect. In other words we'll see how it works and if not then we bounce back to something a little less on the projection side, we use Option B.

I favor this forecast system as well. I am a bit concerned about the numbers of samples that would be used with this GSI30 based forecast system. In other words, we use a minimum of three fishery dependent or independent samples each with 25 female herring; and it is a bit different from Option B where more fish are taken with one less sample.

But I am not going to argue over this, it would be kind of a hair splitting. I would rather go with what has been offered up to us as a progressive way forward, and then we see how it works. I favor the option. I favor the motion. The only thing I don't see as part of this motion, and maybe Terry or someone else is going to address it in a subsequent motion, and that would be the GSI30 trigger value. I am assuming it is going to come up as another motion. With that said then, again I support the motion.

CHAIRMAN WHITE: Any other comments? Yes, Emerson.

MR. HASBROUCK: A concern I have with this motion is that it includes the term effective in there several times. I'm not sure what that means. That we will implement it for one year and then review its effectiveness, and if it is effective then it will go on until we decide to change it. How are we going to quantify effectiveness; I guess is the question?

MR. STOCKWELL: Thanks for the question. You've had the luxury of not having to live the weekly section meetings we have year after year after year as we try to balance out the Period 2 quota. The forecasting that we do in the days out scenarios and the intent to take what seems to be a large amount of quota and make it last from the first of June through the end of September, it has been a challenging job.

This effort is layered over by the spawning protection and effective I think, at least from the vision of the northern New England states would be that we're able to parse the quota out through Period 2 and that there is a fair and equitable access to the resource by the players. We have a trawl fishery that starts effective the first of October and they have their access to the fishery after the purse seine only fishery concludes.

I think if this body after the Technical Committee reviews the protection of, have we actually protected the fish at the time when they're spawning will be the first question. The second will be, have we as a section provided opportunities for the industry to fully harvest their quota and spread it over the period of time?

MR. HASBROUCK: Thank you for putting that on the record.

CHAIRMAN WHITE: Terry, Renee would like to ask a question.

MS. ZOBEL: Terry, in your motion you lay out that you would like the TC to evaluate the effectiveness. Just curious if you have any specific thoughts along those lines how we would evaluate. For example, when scenarios are playing, because there are so many different options within this option essentially, so for example if you were to go with this methodology and say you chose the 70th percentile.

The most protection for pre-spawning fish and went with the four week closure, you run the risk of having spawning fish on the tail ends, because you went to protect more pre-spawning fish. It may look like this was not effective when really it was just the very conservative tied in with the four week closure. Do you understand where my question is coming from?

MR. STOCKWELL: Exactly. It was originally my intention to make a package motion, but the Chair has decided to take them in five bite-sized pieces, so we'll find out what the Section, should this motion go up or down, we'll find out what the will of the Section is and then we'll have at least a target to work with.

CHAIRMAN WHITE: Okay any other? Yes.

MR. AUGUSTINE: I understood your description of effectiveness, Terry and I understand the mess you guys got in the last couple years up there. But if this motion is a standalone and goes out without the clarification as you described, then again we're still left with what does effectiveness mean? For clarification purposes again, Terry, either you or the staff would put together I would hope, a list of those possible measures of effectiveness. Otherwise, I think this is going to be left open to interpretation. Am I correct or did I miss something?

CHAIRMAN WHITE: Terry?

MR. AUGUSTINE: Nobody wants to touch that with a ten foot pole, huh?

CHAIRMAN WHITE: You want to try that, Terry?

MR. STOCKWELL: Sure. I can't answer that right now, Pat, until I see what the final vote of the Section is. You know we've got four other measures that need to be rolled into the spawning area closure monitoring system for approval by the Section. I think it would be incumbent upon, I'll certainly volunteer myself and my staff, who is on the TC, to come back with a proposal for the Section; and if we're scheduled to meet at the spring meeting we can review it at that point, if that works with you, Mr. Chairman.

MR. GROUT: Yes, thank you Mr. Chairman and thank you Terry for making this motion. I think it is a reasonable motion to have us transitioned into something that could potentially help us with our spawning closure management here and improve things. I certainly understand the desire to have a "let's try it out for a year and see how it works" provision, as long as we can move it forward following a favorable review of the program with just a board vote; as opposed to a management action. I support this motion.

CHAIRMAN WHITE: Any other? Seeing none, do we need to caucus? **I'm seeing shaking heads, and then all in favor of the motion please raise your right hand; opposed, abstentions, nulls. It passes unanimously.** Now we need a motion on Option C, whether it is one, two, or three. Doug, did you have a motion for that?

MR. GROUT: One of the things that were missing from this was the Technical Committee wanted us to select a trigger value, which whether the GSI30 trigger would be 23, 25, or 28. Also tied to that were these trigger-values, potentially would be the default closure dates; which are shown down on Page 58 and 59. **My motion is under Section 4.2.6.1, the trigger value will be the 80th percentile GSI30 trigger equals 25.** Also as far as the default date, Sub-Option C2 would be selected. If I can get a second to this I would like to give my rationale for this.

CHAIRMAN WHITE: Second by Mr. Stockwell. Go ahead, Doug.

MR. GROUT: One of the things we need to look at is to make sure that we are covering sufficient spawning closures, covering sufficient fish; making sure that we're covering the spawning fish. One of the things that I saw with the 80 percent is it doesn't push us right up to the end, yet it doesn't go too early.

But more importantly to me when I saw what the default closure dates were for some of the other options, and understand what the default closure dates are for is in case we don't have any samples where we cannot predict. It was going particularly with Option C3 if we were to choose the 90th percentile. We would have a default closure date that is a full three to four weeks after what our current default is, and with the exception of a couple years we have had evidence of spawning fish from our sampling on or before September 21st.

I was not comfortable with going out that far with a default closure date. I am much more comfortable with something closer to the beginning of October. Again, if we have samples it may come earlier, it may come later. It all depends on what the fish samples are showing. I support this and thank you.

CHAIRMAN WHITE: Any other comment?

MR. STOCKWELL: I support Doug's motion as well. I was prepared to come in with a different number, but questions that both Emerson and Renee asked on how to measure effectiveness, I think after another year we'll run this through the process and see where it lands. We may – assuming we decide a year from now to continue the forecast system – we may end up amending this approach. But it's a good start.

CHAIRMAN WHITE: Any other comments? Seeing none; sorry, Dave.

MR. PIERCE: I've labored over this as well, in part because at least one set of comments had indicated that if we chose the option that we did choose in the previous motion they would support the 90th percentile; that is the GSI30 trigger is equal to 28, which closes the fishery just prior to spawning.

I was seriously thinking about using that option or selecting that option. But after giving it more thought and after reading the document again to determine what our objective is, what our concerns are, the statement of the problem. This strikes a middle-of-the-road approach, which is acceptable. Going with the 70th percentile is just too conservative, because it would close the fishery too soon, before the fish really are getting ready to spawn.

The 90th percentile really puts on the edge; we close just prior to spawning so we could miss it. It could be spawning and we miss it. This 80th percentile gives us a better chance of closing when it needs to be closed and as it says in the document itself, we deal with later stages of maturity and just before spawning. It is precautionary, it is conservative but it is not too precautionary and too conservative, which obviously works to the detriment of some of the users of this resource.

CHAIRMAN WHITE: Any other comments? Seeing none; need to caucus? Seeing a few shaking heads. Is there a need to caucus? Take a minute. **Okay all in favor raise your right hand; opposed, nulls, no votes, it passes unanimously**. Okay 4.2.6.2, Terry, you have a motion?

MR. STOCKWELL: **I move to select under 4.1.3 Option A, status quo: Maintain the current spawning areas.**

CHAIRMAN WHITE: Is there a second? Bill Adler. Want to speak to it, Terry?

MR. STOCKWELL: Yes sure, rationale is pretty straightforward. It was strongly supported by the industry, who expressed a lot of concern about the potential for some huge shut downs at a time of the year when we're trying to effectively parse out the bait through Period 2. I think given that we're going to be reviewing this entire action in a year from now that status quo is the best decision.

CHAIRMAN WHITE: Any other comments? Any need to caucus? **Seeing none; all in favor raise your right hand; opposed, nulls, no votes, it passes unanimously.** Doug, do you have a motion for the next item?

MR. GROUT: **Yes, I move to select under Section 4.2.6.4 spawning closure period, Option A status quo, four weeks.**

CHAIRMAN WHITE: Second by Mr. Stockwell. Want to speak to it, Doug?

MR. GROUT: Yes. One of the things that I think a four week closure is appropriate as long as we have the mechanism to reclose in place, which we currently do and hopefully in a follow up motion we will be able to refine it so that we can do it a little bit quicker. But I think that is a key thing from my perspective; that if we're going to stay with four weeks we need to have a reclosure option.

MR. PIERCE: Yes. Doug stated it very well, but I'll just highlight some very important text and logic that presents it in the document itself and that is on Page 24 under spawning area efficacy. It is the paragraph at the bottom of Page 24, and this is quite important. I think all of us have learned this the hard way; that is the impacts of lengthy closures. It says: an extension of the closure period from four to six weeks, which represents one aspect of the potential changes, could potentially have a negative impact on the herring industry.

Fishermen and bait dealers know the stock is rebuilt, and indeed it is. Therefore, further protection via a six week closure is not warranted and will reduce market opportunities, and I believe that is correct. Additionally fishermen expressed concern that effort on mid-water trawlers could be displaced farther northeast where smaller fish are located if the spawning closure lasts up to six weeks.

Over the years I've certainly witnessed that happening. The Mid-water trawlers moving to the north and to the east, fishing in areas where smaller fish can be found and are found; of course purse seiners do the same thing, not just mid-water trawlers. Consistent with my desire and not to promote anything that would prompt the fishery itself to shift onto smaller fish, I would say that this is a good logic for us, sticking with status quo.

CHAIRMAN WHITE: Any other comments? Seeing none; need to caucus? **Seeing none; all in favor raise your right hand, opposed, null votes, no, it passed unanimously.** Doug, do you have a motion on the reclosure protocol?

MR. GROUT: Yes since this is part of the same section**, I move to select under Section 4.2.6.4 spawning closure period reclosure protocol Option B, define protocol.**

CHAIRMAN WHITE: Second by Mr. Stockwell. Any comments? Doug, do you want to speak to it?

MR. GROUT: Yes, one of the issues we had last year, was we had some samples prior to the reopening. According to the current management plan we couldn't use those samples, even though they suggested that spawning was still ongoing. I think we need to modify that to allow samples to be taken from either fisheries dependent or fisheries independent sources in that week before we reopen, so that if we do see spawning still occurring that we can keep it closed without having to reopen it first.

CHAIRMAN WHITE: Any other comments? Seeing none, oh Dave, sorry.

MR. PIERCE: Yes Doug has described what happened last fall in that the fishery opened up. Spawning was deemed to be over, but we decided of course to continue to monitor as we are obliged to do. We were informed in Massachusetts anyways and the other states as well that spawning was still ongoing. There was some discrepancy regarding whether or not that was true.

My staff and the state of Maine staff either did not communicate or there was a misunderstanding. As it turns out the sample of fish that was used to judge that the fish were still spawning, I believe was from an otter trawl trip not in the general area; that is of great concern to me, notably off of Massachusetts.

We decided to do what we thought was the right thing, which was to sample the fishery that would be impacted by a continued spawning closure in a major way, and that was the mid-water trawl fleet. We had opened and then we sampled immediately when the fish came in, and the spawning was still going on at a relatively low level but high enough. We are reclosed. This particular Option B does potentially put us in a position where the same situation might occur again.

That is what constitutes fishery independent information that would warrant a reclosure of a fishery that has been closed for a while, and actually waits to get going again in hopes that the fish are not spawning or they will go to an area where the fish are not spawning. I am uneasy about this, primarily because of the fact that again fisheries independent information is not defined well enough. I am going to oppose the motion for the reason that I've just stated. I just don't want a repeat of what happened this past fall.

CHAIRMAN WHITE: I know some of dependent information could come from tuna fishermen that are rod and reel herring, and I know that last year they volunteered to provide samples. That could be a method of getting dependent.

MR. PIERCE: If I may, Mr. Chairman. That is quite correct, but as we all know there is a great deal of controversy and conflict between those individuals who rightfully so are concerned about the impact of mid-water trawling specifically on the availability of tuna. If I am to say to the mid-water trawl fleet operating out of Gloucester, oh by the way we are reclosing because tuna fishermen have reported that the fish are still spawning. That is a problem. That is another reason why I don't support this motion, because of the possibility that the fishery to be impacted by a reclosure will not be the fishery that is resampled to determine if the fish are still spawning.

MR. STOCKWELL: I share David's concern but I have a different perspective. My sense is that this motion will preclude that from happening again. I guess going back to the general theme of effectiveness, we'll know for sure at the end of the year.

MR. ADLER: My concern on this thing goes back to what David had said something about. The samples were taken from otter trawls. From what I understand the spawning fish – correct me if I'm wrong – the spawning fish frequently on the bottom and the spent fish where the mid-water trawlers and probably the purse seiners would get them, has moved up in the water column.

If you are going to test for spawning fish and you pick them off the bottom, oh yes they're all spawning, and maybe they're not. I don't know how to fix that but if that is the scenario, we've got to be very careful when we go and take that test, where we're getting that fish from.

CHAIRMAN WHITE: Any other comments? Need to caucus? Take a couple of minutes. **Okay are we ready? All those in favor please raise your right hand; opposed, null votes, passes 6-1.** Okay I think we're 4.2.7.1. Terry, do you have a motion?

MR. STOCKWELL: I move Option B to remove the rollover provision. My terminology is a little bit impeded, because I think I've got the wrong numbers in my notes, so I'm going to have to refer to Mike to get the right numbers up on the board.

CHAIRMAN WHITE: Second. Seeing no second, is there another motion? Doug.

MR. GROUT: Move to select under Section 4.2.7.2 fixed gear set-aside provision adjustment, Option A status quo.

CHAIRMAN WHITE: Is there a second? Bill. Mr. Adler, second. Do you want to speak to it, Doug?

MR. GROUT: My rationale is that the data in the document shows that they rarely have caught fish after November, and the advisory panel was supporting the status quo on this.

MR. STOCKWELL: I am going to speak in strong opposition to this motion. It is certainly obvious why there are no landings after the first of November; it is because the fishery is closed. There is no opportunity for the small fixed gear fishermen to have any access to the fish after the overall quota is gone. Pat Keliher and I met with fixed-gear fishermen the last number of years reporting that bunches of fish have arrived close to closure of the overall 1A fishery and they've had no opportunities; 295 ton is not a great deal of fish.

We've bent over backwards sometimes in this commission to help the smaller guys, and it is not a small amount of fish. Look at the AP composition. Until recently we had no fixed gear fishermen on there. By the time we finally had them put on the AP; the AP had already made the recommendation. For those reasons I do not support this motion.

MR. ADLER: Yes, my question on this had to do with the fact that if they don't use the 295 or 6 metric tons it gets rolled into Area 1A, and the fixed gear fishermen could still use it; it is just coming out of 1A. Now I do understand what Terry just said about, well yes but when the whole thing closes the whole thing closes and you lose it. But I don't know if they don't take the 295, they don't take all of the metric tons and they keep it. They can keep fishing if the fish show up again after 1A is closed, and if they don't take it then what happens to let's say the

195, or whatever it is, they have left over? Do we just lose it?

MR. STOCKWELL: That is correct. If out of the 295 tons there has only been, as Doug pointed out, there is a small amount of it harvested prior to the closure of the overall quota. Should this option be moved ahead it would allow the fixed gear fishermen the opportunity to fish until the end of the calendar year. Any uncaught fish would be of conservation value, would not be available for use the following year.

CHAIRMAN WHITE: Any other comments, seeing none; do we need to caucus? **Seeing shaking heads, all those in favor raise your right hand; opposed, motion fails 4 to 2.** New motion?

MR. ROB O'REILLY: Mr. Chairman, I abstained on that one.

CHAIRMAN WHITE: Oh you abstained, I'm sorry. Thank you, Rob. The vote was 4, 2, 1. That would mean that status quo stays in place. Okay 4.2.8.

MR. STOCKWELL: Point of order. Toni.

MS. TONI KERNS: He can have another crack, maybe worded a little differently I guess. If it didn't get a second then technically it wasn't on the board for the parliamentary reason, I think. Mr. Chairman it is your decision. You can't do the same motion at the same meeting, but it failed for a lack of a second. Dennis is a good Robert's Rules of Order for me.

MR. DENNIS ABBOTT: I don't believe that can be brought up again.

CHAIRMAN WHITE: Yes, go ahead, Mark.

MR. GIBSON: I would have seconded that motion. It happened so fast. I don't know if that means anything now, but I would have had I been going as fast as you were.

CHAIRMAN WHITE: Do you have a comment, Doug?

MR. GROUT: Yes, just on this. I think my take on this from the Robert's Rules of Order is that if he had clearly made a motion that had been seconded and it had been defeated, you could not bring it up at the meeting. But it never received a second, so it really was not a motion that the board had at that particular point in time.

Given the fact that we're now in a conundrum that the status quo has failed, I think it would be warranted; unless somebody here at the board or maybe my parliamentary expert thinks that I may be in error. I think you could take this, since it was not seconded and was not on the floor.

CHAIRMAN WHITE: Dennis, can you bail us out of this?

MR. ABBOTT: I was out of the room, so I'm not sure really what happened. But from what I gather, maybe Senator Langley can agree or disagree. Trying to get back to this motion?

CHAIRMAN WHITE: We're trying to get back to the motion that Terry had made that didn't get a second.

MR. ABBOTT: I can't comment on that. That is just not there anymore. I don't see why not. There was no action taken on it. There was no vote taken. There could be another person in attendance who suddenly feels that they would be willing to second the motion.

CHAIRMAN WHITE: Unless there is an objection, I'm going to take the motion a second time if you would like to make it, Terry.

MR. STOCKWELL: Thank you, Mr. Chairman. I would move to select under Section 4.2.7.2 fixed gear set-aside provision, Option B.

CHAIRMAN WHITE: Is there a second? Mark. Do you want to speak to it again, or you don't think there is a need?

MR. STOCKWELL: I don't want to test my luck.

CHAIRMAN WHITE: Need for a caucus? **Seeing none; all in favor raise your right hand, 7; okay opposed none, null none, it passes unanimously**. Empty fish hold provision, Doug.

MR. GROUT: **I would like to move to select under Section 4.2.8, empty fish hold provision Option C1; federal/state empty fish hold provision for select vessels.**

CHAIRMAN WHITE: That motion does make it contingent on federal adoption?

MR. GROUT: It is contingent upon federal adoption; it is only going to be applied to A and B vessels that must pump fish. I think it gets at what we're trying to do here, and again it is contingent on whether the federal provision is approved; which I think is important to be as consistent as possible with our federal partners here

CHAIRMAN WHITE: Is there a second? David Pierce. Speak to it, David.

MR. PIERCE: I don't know where this stands right now with federal review. I can't recall what the service has said publically on this particular issue. But why not take the lead and indicate to the National Marine Fishery Service that this is something we feel should occur? We'll make it contingent upon their implementing the option and we'll assume that they will.

I can support this motion and just hope that the service will overcome whatever reservations it may have about this particular empty hold provision and go with it. I know that at our Gloucester public hearing everyone was in favor of this particular measure, including those who are involved in the mid-water trawl fleet. They said there was absolutely no reason why a vessel should be going back to sea with fish onboard. I would say there is a lot of support from the industry for this particular strategy and I hope it passes.

CHAIRMAN WHITE: Mark, did you have? Eric.

MR. ERIC REID: I would like to thank the commission for spending so much time on this particular issue. Obviously I would support it. What it does is it fully reflects actual fishing practices. I'm not talking about wasteful fishing practices. Hopefully the commission will follow through and pass this one along as well.

CHAIRMAN WHITE: Any other comments? Seeing none; need for caucus**? Seeing no heads shaking all those in favor, raise your right hand; 7, okay opposed, nulls, passes unanimously.** Doug did you have a motion on implementation date?

MR. GROUT: Yes, I didn't send it to Ashton but I'll put up a motion on an implementation date for board consideration. I'm not tied to this date. **I was going to move to have an implementation date of June 1, 2016.** If I get a second to that I'll give my rationale for that date.

CHAIRMAN WHITE: Second, Bill Adler.

MR. GROUT: Yes that is the beginning of the 1A fishery every year, based on our Section action here. It seems if we have this in by place by then even if the states can do this in their regulatory process it seemed like an appropriate date to have an implementation.

CHAIRMAN WHITE: David, you have a comment?

MR. PIERCE: Well, obviously we'll move forward as fast as we can to implement what needs to be put in place. But just as a word of caution, it may be difficult for us to make this implementation date of June 1st, because of the new nature of the review within the commonwealth as to what regulations are going to go to public hearing, what comes out of public hearing. It has become a lot more complicated for us in the last few years. If this passes we'll strive for June 1st, but I just wanted to make everyone aware that it may be July or August. But we'll move as quickly as we can on it.

CHAIRMAN WHITE: Any other comments? Yes Mark, go ahead.

MR. GIBSON: I would just express the same concerns for Rhode Island. We're into February. We already have a loaded public hearing docket, in-house actions. I wouldn't ask the date be changed, but I think we can make it but you never know.

MR. STOCKWELL: Ditto for Maine.

CHAIRMAN WHITE: Okay all on the record. Need to caucus? **Seeing no heads shaking, all in favor raise your right hand, opposed, null votes. The motion passes.** Okay now we're going to need a motion to pass the amendment. This will be a roll call vote. Bill, would you like to make that motion?

MR. ADLER: **Yes, I would like to make a motion that we pass this amendment as adjusted today and as chosen today. Is that what you want?**

CHAIRMAN WHITE: Yes, is there a second? Oops, stand by, Toni?

MS. KERNS: **Bill, because this is an amendment we need to take this to the full commission, so it would be move to recommend to the full commission to approve Amendment 3 as modified today.**

MR. ADLER: That sounds good. Yes that is what I said.

CHAIRMAN WHITE: I thought you said that, Bill. Is there a second? Steve Train. Need to caucus? Seeing non heads shaking, we'll need the roll call read.

MS. HARP: Terry Stockwell.

MR. STOCKWELL: Yes.

MS. HARP: New Hampshire.

MR. GROUT: Yes.

MS. HARP: Massachusetts.

MR ADLER: Yes.

MS. HARP: Rhode Island.

MR. REID: Yes.

MS. HARP: Connecticut.

MR. DAVID G. SIMPSON: Yes.

MS. HARP: New York.

MR. HASBROUCK: Yes.

MS. HARP: New Jersey.

MR. RUSS ALLEN: Yes.

CHAIRMAN WHITE: **Okay it passes unanimously, very good.** I know we're trying to make up time. I had one more agenda item that I requested of Ashton, and that is overview of the research set-aside program. You have a written document that was handed out. My suggestion is that we wait until the next meeting for her to go over that and answer any questions. If there are no objections to that move to the last item of business.

ADJOURNMENT

Is there any new business, seeing none; the motion to adjourn?

(Whereupon, the meeting was adjourned at 3:12 o'clock p.m., February 2, 2016.)

Atlantic States Marine Fisheries Commission

WHITE PAPER ON ATLANTIC HERRING AREA 1A FISHERY PERFORMANCE IN 2015 AND 2016

Ashton Harp, Atlantic Herring Fishery Management Plan Coordinator

October 2016

I. OVERVIEW

This white paper provides an overview of Area 1A Atlantic herring management, landings and alternative management tools for consideration by the Atlantic Herring Section when it meets to discuss fishery performance in October 2016. It is being brought forward by a subset of the Section (member states of Maine, New Hampshire and Massachusetts) to elevate to the full Section issues that were identified during recent days out discussions. In particular, the accelerated pace of Area 1A Trimester 2 landings and the increasingly dynamic nature of days out measures to control Trimester 2 effort that have varied across states. The list of identified alternative management tools to address these issues is not a comprehensive list and should be viewed as topics to discuss, not pre-determined pathways.

II. INTRODUCTION

The Atlantic herring summer and early fall fishery (June-September) recently has been most active in Areas 1A and 3 (Figure 1). Demand is primarily driven by lobstermen during this timeframe because herring is the preferred bait for lobster traps. Traditionally, inshore (Area 1A) and offshore (Area 3) herring landings combined with (inshore) effort controls have supplied fishermen and the bait market with adequate amounts of herring. The primary effort controls in Area 1A are landing day restrictions and seasonal quotas.

In 2015 and early in the 2016 fishing season, the Area 1A seasonal quota was harvested at an above-average rate and there were concerns about the availability of Atlantic herring bait throughout the summer and early fall months (June-September). In response, Atlantic Herring Section members from Maine, New Hampshire and Massachusetts reduced the number of landing days available to herring harvesters in Area 1A. In 2016, Maine took additional measures to restrict fishing days, weekly landings, at-sea transfers, etc. to further slow the rate of harvest.

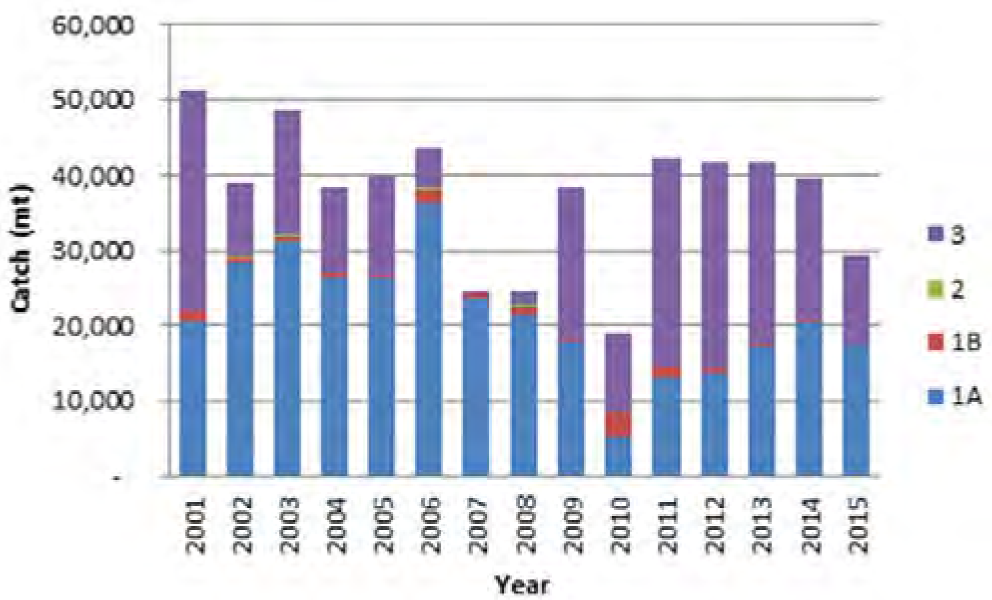

Figure 1. Harvest by Management Area from June through September, 2001-2015
Source: NMFS

III. BACKGROUND

DESCRIPTION OF AREA 1A MANAGEMENT

The U.S. Atlantic herring fishery is currently managed through complementary fishery management plans (FMPs) by the Atlantic States Marine Fisheries Commission (ASMFC) and the New England Fishery Management Council (NEFMC). The stockwide annual catch limit (ACL) is divided amongst four distinct management areas: inshore Gulf of Maine (Area 1A), offshore Gulf of Maine (Area 1B), Southern New England/Mid-Atlantic (Area 2), and Georges Bank (Area 3). The Area 1A fishery is managed by ASMFC's Atlantic Herring Section, which includes representatives from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York and New Jersey.

The Section can use bi-monthly or trimester seasonal quotas to distribute the Area 1A sub-ACL to best meet the needs of the fishery. The actual splits (amounts or percentages by months or trimesters) are set as part of the annual specifications process. Since 2009 (Addendum I to Amendment 2), the Section has split the Area 1A sub-ACL into trimesters as follows:

Table 1. Current seasonal quota allocation of the Area 1A sub-ACL

Trimester 1	January 1 - May 31	0%[1]
Trimester 2	June 1 – September 30	72.8%
Trimester 3	October 1 – December 31	27.2%

[1] NEFMC has proposed a seasonal Area 1A sub-ACL division of 0% from January-May in the 2013-2015 and 2016-2018 specifications.

The Section also utilizes days out of the fishery to slow the rate of Area 1A catch so the seasonal quota can be spread throughout the entirety of each trimester. The phrase 'day out' originally meant one could not fish or land on a day out of the fishery. At present, it refers to a no landing day. Prior to each trimester, Section members from states adjacent to Area 1A (Maine, New Hampshire and Massachusetts), with input from stakeholders, set the number of Area 1A landings days per week via a Days Out Meeting.

At each Days Out Meeting the Atlantic Herring Technical Committee provides projected landing day scenarios based on the catch rates from the previous three years. The states adjacent to Area 1A agree to the start date, the numbers of days out of the fishery per week, as well as which consecutive days of the week a vessel can land Atlantic herring. For example, '4 days out' would be interpreted on a weekly basis, meaning 4 consecutive days out of each week will be no landings days. If states cannot agree on the specific days out then the decision will go before the full Section at the next ASMFC meeting or at a special meeting of the Section called by the Chair. Adjustment to the days out can only be made if states hold another meeting or conference call.

HISTORY OF AREA 1A EFFORT CONTROLS

The days out management measures, first implemented in 1999 via Amendment 1 to the Atlantic Herring FMP, established fixed days out of the fishery relative to harvest levels. It was called a 'day out' because a vessel could not land or fish on the designated days out. For example, Friday, Saturday and Sunday were no landing/fishing days when 75% of the total allowable catch was expected to be exceeded; at 90%, Monday also became a no landing/fishing day. Amendment 2 (2006) removed the fixed landing days and allowed Section members to decide the specific days out of the fishery, as long as they were consecutive days. Consecutive days are seen as more effective because the fishery has to wait a period of time before resuming fishing efforts.

In the 2007 and 2008 fishing years there was a bait shortage due to a reduced Area 1A quota and increased effort including an increase in the number of carrier vessels. The Section took action via Addendum I to Amendment 2 (2009) by creating seasonal quotas (bi-monthly periods or trimesters) to control effort and distribute the quota seasonally. In addition, a process to determine days out of the fishery was established, and the prohibition on fishing during a day out was removed due to jurisdictional concerns from the ASMFC Law Enforcement Committee. These days out measures and seasonal quotas are the primary effort controls in the Area 1A fishery.

AREA 1A EFFORT CONTROLS IN PRACTICE

The majority (72.8%) of the Area 1A sub-ACL has been allocated during the months of June through September (Trimester 2). This time period largely overlaps with the peak months for lobster landings (Figure 2), where herring is the most widely used bait type (Dayton et al 2014).

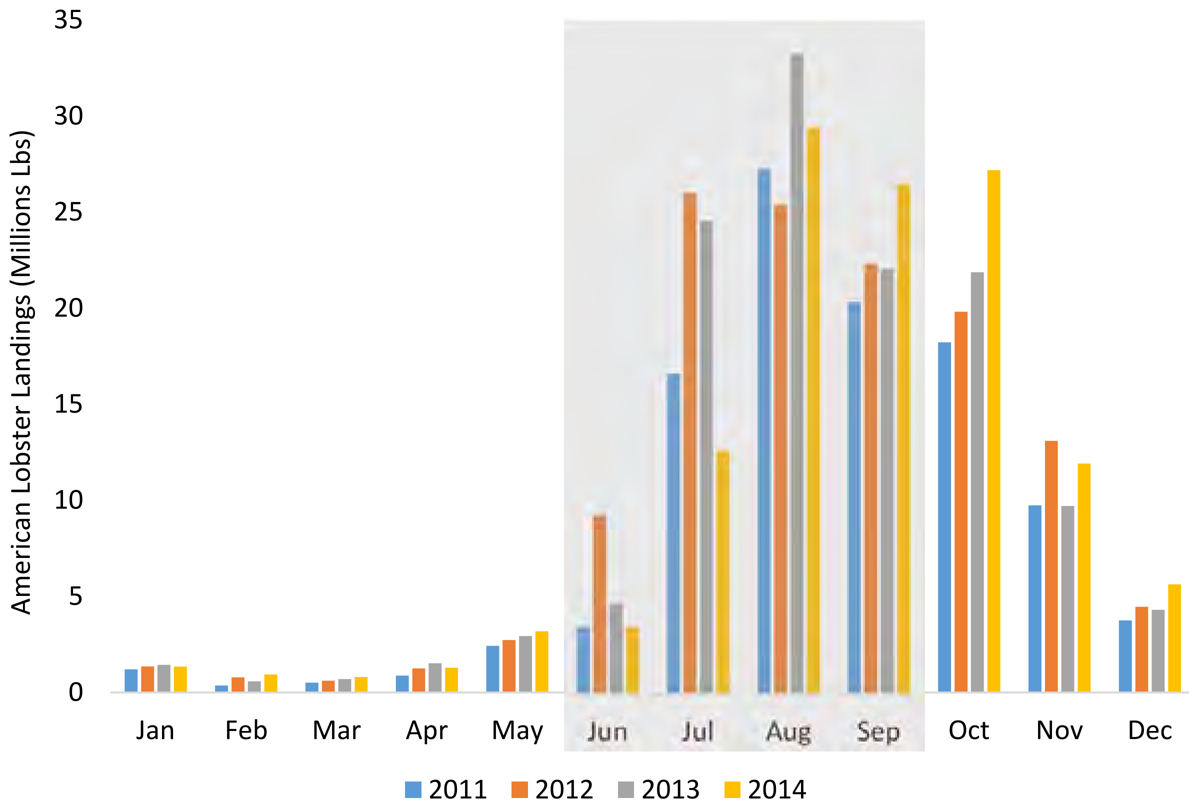

Figure 2. Monthly landings of American lobsters in Maine (2011-2014). The months within Trimester 2 of the Atlantic Herring Area 1A fishery are shaded in grey. Source: ACCSP

Table 2 shows the historical landing days during Trimester 2 of the Area 1A fishery. At the start of the season, managers make planned landing day adjustments based on fishery performance from previous years. At times, managers have to make reactionary changes in-season to increase or decrease the landings days based on the amount of seasonal quota available.

In 2011, 2012 and 2014 managers gradually increased the amount of landing days such that Trimester 2 ended with seven landing days to ensure the seasonal quota was harvested. In 2013, the season opened with seven landing days and was restricted to zero landing days by the beginning of September. In 2015, managers planned to gradually increase the amount of landing days, but instead the fishery was restricted to zero landing days by the end of August. In 2016, the Section planned to gradually increase the number of landing days in June/July, however, higher than expected landings in the latter half of June resulted in landing day restrictions in mid-July and mid-September.

Table 2. Area 1A Landing Days during Trimester 2 (2011-2016)

Year	Trimester 2	Landing Days	Comments
2011	June 1 – June 26	2	3 in-season planned changes; 1 reactionary
2011	June 27 – July 17	3	
2011	July 18 – Aug 7	4	
2011	Aug 8 – Sept 30 (*reactionary*)	7	
2012	June 1 - 30	2	3 in-season planned changes
2012	July 1 – 14	4	
2012	July 15 – Sept 30	7	
2013	June 1 – Sept 30	7	1 reactionary in-season change
2013	Sept 9 – 30 *(reactionary)*	0	
2014	June 1 – July 6	5	1 reactionary in-season change
2014	July 7 – Sept 30 *(reactionary)*	7	
2015	June 1- July 5	5	2 in-season planned changes; 1 reactionary
2015	July 6 – Aug 27	7	
2015	Aug 28 – Sept 30 *(reactionary)*	0	
2016	June 1 – 30	3	3 in-season planned changes; 2 reactionary
2016	July 1-14	4	
2016	July 15-23	5	
2016	July 24 – Sept 17 *(reactionary)*	2	
2016	Sept 18 – Sept 30 *(reactionary)*	0	

IV. RECENT CONCERNS ABOUT AREA 1A FISHERY PERFORMANCE

2015 FISHING SEASON

Concern: In Area 1A the rate of landings accelerated in August such that the seasonal quota was exceeded on August 28; triggering a zero landing day scenario for all of September.

During June – September, the focal months of the white paper, the source of Atlantic herring landings were from Area 1A and Area 3. Figure 3 provides a monthly overview of Atlantic herring landings in 2015. Figure 4 shows a July/August increase in Area 1A landings as Area 3 landings became stagnant, likely due to Georges Bank haddock catch cap concerns[2]. Based on preliminary haddock data, 63% of the Georges Bank haddock catch cap had been used by the midwater trawl fleet at the end of July (Table 3)—Area 3 landings decreased sharply in August. This lack of Area 3 landings in August disrupted the flow of herring supply to markets and put more pressure on Area 1A.

On August 26, the Commission scheduled an emergency days out call to discuss the increase in Area 1A landings. Some harvesters agreed to stop fishing until the next landings report was

[2] Haddock comprises the largest component of groundfish bycatch by midwater trawl vessels directing on herring, and the catch of haddock by these vessels is managed by the New England Fishery Management Council (NEFMC) through a catch cap and increased monitoring/sampling (Amendment 5 to the NEFMC Atlantic Herring FMP).

released. Ultimately, the sudden increase in effort in August could not be diminished by decreasing the number of landing days, rather the Area 1A fishery moved to zero landing days on August 28. As a result, Atlantic herring vessels could not fish in Area 1A during the month of September, when demand for herring is strong. Area 1A re-opened for Trimester 3 on October 5, 2015 with three landing days and closed on November 9, 2015.

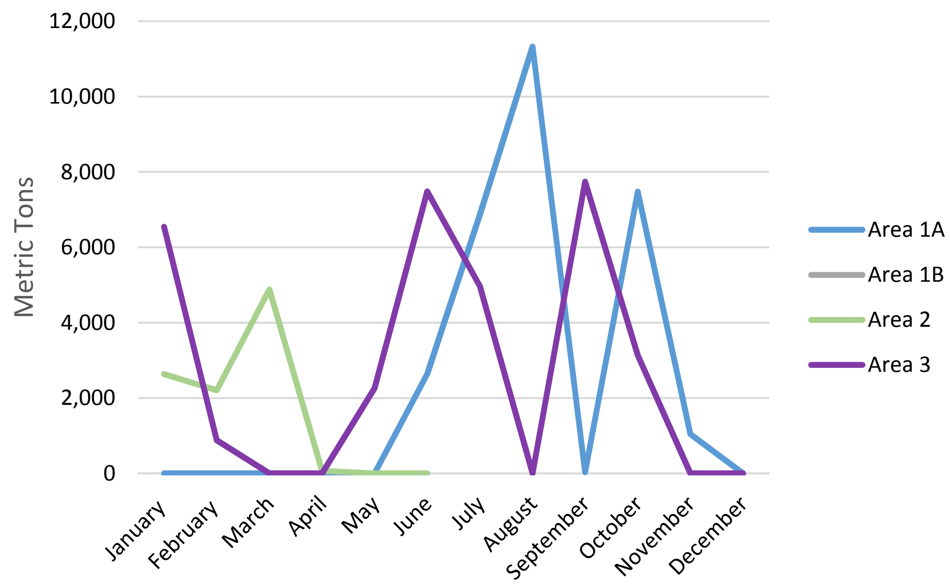

Figure 3. 2015 Monthly Atlantic Herring Landings by Management Area
Source: NMFS. This is preliminary landings data, confidential data has been omitted

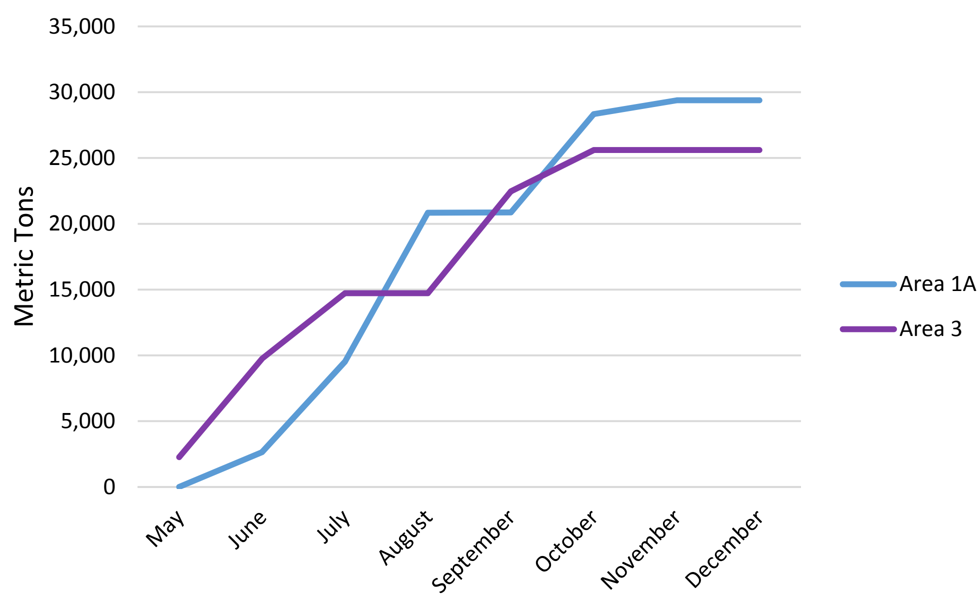

Figure 4. Cumulative Atlantic Herring Landings from May through December in 2015
Source: NMFS. This is preliminary landings data, confidential data has been omitted

Table 3. Georges Bank Haddock Catch by Herring Midwater Trawl Vessels, May 2015 – August 2016. Source: NMFS, preliminary data

	Month	Monthly Estimated Haddock Catch (mt)	Cumulative Estimated Haddock Catch (mt)	Cumulative Percent of Quota
	May	43.09	43.09	18.98%
	June	54.51	97.59	42.99%
	July	45.7	143.29	63.12%
	August	0.25	143.54	63.23%
	September	66.32	209.87	92.45%
	October	25.68	235.54	103.76%
	November	0	235.54	103.76%
	December	0	235.54	103.76%
	January	0	235.54	103.76%
	February	0	235.54	103.76%
	March	0	235.54	103.76%
	April	0	235.54	103.76%
FY2016	May	23.6	23.6	4.50%
	June	3	26.6	5.10%
	July	0.1	26.7	5.10%
	August	0.8	27.5	5.30%

2016 FISHING SEASON

Concern: Above-average landings at the start of the season, and thereafter, led to emergency restrictions for vessels landing in Maine (on behalf of Maine DMR), which were more restrictive than those of the Commission.

The 2016 Area 1A Atlantic herring fishing season opened in June to almost double the projected landings. For example, three weeks into June the fishery was projected to have harvested 1,300 mt, however 2,837 mt[3] had been harvested. Figure 5 provides a monthly overview of Atlantic herring landings in 2016. During June – August, the primary source of Atlantic herring landings was from Area 1A. Similar to 2015 but earlier in the season, Area 3 landings became stagnant and Area 1A landings increased (Figure 6). Area 3 herring fishermen reported finding some Atlantic herring schools, but in deep waters and intermixed with haddock schools. Utilizing the more than half of the Georges Bank haddock catch cap (Table 3) so early in the 2015 fishing season prompted a small number of midwater trawl vessels to shift effort to Area 1A to operate as purse seiners[4].

[3] Preliminary landings data
[4] In 2007, federal regulations prohibited midwater trawlers from fishing in Area 1A from June 1-September 30.

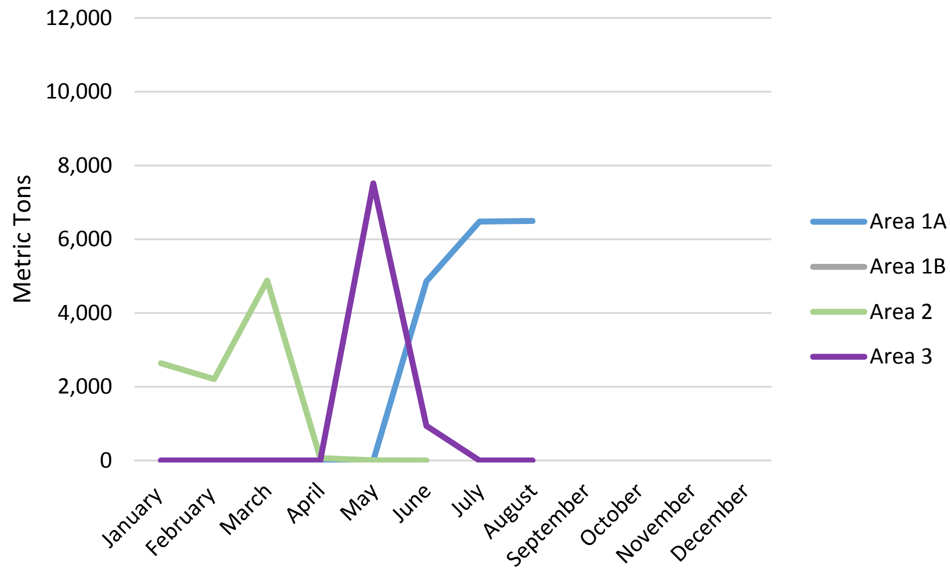

Figure 5. 2016 Monthly Atlantic Herring Landings by Management Area
Source: NMFS. This is preliminary landings data, confidential data has been omitted

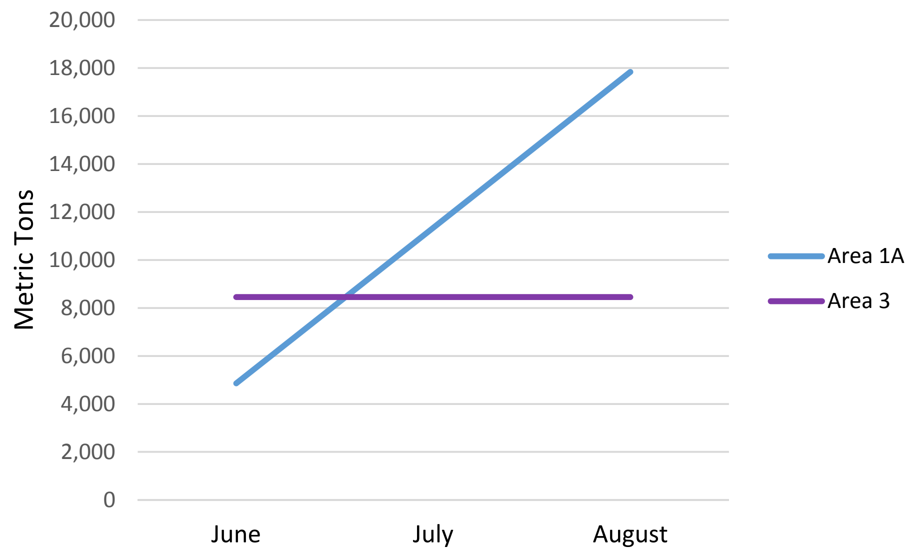

Figure 6. Cumulative Atlantic Herring Landings from June through August in 2016
Source: NMFS. This is preliminary landings data, confidential data has been omitted

Adding to the increased effort in Area 1A were the effects from other fisheries, specifically the New Jersey menhaden purse seine fishery closed on June 25, 2016 which reportedly prompted a southern vessel to re-locate to Massachusetts to harvest Atlantic herring.

In an attempt to extend the Trimester 2 quota into September, Maine's Department of Marine Resources (DMR) implemented a series of emergency rules that were more restrictive than ASMFC regulations (states can implement measures that are more restrictive than that of the

Commission, but not less so). DMR's measures only applied to vessels landing in Maine. The final measures, effective July 9, 2016, included:

1. Weekly landing limit of 600,000 pounds (15 trucks)
2. 3 consecutive fishing days
3. 2 consecutive landing days
4. Harvester vessels are limited to making one landing per 24-hour period
5. Harvester vessels are limited to making at-sea transfers to only one carrier per week.
6. All carrier vessels landing herring are limited to receiving at-sea transfers from one vessels per week.

A days out call was scheduled on July 20 to discuss the current landing day scenario and Maine's emergency rules. The states of Maine, New Hampshire and Massachusetts agreed to decrease the landing days from five to two days per week, but did not adopt the rest of the restrictions. Maine DMR kept the emergency restrictions in place throughout Trimester 2. The Area 1A fishery moved to zero landing days on September 18, 2016.

V. MANAGEMENT ALTERNATIVES

The following alternative management measures, which seek to acknowledge current fishing practices and provide equitable fishing opportunities for all fishermen and regions, have been suggested by Commissioners for Section consideration and discussion. They are grouped by the complexity of the action(s), specifically whether it would require an amendment, addendum or specification adjustment (Table 4). Individual action(s) can be selected or modified for future inclusion in a draft management document if agreed upon by the Section.

Table 4. Management document associated with management alternatives

Potential Action	Addendum	Amendment	Specifications	Requires complementary action by NMFS
Landing days do not have to be consecutive	X			
Small Mesh Bottom Trawl Days Out	X			
Restrict fishing days	X			X - maybe
Weekly landing limit and restrict transfers at sea	X			
Clarify Days Out procedure	X			
Restrict vessels from midseason gear changes	X			X
SMBT set-aside	X			X

Modify in-season allocation			X	
Small Mesh Bottom Trawl sub-ACL		X		X

The following management action could be adjusted under annual specifications at the Annual Meeting. This is the only adjustment that would impact the 2017 fishing season. The other options require multiple Section meetings to review and possibly approve.

1. *Modify the Area 1A in-season allocation.*
   - Traditionally the Section has opted to separate the Area 1A sub-ACL into trimesters (Table 1). Amendment 2 included other trimester and bi-monthly quota allocations to consider (Table 5a and 5b). Alternative allocations would be designated in the annual specifications. A bi-monthly quota allocation would require significant increased Technical Committee effort to track. Changing when the quota can be taken may not address the increase in effort that carrier vessels provide to smaller vessels.

Table 5a. Bi-monthly quota percent allocations. Percentages were calculated using vessel trip reports from 2000 – 2007

Bi-Monthly Quotas								
January – December			No Landings Prior to June 1 (with June as a one-month period)			No Landings Prior to June 1 (with December as a one-month period)		
Period	**Months**	**%**	**Period**	**Months**	**%**	**Period**	**Months**	**%**
1	Jan/Feb	1.5%	1	June	16.4%	1	June/July	36.8%
2	Mar/Apr	2.3%	2	July/Aug	40.1%	2	Aug/Sep	36.0%
3	May/June	24.0%	3	Sep/Oct	34.0%	3	Oct/Nov	27.1%
4	July/Aug	34.6%	4	Nov/Dec	9.5%	4	Dec	0.2%
5	Sep/Oct	29.4%						
6	Nov/Dec	8.2%						

Table 5b. Trimester and seasonal quota percent allocations. Percentages were calculated using vessel trip reports from 2000 – 2007

Trimesters			Seasonal Quotas					
January – December			January - December			No Landings Prior to June 1		
Trimester	**Months**	**%**	**Season**	**Months**	**%**	**Season**	**Season**	**%**
1	Jan - May	13.7%	1	Jan - Sep	76.5%	1	Jun - Sep	72.8%

2	Jun - Sept	62.8%	2	Oct - Dec	23.5%	2	Oct - Dec	27.2%
3	Oct - Dec	23.5%						

The following management measures would need to be considered through the addendum process and, in some cases, require a complementary effort by the National Marine Fisheries Service (NMFS). If Draft Addendum I to Amendment 3 is initiated at the Annual Meeting the management measure(s) may be implemented prior to the 2018 Area 1A fishing season (Table 6).

1. *Modify the Days Out program such that landing days are no longer consecutive days.*
   - Consecutive days out of the fishery has been deemed more effective because the fishery has to wait a longer period of time in between landing days. The Days Out program has always incorporated the use of consecutive landing days, typically starting on Sunday/Monday. However, landing days could be dispersed through the week to accommodate various needs within the fishery. For example, in Maine herring is landed on Sunday evening so it is ready for the bait market on Monday. In New Hampshire fishermen prefer to harvest herring on Friday when the whiting (silver hake) market is not active. In this scenario, states want non-consecutive landing days which may include a Sunday/Monday landing day and a Friday landing day, but not a Saturday landing day due to worker related overtime costs.
2. *Modify the Days Out program such that the small-mesh bottom trawl fleet (SMBT) could have a different allocation of landings days and times that are separate from the purse seine and mid-water trawl fleet landing days. This measure was previously considered in Addendum III to Amendment 2 but was not adopted.*
   - Currently SMBT vessels follow the same landing days as the rest of the fishery. However, SMBT vessels land about 1% of the herring taken in Area 1A, therefore, limiting these vessels does very little in terms of spreading out the catch. A small day boat that uses SMBT gear does not have the ability to fish prior to a landing day like other gears, they fish and land on the same day. The option would allow SMBT fleet to harvest herring on days that are closed to landing for purse seine and mid-water trawl fleets. If this option were adopted there could be a scenario where purse seine and midwater trawl vessels were limited to 3 landing days and SMBT vessels were allowed 5 to 7 landing days. Some herring vessels use multiple gear types during the fishing year so there is potential for a vessel to switch to SMBT to have more landing days, this could be restricted if it applied to SMBT vessels with a C or D permit.
3. *Modify the Days Out program to restrict fishing days, in addition to landing days.*
   - A restriction on fishing days was included in the original Days Out program, but removed via Amendment 2 because the Law Enforcement Committee (LEC) said they could not effectively enforce the provision. As stated in a 2009 LEC memo, the vast majority of fishing takes place in federal waters where state officers have no authority to enforce ASMFC regulations. If NMFS adopted the Days Out

provisions then the states would be able to enforce the provisions through a Joint Enforcement Agreement. This regulation would then need to be adopted by all states in order to be effective.

4. *Modify the Days Out program to create a weekly landing limit (pounds & trucks). In addition, harvester vessels are limited to making at-sea transfers to only one carrier per week. All carrier vessels landing herring are limited to receiving at-sea transfers from one vessel per week.*
   - Currently the Days Out program is specific to landing day restrictions. The increase in the number of carrier vessels has rendered days out less effective in controlling effort because vessels can transfer catch to large carrier vessels at-sea, allowing harvesters addition days of fishing beyond the days that are open to landings. The state of Maine implemented a 600,000 pound weekly landing limit in 2016 and restricted at-sea transfers. This measure may be more difficult to implement if a state does not have its own monitoring system or access to VMS reports.
5. *Clarify what it means for states to "agree" on the numbers of days out in the fishery, does this mean consensus or vote? If states, cannot agree then what is the default landing day scenario, 7 landing days?*
   - As stated in the Days Out procedural language, if Section members from Maine, New Hampshire, and Massachusetts cannot agree on the specific 'days out', then the matter will go before the full Section for review at the next ASMFC meeting week or at a special meeting of the Section called by the Chairman. States have been selecting landing days by voting. Default landing days are currently interpreted as seven landing days if no decision is made.
7. *Restrict a vessel from operating a vessel using a different gear mid-season in Area 1A.*
   - At the start of the fishing season a vessel would have to designate their Area 1A gear type and switching mid-season would not be allowed. ASMFC and NMFS would have to adopt similar regulations for this to be enforceable.
8. *Set-aside a percentage or value of the Area 1A sub-ACL for the SMBT.*
   - A research set-aside (3%) and a fixed-gear set-aside (295 metric tons) are deducted annual from the Area 1A sub-ACL. If approved by ASMFC and NMFS, a SMBT set-aside would be in addition. Weekly reporting would be necessary to effectively monitor a SMBT set-aside. Federal IVR is an existing reporting system that could be used to monitor SMBT landings weekly, but IVR reports do not include gear type. In order to successfully manage a SMBT set-aside, the NMFS would need to adjust IVR reporting requirements to include gear type, including mesh size. If a vessel with a limited access permit switches to SMBT than VMS monitoring reporting is required. During Area 1A Trimester 2, SMBT vessels have landed less than 100 MT since at least 2013. This measure may be more difficult if a state does not have its own monitoring system. In addition, it is different than a fixed gear set aside because SMBT vessels can easily switch to operate as a midwater trawl vessel.

Table 6. Draft timeline if an addendum is initiated at the Annual Meeting

October 2016	Atlantic Herring Section initiates Addendum I to Amendment 3
May 2017	Section reviews Draft Addendum I and considers its approval for public comment
May–July 2017	Section solicits public comment and states conduct public hearings
August 2017	Section reviews public comment, selects management options and considers final approval of Addendum I
May 2018	Provisions of Addendum I are implemented by states

The following management measures would need to be considered the amendment process and would require joint cooperation with NMFS. If Draft Amendment 4 is initiated at the Annual Meeting, the management measures could be implemented prior to the 2019 Area 1A fishing season. A draft Public Information Document would be presented at the May 2017 meeting.

1. *Allocate a sub-ACL for the small-mesh bottom trawl fleet. This measure was previously considered in Addendum III to Amendment 2 but was not adopted.*
    - Currently there are four management areas for Atlantic herring with respective sub-ACLs. If approved by ASMFC and NMFS this would create a 5th sub-ACL for the SMBT fleet. Weekly reporting would be necessary to effectively monitor a SMBT sub-ACL. Federal IVR is an existing reporting system for open access permits that could be used to monitor SMBT landings weekly, but IVR reports do not include gear type. In order to successfully manage a SMBT sub-ACL, the NMFS would need to adjust IVR reporting requirements to include gear type, including mesh size. If a vessel with a limited access permit switches to SMBT than VMS monitoring reporting is required. During Area 1A Trimester 2, SMBT vessels have landed less than 100 MT since at least 2013.

VI. LITERATURE CITED

Dayton A, Sun JC & Larabee J. (2014). Understanding Opportunities and Barriers to Profitability in the New England Lobster Industry. Portland, ME: Gulf of Maine Research Institute. 15-16 p.

NEFMC. (2012). Final Amendment 5 to the Atlantic Herring Fishery Management Plan, Incorporating the Environmental Impact Statement. Vol. I and II. Newburyport, MA: M New England Fishery Management Council in consultation with the ASMFC, and NMFS.

Mr. Doug Grout and members of the herring section, October 3, 2016

The landing day strategy instituted by the herring section has been an unmitigated failure for New Hampshire few remaining small draggers. On a personal basis I have had only two days in the entire season when I was able to land more than the incidental catch limit. Large boats often fish two or three days using refrigerated seawater systems(RSW) to tank the fish for the landing day. Small boats have no such ability and are constrained to fishing on the landing days. We are further constrained by weather and the fact that the fish have to go to the bottom for us to catch them with raised footrope trawls. This may only occur several days per week.

I understand you have to constrain the larger boats to keep from exceeding the quota, but a one size fits all management strategy that eliminates the small boats from the fishery is discriminatory.

Before the start of the 2017 season the section should either implement different management solutions for different segments of the fishery or New Hampshire should create its own limits for vessels landing in New Hampshire. New Hampshire vessels only have a few days a year they catch more than 5000 pounds. One possible solution is to increase the incidental catch to 5000 pounds and keep the days out strategy in place. This would at least allow us to make a living while having neglible effects on the 1a quota.

Another solution would be to give the category C and D vessels a weekly quota by permit type. Currently C boats are limited to 55000 pounds per day and D permits 6600 pounds. For example you could give the C boats 30,000 per weeks and the D boats 15,000 pounds. This is still substantially less than they could catch if the fishery were open seven days per week, but would again allow them to make a living on the days when the fish go to the bottom. Again this would remove them from the landing days scenario.

I have also been told that NHFG in constrained in its ability to create viable solutions through rule making by state statutes. Whatever needs to be changed should be submitted to the legislature after the elections so there are no impediments to creative solutions in 2017. On a personal basis I will be contacting seacoast legislators soon after the election to request action.

As demonstrated above, there are solutions and status quo is not an option. Allowing one group of vessels to land 600,000 pounds per week, while limiting another group to 2000 pounds per day is not an equitable distribution of the resource.

I look forward to working with you and members of the section on a solution to this issue.

Sincerely,

David T. Goethel
F/V Ellen Diane
23 Ridgeview Terrace
Hampton, NH 03842
Submitted electronically

Atlantic States Marine Fisheries Commission

American Lobster Management Board

October 27, 2016
12:30 – 4:00 p.m.
Bar Harbor, Maine

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(D. Borden)*	12:30 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from August 2016	12:30 p.m.
3.	Public Comment	12:35 p.m.
4.	Consider American Lobster Draft Addendum XXV for Public Comment (*M. Ware)* **Action**	12:45 p.m.
5.	Discussion on Trap Caps Included in Addenda XXI and XXII (*M. Ware*)	1:45 p.m.
6.	American Lobster Reporting Work Group Report *(M. Ware)* **Possible Action**	2:00 p.m.
7.	Consider Jonah Crab Draft Addendum II for Public Comment **Action** • Jonah Crab Working Group Report *(M. Ware)*	2:45 p.m.
8.	Consider Approval of 2016 American Lobster FMP Review and State Compliance *(M. Ware)* **Action**	3:40 p.m.
9.	Update on the Atlantic Marine Monument Designation *(M. Ware)*	3:45 p.m.
10.	Update on New England Fishery Management Council Deep-Sea Coral Amendment *(M. Ware)*	3:55 p.m.
11.	Other Business/Adjourn	4:00 p.m.

The meeting will be held at the Harborside Hotel, 55 West Street, Bar Harbor, Maine; 207.288.5033

Vision: Sustainably Managing Atlantic Coastal Fisheries

MEETING OVERVIEW

American Lobster Management Board Meeting
Thursday, October 27, 2016
12:30 – 4:00 p.m.
Bar Harbor, Maine

Chair: David Borden (RI) Assumed Chairmanship: 02/16	Technical Committee Chair: Kathleen Reardon (ME)	Law Enforcement Committee Representative: John Cornish (ME)
Vice Chair: Stephen Train (ME)	Advisory Panel Chair: Grant Moore (MA)	Previous Board Meeting: August 4, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, VA, NMFS, NEFMC (12 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 2016

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. American Lobster Draft Addendum XXV (12:45-1:45 p.m.) Action
Background • The 2015 Stock Assessment concluded the SNE lobster stock is at record low abundance and is experiencing recruitment failure. • In response, the Board initiated Addendum XXV to increase egg production and decrease fishing pressure in the SNE stock. • At the August 2016 meeting, the Board instructed the PDT to develop options that consider a 0%, 20%, 40%, and 60% increase in egg production.
Presentations • Overview of draft Addendum XXV for public comment by M. Ware **(Supplemental Materials)**
Board actions for consideration at this meeting • Approve draft Addendum XXV for public comment.

5. Discussion on Trap Caps Included in Addenda XXI and XXII (1:45-2:00 p.m.)
Background • In a letter to the Board, GARFO stated that it is suspending its rule-making for Addenda XXI and XXII until there is more clarity on the management action that will be taken in SNE.

- On a September 7th conference call, the Trap Cap Working Group discussed the individual ownership caps and active trap caps prescribed in Addendum XXI and XXII. There may be an option to move forward with active trap caps in federal waters.

Presentations

- Overview of discussion by Trap Cap Working Group by M. Ware **(Briefing Materials)**

6. American Lobster Reporting Work Group Report (2:00-2:45 p.m.) Possible Action

Background

- Currently, Addendum X requires 100% dealer reporting and at least 10% active harvester reporting in the lobster fishery.
- There is concern that the current reporting requirements do not provide enough information to accurately characterize the lobster fishery.
- The Lobster Reporting Work Group met on September 26th to discuss ways to improve reporting in the fishery.

Presentations

- Lobster Reporting Work Group Report by M. Ware **(Briefing Materials)**

Board actions for consideration at this meeting

- Initiate an addendum to improve reporting in the lobster fishery.

7. Jonah Crab Draft Addendum II (2:45-3:40 p.m.) Action

Background

- There is concern about the equity of the current claw provision as some claw fishermen can continue this practice while others must land whole crabs. NOAA Fisheries also stated it may prove challenging to implement the current claw provision due to National Standard 4.
- The Board initiated Addendum II to consider a coastwide standard for claw harvest in the Jonah crab fishery.
- The Jonah Crab Working Group met via conference call on September 12th to discuss options in the Addendum. The group is also proposing that a second issue be added to the addendum to consider creating a definition of bycatch in the Jonah crab fishery.

Presentations

- Overview of draft Addendum II for public comment by M. Ware **(Briefing Materials)**
- Jonah Crab Working Group Report by M. Ware **(Briefing Materials)**

Board actions for consideration at this meeting

- Approve draft Addendum II for public comment.

8. Fishery Management Plan Review (3:40-3:45 p.m.) Action

Background

- State Compliance Reports for the lobster fishery are due on August 1
- The Plan Review Team reviewed each state report and compiled the annual FMP Review.
- Delaware, Maryland, and Virginia have requested *de minimis* status.

Presentations

- Overview of the FMP Review Report by M. Ware. **(Supplemental Materials)**

Board actions for consideration at this meeting

- Accept 2016 FMP Review and State Compliance Report.
- Approve de minimis requests

9. Update on Monument Designation in the Atlantic Ocean (3:45-3:55)
Background • On September 15th, a Marine Monument was declared in the Atlantic Ocean which encompasses Oceanographer, Lydonia, and Gilbert canyons as well as seamounts. Lobster fishing is permitted for 7 more years within the monument boundaries.
Presentations • Update on Marine Monument by M. Ware

10. Update on NEFMC Omnibus Deep-Sea Coral Amendment (3:55-4:00)
Background • The NEFMC is currently drafting an Omnibus Deep-Sea Coral Amendment that may consider restrictions to lobster gear. The Amendment currently includes proposed discrete zones as well as broad regions based on a series of depths. • NEFMC is tentatively targeting public hearings on this document for the late spring or early summer of 2017.
Presentations • Update on NEFMC Omnibus Deep-Sea Coral Amendment by M. Ware

11. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

AMERICAN LOBSTER MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
August 4, 2016

These minutes are draft and subject to approval by the American Lobster Management Board. The Board will review the minutes during its next meeting.

TABLE OF CONTENTS

These minutes are draft and subject to approval by the American Lobster Management Board.
The Board will review the minutes during its next meeting.

INDEX OF MOTIONS

1. **Approval of Agenda by Consent** (Page 1).

2. **Approval of Proceedings of May, 2016 by Consent** (Page 1).

3. **Recognizing the impact of climate change on the stock, move to make the goal of Addendum XXV to respond to the decline of the SNE stock and its decline in recruitment while preserving a functional portion of the lobster fishery in this area. This Addendum is intended to be an initial response to the most recent stock assessment. Options for the PDT to develop include:**

   - **Status quo (0% increase in egg production)**
   - **20% increase in egg production**
   - **40% increase in egg production**
   - **60% increase in egg production**

   The PDT is tasked with developing specific management options that meet these goals. These options should be phased in over 2 years and reviewed periodically to determine progress (Page 17). Motion by Dan McKiernan; second by Jason McNamee. Motion carried (Page 23).

4. **Move to add an alternative to Draft Addendum II, including a delineation line at 41 degrees north latitude for a Jonah crab claw-only fishery** (Page 35). Motion by Michael Luisi; second by Brandon Muffley. Motion fails (Page 36).

5. **Move to approve Draft Addendum II to the Jonah Crab FMP for public comment** (Page 36). Motion by Steve Heins; second by Pat Keliher. Motion postponed until next meeting (Page 39).

6. **Move to include in Option C a range of small volumetric claw harvest from 5 gallons to the bycatch limit of 2,000 claws** (Page 37). Motion made by Michael Luisi; second by John Clark. Motion postponed until next meeting (Page 39).

7. **Move to postpone approval of Draft Addendum II and consideration of above motion regarding option C until the next meeting** (Page 38). Motion by Steve Train; second by Steve Heins. Motion carried without objection (Page 39).

8. **Move to approve Maine's conservation equivalency proposal on trap tags** (Page 40). Motion by Bill Adler; second by Pat Keliher. Motion carried without objection (Page 40).

9. **Move to recommend that the ISFMP Policy Board have the ASMFC send a letter to NOAA's Office of Law Enforcement asking for lobster to become a higher priority through their Joint Enforcement Agreements Program** (Page 42). Motion by Pat Keliher; second by Dan McKiernan. Motion carried without objection and an abstention from NOAA Fisheries (Page 42).

10. **Motion to adjourn by Consent** (Page 44).

ATTENDANCE

Board Members

Pat Keliher, ME (AA)
Stephen Train, ME (GA)
Rep. Jeffrey Pierce, ME, proxy for Sen. Langley (LA)
Douglas Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
G. Ritchie White, NH (GA)
William Adler, MA (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
Jason McNamee, RI, proxy for J. Coit (AA)
David Borden, RI (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Rep. Craig Miner, CT (LA)
David Simpson, CT (AA)
Steve Heins, NY, proxy for J. Gilmore (AA)
Arnold Leo, NY, proxy for E. Hasbrouck (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Tom Fote, NJ (GA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)
Roy Miller, DE (GA)
John Clark, DE, proxy for D. Saveikis (AA)
Ed O'Brien, DE, proxy for Del. Stein (LA)
Rachel Dean, MD (GA)
Mike Luisi, MD, proxy for D. Blazer (AA)
Joe Cimino, VA, proxy for J. Bull (AA)
Allison Murphy, NMFS
Peter Burns, NMFS
Terry Stockwell, NEFMC

AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Bob Glenn, Technical Committee Chair

Staff

Megan Ware
Toni Kerns
Robert Beal
Mark Robson
Ashton Harp
Amy Hirrlinger

Guests

Jim Dodson, Virginia
Dick Allen, Little Bay Lobster Co.

These minutes are draft and subject to approval by the American Lobster Management Board.
The Board will review the minutes during its next meeting.

The American Lobster Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 4, 2016, and was called to order at 10:10 o'clock a.m. by Chairman Dave Borden.

CALL TO ORDER

CHAIRMAN DAVID V.D. BORDEN: I call the meeting to order at 10:10. My name is David Borden; I'm the Chairman of the Lobster Board. We have a rather full agenda today, and I've already been contacted by a number of board representatives that have to catch flights. Anything we can do today to expedite the deliberations, I think, will be useful and serve in the best interest of everyone here.

APPROVAL OF AGENDA

CHAIRMAN BORDEN: As far as the agenda that has been distributed, the only additions or changes that have been brought to my attention so far have been Pat Keliher asked to move a couple of the issues up that relate to Maine, so that he can catch a flight. But I think that we can do that if we expeditiously handle the Jonah Crab addendum, which is nothing more than putting that out to public hearing. My question is, are there any additions, deletions or changes to the agenda; and if not, we'll deal with the agenda as it stands. Yes, Terry.

MR. TERRY STOCKWELL: Just for the record, I haven't moved to South Carolina; but I'm here in my New England Fishery Management Council seat. I will not be voting on any non-council motions and will abstain, but I will also be requesting that the deep sea coral discussion be moved ahead so I can catch the same flight as Pat.

CHAIRMAN BORDEN: Any other additions or comments on the agenda; if not then the agenda stands approved as distributed.

APPROVAL OF PROCEEDINGS

CHAIRMAN BORDEN: Proceedings were distributed. Are there any comments or changes on the proceedings; no hands up, any objections to approving them by consensus? They stand approved.

PUBLIC COMMENT

CHAIRMAN BORDEN: Public comments, we have one individual, Jim Dodson, from Virginia who would like to address the board. I've already spoken to Jim and emphasized the fact that I would like him to keep his comments fairly straightforward. He's been very organized. He prepared written comments so the board can take those; so Jim, if you would like to address the board. This is for items that are not on the agenda. Welcome!

MR. JIM DODSON: Thanks, everybody. I know everybody pretty well knows who I am. I've been back and forth with NOAA Fisheries in regards to what has gone and seems to be a problem in the fish pot fishery, to where NOAA Fisheries has permitted us to use fish pots since the beginning of time; and there seems to be inconsistencies that I, myself, and I believe my state behind me felt as though ASMFC in 2.2 classified all sea bass pots, which should be any fish pot as non-trap gear. It seems as though there is an inconsistency where those certain pots that are classified as being in nowhere, which is where I am. I would like to request the board to have NOAA Fisheries place a pot into one fishery and allow a permit to be received for one or the other. If they gave you a fish pot license back in the beginning of time, they can use the beginning of time as a reference; so that we can have a license to do things legally.

I believe that there is a process that we're here. You guys are council members. I believe ASMFC has done their job, and if we follow 2.2, it should put all pots that are from a lobster standpoint -- the trap fishery was 200 pots or more, a certain amount of landings. That was supposed to be in the trap fishery and everybody else should be in the non-trap fishery.

I handed in what I had; it is just a request that we can get a license to be able to fish legally and fairly and not discriminate and say that one gear type can be allowed bycatch and a hundred lobsters, and then say to others that no, you're not allowed to bycatch and you have to alter your gear or you have to do anything.

I have been fishing since the decades that they said, and this has been an ongoing problem that has not been corrected. If anybody is allowed a hundred lobsters per day, everybody should be allowed. That is the extent, and you guys can read my letter and I won't keep you. I appreciate it. I came all the way up here. I know you guys are busy, but I believe in your process, and I would appreciate it.

CHAIRMAN BORDEN: Thank you, Jim; why don't you stay right there. Anyone have questions for Jim? I'll take a couple of questions. If not, no hands up; thank you. Oh, excuse me, yes.

MR. JOSEPH CIMINO: As Mr. Dodson mentioned, NOAA has explained quite a bit about the differences in the two plans that exist right now. I was wondering if maybe they could go through that a little bit. As you said, we've got a very intense agenda here. We're going to be considering a lot of hard decisions, and hopefully, there will be a lot of options involved. I think maybe potentially there is a way forward for Mr. Dodson if we can hear a little bit about the differences on the federal plan; compared to the ASMFC plan.

CHAIRMAN BORDEN: Any other points that anyone wants to make, if not thank you very much, Jim for coming, and we'll factor in your suggestions as people read through the document.

MR. DODSON: Thank you for your time, and again just look at the fairness and allow fishermen to be able to get a legal permit. Again, I can't see putting me into the trap fishery just because I use bait. I think every pot is baited and that is the strict issue. If ASMFC says it is a non-trap, then I think that we should move on and allow me to get that permit. Thank you.

UPDATE ON STATUS OF FEDERAL RULEMAKING FOR LOBSTER

CHAIRMAN BORDEN: Next item on the agenda is federal rule making. Just by way of background, we had submitted a letter to NOAA. NOAA has responded. Peter, would you like to comment on the letter please?

MR. PETER BURNS: Yes, we submitted a letter to the board just to give an update on where we are with respect to lobster rule making; and particularly, as it relates to what is happening with southern New England and the trap transfer program. We implemented the trap transfer program last year, along with the scheduled trap reductions that are in place for Area 2 and 3. Now we're in our second year of that trap reduction program and our trap transfer program. We intend to continue going on with that. Things changed a little bit when we received the 2015 stock assessment. We started looking at Addenda XXI and XXII measures, which look at the aggregate trap caps for Areas 2 and 3, along with the decrease in the overall cap for Area 3 and the trap banking provisions for Area 2 and 3. We were looking at the commission's recommendations to implement those, sort of as the second version of our trap transfer program.

Then we got the last stock assessment that showed that the southern New England stock was even in worse shape than we had thought before. At that time we couldn't really justify going forward with implementing a banking program and some of these other measures, because we didn't feel that it was responsible to potentially allow fishermen to buy more traps than they could fish when the commission was deliberating measures that could severely restrict the catch in the fishery.

Part of what that letter does is it notifies the commission that we're still moving forward with the trap transfer program, to allow fishermen to still be able to optimize their businesses in the wake of the trap cuts that are already in place. But we're suspending our rulemaking on Addenda XXI and XXII pending the outcome of what happens with our southern New England management program.

I think where the commission wants to go with those two Addenda may become more evident as we move forward with southern New England management, and we're going to have a lot more discussion about that at this meeting and probably many more meetings to come.

I think at some point it would be good to just take a harder look at that in whatever way is appropriate; whether it's a working group or within the context of our addenda moving forward for southern New England to see if and whether those components of the plan fit in with our future management.

CHAIRMAN BORDEN: Questions for Peter, anyone? Any questions? Bill Adler.

MR. WILLIAM ADLER: Peter, so basically, you're allowing the transfers to continue. What you're basically suspending here is the part about banking of the trap? Is that what I'm understanding here?

MR. BURNS: If I may, Mr. Chairman. Yes. Addenda XXI and XXII looked at trap banking. Right now, any federally permitted lobster fisherman can only -- once they have the trap reductions every year, they can buy back up to that fishable trap limit for the area. What the banking would allow in Addendum XXI would allow a fisherman to purchase an additional number of traps above and beyond what they could fish.

It could facilitate the number of transactions they would need to get enough traps to be able to keep their limit up to the fishable limit throughout the whole course of the trap reductions. Given the fact that the commission could be looking at some significant reductions in catch or restrictions in the fishery, we didn't think it was appropriate to go forward with something like that right now. Because it could cause people to maybe make some business decisions on investments in the fishery in the wake of potential further cuts. What we decided to do was just keep the trap transfer program in place, because we still have those trap reductions on the board. It still allows them to build up or scale down their businesses as needed.

CHAIRMAN BORDEN: Other questions for him? Basically, a suggestion I've discussed with Peter is the desirability of putting together a workgroup; depending on what the commission does on some of these other issues. What I would suggest is after we deal with some of the issues on the agenda today, we'll have a better sense of where the board is going to go, and I'll raise that at the end of the meeting.

If people think that a working group is an appropriate way to go then I'll make a suggestion on how to do that. Are there any objections to handling it that way? If not, then we're going to move on with the next issue, which is the Lobster Technical Report. Just by way of background, at the last board meeting we agreed to initiate an addendum to address the decline of southern New England stock by lowering the fishing mortality and increasing the egg production.

The board also set preliminary targets or goals, if you will, of 20 to 60 percent egg production and tasked the TC with preparing some examples. I want to emphasize the word "example" so that board members could actually see what the impacts might be at different levels. The TC has done that. I would just like to -- before I introduce Bob Glenn to give the report, I would just like to complement Bob and the Technical staff on the work they've done.

I think the final group of tables that they circulate is really excellent. They are easy for not only the board to use, but the industry to use. In other words, you can look at different measures, you can look at what the impact is on egg production, and you can look on how that affects the spawning stock biomass and how it affects the catch. It is kind of a useful matrix that I think we'll all benefit from. It will accelerate the discussions on the issues; with that as background, Bob Glenn.

TECHNICAL COMMITTEE REPORT

MR. ROBERT GLENN: As David just said, we were tasked at the last meeting to conduct an analysis on management strategies that would achieve a 20 to 60 percent increase in egg production in the southern New England lobster stock. The primary tools we were asked to evaluate were changing the minimum size, changes in the maximum size, and also an evaluation of how trap reductions would increase egg production in southern New England.

First, I'll go over what we did, the analysis we conducted for chang1es in the minimum and maximum size. We used the same projection model to do this evaluation as we have presented to you in the past. In this particular case, what we did was we carried the terminal year population structure, so the abundance in the size structure of the stock from 2013; as a baseline to gauge how changing the minimum size and the maximum size would affect or how that would reduce exploitation and increase egg production.

What the projection allows us to do is it allows us to change different parameters and evaluate how the population structure in subsequent years looked. Previous presentations that we've given we've looked at how varying growth, how varying fishing pressure, or varying natural mortality impacts the stock.

In this particular analysis, all of those parameters are held constant, and what we simply did was change the minimum and the maximum sizes. As I said, the model parameters that we kept constant were a natural mortality at 0.285. For fishing mortality was the mean rate from 2008 to 2012, and then for recruitment, we used mean recruitment rates from 2012 to 2014. Then once we ran the projections and we get an estimate of the female abundance after a minimum/maximum size, we then converted that into egg production by multiplying the female abundance times the probability of the female carrying a clutch in that given year at that length, times the fecundity at that length.

Basically, it is just converting the unit of measure from females to number of potential eggs. The egg production estimates are based on projection scenarios when the population reaches equilibrium. In this case that was roughly ten years. We did this because the initial size composition for projection runs is based on the size composition from the terminal year of the assessment model; which typically are fairly unstable.

You want to let that ramp up for a little while and hit stability before you choose your answer. Also, because lobsters grow slowly, it takes several years for the changes in the gauge size to take effect; especially for larger lobsters who have longer intermoult durations. Then finally, we wish to analyze separate scenarios for inshore and offshore southern New England, which have different legal sizes and fishing pressures.

The length composition for subsets of the stock is difficult to parameterize. Moving into the results, these two figures here, the one on the left is the results for inshore. The one on the right is results from offshore. We present them differently, as I indicated, because we're starting at the baseline with a starting different minimum sizes and maximum sizes and inshore and offshore of southern New England.

In this particular figure, the Y axis, the vertical axis on the left is the maximum size; and then the X axis on the bottom is the minimum size, and then each square represents percent increase in egg production; the darker the color, the lower the percentage of egg production, the lighter the color the higher the percentage of egg production.

This just kind of shows the relationship that as minimum size increases and maximum size decreases, egg production will increase. The three lines that you see in these graphs, the contour lines, the solid white line is a contour line that follows the minimum or maximum size at which you would get a 10 percent increase in egg production.

The dashed white line is 20 percent, and the small dotted line is 30 percent. If you follow that line over and choose the minimum and maximum size, in that case, you're following that 10, 20, or 30 percent contour. We also wanted to look at separately the impact of either changing the minimum size while keeping the max size constant, or conversely changing the maximum size while keeping the minimum size constant.

We did this again for both inshore and offshore scenarios, and also to give you a range from 20 to 60 percent. For inshore, in this particular case, if you look at the top left square in this table, you'll see that the minimum size at which you would achieve 20 percent increase in egg production if you did not change the maximum size, is 92 millimeters. Also, at 60 percent it would be 101 millimeters.

For maximum gauge changes, you can achieve a 20 percent increase in egg production by keeping the minimum size constant and lowering the maximum size to 103 millimeters. There were no scenarios by which you could keep minimum size constant and lower the maximum size enough to achieve a 60 percent.

For offshore, to achieve a 20 percent increase in egg production at the current maximum size of 171 millimeters, which I believe is six and three-quarter inches, you would have to increase the minimum size to 95 millimeters; and to achieve a 60 percent increase, you would have to increase it to 103.

Then finally, if you wanted to hold the offshore minimum size constant at 89 millimeters, you would have to reduce the maximum size to 103 millimeters to achieve a 20 percent. Again, there were no scenarios by which you could reduce the maximum gauge sufficiently to achieve a 60 percent increase while leaving the minimum size constant.

Basically, one of the things that this demonstrates, and you can see this in those figures I showed as well, is that you get more bang for your buck from the minimum size increase. This may be a little counter intuitive, because everyone thinks of a large female who carries a very large clutch. But part of the dynamics is that in the population there are far more smaller animals than there are large animals.

Then over time both fishing mortality and natural mortality act on those animals, so a smaller and smaller proportion are given the opportunity to make it to that size. You don't get as much bang by reducing the maximum size as you do the minimum size. This table here, Table 2 in the document, is just a number of different scenarios for inshore and offshore that shows you the minimum and maximum; some different options for minimum and maximum size that would achieve either a 20 or a 60 percent.

Then a table which I think is a little more informative is this one, which was the first table in the supplemental material. We apologize for not getting this out in the document. It was kind of an afterthought. We thought it would be good to show in addition to egg production, how changing the minimum and maximum size also affects exploitation, spawning stock biomass, reference abundance and also the catch.

In these scenarios, I picked a number of different options, just to give you a range to show you the minimum and maximum sizes that would achieve say a 20 percent reduction. We also put them in English units. I know I certainly think better in English units than metric units; so it is easier to visualize what say a 4.5 inch lobster looks like as opposed to what 115 millimeter lobster looks like, at least in my head.

But anyways, you can see a number of scenarios here. I don't think I will read each of the options here, but I certainly can answer any questions about these tables. Mr. Chair, would you like me to continue through the next part or would you want me to take questions on the minimum/maximum size first?

CHAIRMAN BORDEN: I think it would be clearer if we just took the questions now, if that's all right with you. Are there any questions for Bob on this section?

MR. ADLER: Just a question. Bob, down there lobsters are sexually mature at the current minimum size right now, I think, aren't they?

MR. GLENN: Yes, at the current minimum size, roughly 90 plus, 95 percent are sexually mature at minimum size.

MR. ADLER: Yes, that is three and three-eighths down there, right?

MR. GLENN: Correct.

MR. STEPHEN TRAIN: Bob, when we're looking at these percentage increases on egg production, I'm trying to – I'm not a scientist, I'll figure it out some day – when a female lobster is carrying eggs, they get impregnated after they shed, and the smaller lobsters shed more often. As we increase the size of the lobster they shed less often.

Even though they've got a greater egg production, the success of the eggs or whatever is going to happen less often. Then I look at the water temperatures down there and the size of the lobsters at sexual maturity, and I wonder if we moved this size up are we going to increase our risk of shell disease and other things when they are not shedding as often; and what is the real benefit on egg production when we get up there and maybe hurt our markets?

MR. GLENN: Not to dodge the question, but I mean these analyses assume that natural mortality remains constant at 0.28. It is hard for us to predict if there would be differential mortality with larger egg bearing females that shed less frequently. Certainly, if we look at the demographics of shell disease in southern New England, the portion of the stock that has the highest incidence of shell disease are egg-bearing females.

That is directly related to the fact that they have the longest intermoult duration, meaning that they carry their shell for the longest time period in between moults, because they are carrying a clutch and also developing eggs internally. During that process they tend to accumulate fairly high rates of disease. But at this point it would be difficult for us to project size specific natural mortality related to shell disease on that. It is not something that we're able to do.

MR. MICHAEL LUISI: Bob, I'm in your same camp regarding the English unit conversions. As a suggestion, any time we can make conversions in the documents that we're looking at, I think it would be helpful. It is much easier to think in terms of inches than millimeters, as far as I'm concerned.

My question is related to the analysis that you performed looking at the inshore and offshore and keeping those two areas separate from one another. Did the TC discuss at all any type of standardization, or was there any consideration as to blending those two areas together and having one constant standardized unit of measure for both the inshore/offshore component?

MR. GLENN: Yes, we did discuss it. One of the challenges is we're starting out at different minimum or maximum sizes, so for conducting this analysis the effect of a different minimum or maximum size is going to be different inshore and offshore; primarily right out of the gate, because you're starting at a different goal line or different baseline. Moving forward, if you were to standardize those regulations among the two, over time when the stock hits equilibrium status, we should be able to evaluate that. Actually, if you look at some of the scenarios that I presented in the table, there are a few where you could pick a similar maximum size; and there is only one or two millimeters difference in the minimum size. I think anyone on the TC would tell you that is probably well within the margin of error in these projections, in that a millimeter or two is not going to – the difference between 17 or 21 percent is probably close enough.

My recommendation, if you're interested in moving forward with standardization, is that if you look at some of these size ranges, you'll see that the differences in percent increase in egg production are fairly small; only by a few millimeters difference. There would be an opportunity to standardize in that situation.

MR. LUISI: Thanks for that, just so I make sure I understand it correctly. Maybe for the long term it is something to consider, but given the fact that the inshore and offshore areas have different units to begin with, I would assume that one area would be impacted on the short term more so than, let's say, we shoot for a 20 or 30 percent increase in egg production. If we went standardized, would one area face more of a challenge than another?

MR. GLENN: The answer to that is yes, depending on the area and whether you choose to implement minimum or maximum sizes. The size structure offshore is typically larger than inshore. In situations like that, typically, the maximum size is going to have more immediate impact on their catch than a minimum size. Conversely, we tend to be a smaller size distributional lobster inshore, so changes in the minimum size will have a higher degree of impact on fishermen inshore.

CHAIRMAN BORDEN: Other questions? Adam.

MR. ADAM NOWALSKY: Does the work on egg production increases account for potential additional harvest that may occur by going up in gauge size? What I mean by that; I jumped ahead one table in the supplemental materials, which show that once you get above 125 millimeters as a maximum gauge size, you have no realized gain in egg production at that time, nor do you necessarily have a loss in egg production. In my mind, if you increase the maximum gauge size, it would allow for harvest of larger lobsters.

I understand your comments about the fact that it may not be the expected relationship that a larger lobster carries more eggs; therefore, there is a larger gain. I understand that. But if you increase the gauge size, in my mind, more lobsters could be harvested; which would, in my mind, result in a lower overall production of eggs. Do these gauge sizes accommodate that multiplier effect that may occur, or is this just looking at it in one dimension? I hope I am explaining that.

MR. GLENN: In these projections, what they're looking at is the current stock structure from the last assessment. That would be the total abundance and the size structure of that abundance; and from there, projecting forward given constant natural mortality, constant levels of fishing mortality. Then, basically, you would tweak the selectivity in the model, which is the minimum and maximum size of what animals are allowed to be harvested, and what animals are protected.

You run that forward in a projection out through 25 years, it hits equilibrium about 10, and if that is the point at which we kind of gauge what the impact would be. It takes into account the number of animals in the stock from where you're starting, and where you were expecting to go, given all those assumptions; and it would take into account the fact that the fecundity at size, meaning that bigger animals produce more eggs. It does incorporate all that. I should say, I hope I am answering your question.

CHAIRMAN BORDEN: Adam, do you want to follow up?

MR. NOWALSKY: Is there an incorporation of the fact that a larger gauge size, without a corresponding change to the minimum gauge size, would result likely in larger harvest?

MR. GLENN: When you say larger, do you mean in the total amount of lobsters or in a larger size distribution?

MR. NOWALSKY: Total amount, numbers.

MR. GLENN: The model doesn't project that. In scenarios where we hold minimum size constant and dramatically reduce the maximum size, it doesn't predict that catch would increase. It predicts that catch would decrease.

MR. NOWALSKY: Does it do the same in the other direction? If you increase maximum gauge size, does it predict increase in harvest?

MR. GLENN: We didn't run any scenarios where we increased the maximum size from its current baseline.

CHAIRMAN BORDEN: I would finish that sentence by saying, but that could be done. In other words, that type of analysis could be done if the board wanted it done.

MR. DAVID G. SIMPSON: Bob, how do you treat males in all of this, in terms of response to the stock? Is that why, the catch column, the much smaller reduction in catch, relative to apparent benefits of egg production exploitation. Is that related to the males? How do we manage males? I'm anticipating that if we go down this route we're going to hear sooner or later that something about a male only fishery; you know where I'm going.

MR. GLENN: I understand. That is a great question. In this analysis, because the board asked us to specifically look at egg production, the entire analysis is based on females only. We didn't incorporate. In this table that shows the percent reduction in catch, this would only apply to the female portion of the stock.

CHAIRMAN BORDEN: Other questions? I just follow up on Adam's point and just to emphasize this. It is all part of the Technical Committee report that moult frequency declines with age, and that is one of the tricky parts that everybody should keep in mind. But the other aspect of it is that egg viability probably goes up with size.

There is no way to quantify that. For most marine populations that is the case, and it is also probably the case with lobsters. There are some benefits out of that strategy. Are there any other questions on this section? If not, Bob, do you want to continue?

MR. GLENN: Now I'll move into our second task, which was to provide advice on how the currently planned trap reductions would affect the southern New England lobster stock; particularly in regards to egg production. We assessed a 25 percent reduction in actively fished traps from the terminal year estimate in the assessment.

A couple things to note, this is a fairly difficult task for us to do; because the relationship between traps fished and fishing mortality is extremely complex. Multiple factors besides a number of actively fished traps affect catch rates; thinks like latent effort, how often the traps are hulled, soak time, trap efficiency, the spatial distribution of the resource and the potential for changing fleet characteristics, make it very difficult to quantify a trap as a unit of effort.

Despite these issues, the TC attempted to model the relationship between the number of actively fished traps and the fishing mortality; using data and exploitation estimates from the southern New England stock assessment. To do this, this analysis makes the following assumptions that the 25 percent reduction will actually result in a 25 percent decrease in actively fished traps.

This assumes that there is no latent effort. It also assumes that fishers do not try to compensate for the decrease in traps, such as changing the soak time by hauling more frequently, fishing more, baiting more heavily or do anything that would try to improve catch rates would not be included in this analysis. This assumes that the catchability of the trap is going to stay constant.

To be able to do this analysis we took the time series of actively fished traps, and the corresponding exploitation rate from the length structured model in the stock assessment for southern New England from 1981 to 2013. When we look at this relationship between exploitation and traps fished from the assessment, it is pretty apparent that we see two different regimes.

If you look in this particular figure, exploitation rate is the Y axis and total traps fished in thousands are on the X axis. You can see, in the earlier years in the eighties, all of those points are kind of in blue above, and then in green below. If you look at this, you can try to model one relationship through the middle of it.

But in our case, it seemed pretty obvious to us that there were two separate regimes going on here, one that happened in the past and one that happened more recently. We decided to try to give insight under a long term scenario and also a more short term scenario; depending on how you expect that relationship to play out.

Based on that, we looked at all years from 1981 to 2013 for one scenario, and then the second one was from 1999 to 2013. We bootstrapped a thousand model runs with replacement for the all scenario and the recent year scenario, and then recorded the model predicted exploitation rates at the current trap levels after, and also after a 25 percent reduction.

The difference between the baseline and what would happen after a thousand model estimates at a 25 percent trap reduction, is how we were able to get those results. If you look at this, this is a representation of those bootstrapped estimates. The green points are the actual data. The dark green line is the bootstrap mean, and then each individual line is each individual bootstrap run. You can see there is a fairly broad degree of scatter around the mean. This one that I'm showing here is when we modeled it for all years. When we look at it for the recent years, you can see there is fairly different. It is a much shallower slope, and it is actually a little bit more of an optimistic scenario; where you get a higher decrease in exploitation, relative to the trap reductions in this case. We summarized those results; 25 percent reduction in active traps fished under the all year scenario resulted in that exploitation rates were reduced from 0.27 to 0.23, which is about 11.6 percent reduction.

But you also notice, and this shows up in the scatter, as well; the confidence intervals around that estimate is fairly broad. Then this also would result in a 9.6 percent increase in egg production. When we break this down for just using that relationship based on the recent years, exploitation rates were reduced from 0.207 to 0.176, or about a 14.3 percent reduction; which would also result in about a 13 percent increase in egg production.

However, the TC had several concerns about this analysis. One of the primary assumptions that soak time is constant is not valid. If we look at empirical data from the jurisdictions that we have soak time data from, namely Massachusetts and Connecticut, we see that there are definite trends in soak time. Soak time hasn't remained constant.

Fishermen change their soak time in response to a number of different variables, including market conditions, bait prices, catch rates, lobster density; there is a whole host of reasons why soak time changes, but it does change. The thing to remember is that as the average annual soak time decreases, the number of times a trap is hauled increases and vice versa.

In this case the total amount of effort exerted by a trap is directly proportional to one, how often it is hauled and also the trap efficiency at the point at which it was hauled. Both of these parameters are directly influenced by soak time. We look at some of the empirical data that I was referencing. This is the trend in soak time for Massachusetts and Connecticut portions of southern New England in recent years.

You can see that there are definite trends. In Connecticut, we've seen just a continued increase. This is probably indicative of extraordinarily low stock densities that make it such that it is not financially beneficial to haul the traps very frequently at all. In Massachusetts, which would be in Area 2, the lobster density is a little bit higher; and I think what you're seeing is the decrease in soak time is probably a response to the large declines in traps fished that we've seen in this area.

To compensate for having fewer traps, or the fact that there is less competition now, there is financial incentive for fishermen to haul them more frequently on a shorter soak time. This trend is also kind of backed up by what we see for both Connecticut and Massachusetts in the catch-per-unit effort.

If you look at catch-per-unit effort as pounds per trap haul, and if you look in the top right graph that is in Massachusetts, so 537 would be the offshore portion; which is the blue line, and the red line 538. That would be the inshore portion of Massachusetts Area 2. What we see, especially in the inshore portion, is that catch-per-unit effort is at an all-time high.

As more traps are removed from the system, the catch rates in the remaining traps tend to jump up; despite overall what we see. We've seen declining trends in abundance and declining trends in catch. We still see rapid increases in catch-per-unit effort. The bottom right graph is similar information for Connecticut. In Long Island Sound, where lobster density is probably lower than anywhere else, they are seeing higher catch-per-unit effort than they ever have. This demonstrates that the traps in southern New England are fishing nowhere near their saturation level, so they are at max efficiency. A lobster trap can easily catch six, seven, eight, ten pounds per pot; but over time we've seen that they've been fishing well below that max efficiency, and as you remove adjacent pots, those catch rates increase.

Other things to consider about trap efficiency is they are complicated by interactions with population density, trap saturation, interspecific competition, bait type and quantity, trap size, spacing, trap design, water temperature, the list goes on and one. What we're trying to demonstrate is that it is not a simple relationship.

Quantifying a standard unit of effort in trap fisheries is extremely complex. It is notoriously illusive. It's been looked at in the past for American lobster on several occasions in the eighties and nineties, and no one was able to really crack the code. Similarly, if you look at other trap fisheries for other crustaceans and crabs and lobsters, or anything that really deals with a trap that is a passive gear, it is difficult to characterize.

As a result, the number of traps fished is a very poor metric of fishing effort. The number of traps hauled standardized to soak time is the only true measure of effort in a trap fishery. Finally, the number of trap hauls is not universally available for southern New England. Only a few of the jurisdiction, including Massachusetts and Connecticut, monitor the number of trap hauls; so it is not universally available for all fishers in that area.

Other conclusions were that the assumption of constant soak time in this analysis was not valid. However, the best case scenario from the analysis, and this would be using the recent year scenario, was a 14.3 percent reduction in exploitation; with a corresponding 13.1 percent increase in egg production.

However, as I mentioned, for all the reasons that I've tried to explain, the TC strongly cautions the board against using these analysis to quantify or predict current or future reductions in exploitation related to trap reductions. Then a few final thoughts about the task or the goal of a 20 to 60 percent increase in egg production, one thing we wanted to remind the board was that the recruitment appears to be decoupled from spawning stock biomass.

I flashed this chart up before. I'm sorry it is a little hard to see up here, I should have increased the size. But what we're seeing right now in southern New England is that the spawning stock biomass is similar to what we were seeing in the early 1980s. However, for the size of the spawning stock biomass, we're getting about 20 times less the recruitment out of a similar level of biomass.

What that shows us is that there is a problem with recruitment. There is a problem with lobster settlement. As a result, increasing egg production may not have the same response that it once did. Perspective increases in egg production will only benefit the stock if recruitment rates remain constant or improve.

The TC also would like to warn that increasing egg production by 20 to 60 percent is unlikely to be sufficient to prevent further declines in the southern New England lobster stock. Then finally, the projection analysis originally presented by the TC, indicated that an 85 percent reduction in exploitation would be necessary to stabilize the stock. That's it.

CHAIRMAN BORDEN: Before I take questions, I would just like to thank the TC members, Burton Shank and Conor McManus for the work that they did on this. It was a difficult task and they've been slaving at this for some time, and they did a fabulous job, I think. It's really innovative work. Questions for Bob, any questions? Jason.

MR. JASON McNAMEE: It is not a question, but an opportunity to offer a different perspective on the trap reduction analysis; and so I'm not sure if that is appropriate.

CHAIRMAN BORDEN: I would just as soon take questions right now, and then I'll make a note and come back to you after the questions.

MR. LUISI: Bob, can you give me an indication. As you mentioned latent effort, and the fact that in your analysis there would be no latent effort advancing into the fishery. What is the percentage of potential versus active pots being fished? Do you have some sense; some ratio of what is out there that could potentially become a part of the fishery that hasn't been?

MR. GLENN: I wouldn't speak to that right now. I know that is information that we can look at the traps allocated versus those that are actively fished, and I know we haven't in the past. But I don't have that with me right now, so I wouldn't speak on to that. But it is something I could report back to the board on later.

MR. JOHN CLARK: Thanks for the very good, but depressing presentation, Bob. Just curious of your last statements there, and you've probably gone over this before that recruitments decouple from spawning stock biomass, 85 percent reduction to stabilize the stock. What do you mean by stabilize the stock? If it has this lack of a link to the recruitment, we wouldn't see a further decrease in the number of spawners out there, but assuming natural mortality would continue, and that we wouldn't see necessarily any increase in the biomass out there.

MR. GLENN: That statement is based on the initial projections that we presented to the board that make assumptions about what the current rate of growth is, what the current natural mortality rate is, and then project that forward. Understand that projections like this are wide goal posts. There is a high degree of uncertainty in them.

But from the analysis that we conducted, given all those caveats about that recruitment levels would stay static at their current levels; that natural mortality would remain high, and we would project that it would require an 85 percent reduction in exploitation just to stop the stock from future declines based on those projections.

CHAIRMAN BORDEN: John, do you want to follow up on that?

MR. CLARK: Well, I figured that is what they were getting at there, but it seems that there are some pretty grim options there based on that to expect any recovery from the stock. It seems like whatever we do, there is no guarantee that the stock will recover.

CHAIRMAN BORDEN: I would just add to your observation just now that I think the Technical Committee has put that in numerous reports. Unless the environmental conditions change, if you look at the figure up on the board, I think the Technical Committee estimated that the number of recruits is declining by approximately 15 percent a year over the recent years. This is not a fishing mortality issue; it is an environmental issue is what we're trying to deal with.

If we don't get some kind of change in the environmental conditions, and this continues, it is only going to continue for just so long. The other issue is if you look at some of the NOAA weather forecast climate prediction models that have come out in the last few years. They are predicting very sizeable water temperature increases throughout southern New England, and that is a complication. That has not been factored into this analysis. I've got Ritchie White and David and Dan McKiernan.

MR. G. RITCHIE WHITE: Bob, if we pass an action today and increase egg production to a certain level and decrease exploitation, would you then have any ability to predict, since those would probably be substantially less than the 85 percent that we're talking about to stabilize. For substantially less than that, would you be able to have some prediction on how long the present population would last? In other words, how fast would the spawning stock biomass and overall population be declining? Any sense in how many years before it is gone?

MR. GLENN: That's an analysis that we could conduct, but it is not something you necessarily would want to put a high degree of confidence in. Right now, given the current environmental conditions and the current trends that we're seeing in recruitment, the best that you can hope to do is maintain spawning stock biomass; so that in any given year, if conditions are positive for recruitment, then we can take advantage of that.

It is hard to project forward. Is natural mortality going to stay the same, increase or decrease; and the same thing with recruitment, the same thing with water temperature, so it would be tough to do. We could do it, but it would have a long laundry list of assumptions of which you would have to hold your nose a fair amount.

MR. SIMPSON: Again, this is a great report, a lot of great work; and I said to you, Bob, yesterday, extremely well written. It has answered a lot of the questions that I asked in May that couldn't be answered, and coming out pretty much as I expected it might; frankly. You helped me with the last statement, because as I said in May, I kind of lost my bearings with this new direction of egg production.

I have been looking at those projections. Our goal for the last year plus has been talking along the lines of, let's stabilize the stock; what would be required? You are reminding us it would take about an 85 percent reduction in exploitation to achieve that. These scenarios we're considering fall well short of that.

I appreciate your spelling that out for us. In terms of the trap reductions, it's very much what I was anticipating. I just note, I think it was Mike who asked the question, you know in Connecticut in 2015 we had about a 235,000 trap allocation total for Connecticut. This year we issued about 70,000 tags, and probably half of those may be active; 30, 35,000 tags. When you talk about reduction in active traps, for us, it wouldn't be cutting from 235, it would be cutting from maybe 30 or 35, so we would be down in the order of 20,000 traps allocated, which would turn us upside down in terms of who gets to fish and how many traps they would get to fish.

CHAIRMAN BORDEN: Follow up. I've got Dan on the list.

MR. DAN McKIERNAN: Bob, one of the challenges that we have with the industry is they allege to see small lobsters offshore and that somewhat in denial, but they claim to have some different views. I know the work that you did about five years ago was really considered excellent; a landmark piece of science where you actually demonstrated larvae being shifted offshore, instead of into the nearshore areas where traditionally lobster settle.

I think you've established the point that; don't expect great settlement, great survival for lobsters if you're trying to settle in those areas offshore, because it is deeper water. It is probably less optimal habitat. But I guess I'm just trying to understand when we describe recruitments, and on that graph, it is showing the number approaching zero levels of recruitment, yet we still have people fishing in all of our nearshore areas.

I guess I am trying to understand where the really low numbers come from. Do they come from the juvenile surveys that are done by scuba divers in the traditional areas, or are they done by say, the offshore trawl survey where they might be able to pick up lobsters in the 50, 60 millimeter range as pre-recruits? Then what role does the ventless trap survey have in giving you the ability to connect these dots?

MR. GLENN: In this relationship or in the model in general, recruits are the recruit abundance coming into the model from the trawl survey indices, which they come into the model at 53 millimeters. If you look at that relationship over time, what we've seen is that the number of lobsters that we're seeing in that first recruit to the trawl survey has declined pretty dramatically relative to the spawning stock biomass.

We also consider trends in the ventless trap survey, but that is only a short time series at this point, so we don't have good historical perspective. Ventless trap survey started in 2006, which is long after the decline in southern New England. It is hard for us to reconcile that with what ventless trap indices may have looked like back in say 1995 when abundance was very high.

Then the other thing that we look at, and it is not explicitly in this model, but another thing to consider is we look at the young-of-the-year indices that those would settle to the bottom four or five years, or roughly four years before they would hit that size where they would recruit to the trawl survey. The trends in that are down substantially, especially in the last four or five years where settlement is near record lows. If you look at like the Rhode Island Index, and those haven't even entered this yet.

CHAIRMAN BORDEN: Anyone else, any other questions?

MR. BRANDON MUFFLEY: Bob, I can't really tell, because the numbers get pretty condensed down at the bottom of this stock recruit graph here, but has this been updated since the stock assessment? I ask, and I think you've mentioned this in previous meetings, I mean it shows generally that SSB has been somewhat stable recently. Now recruitment has not been stable, because it continues to drop off. But SSB has been in a pretty tight, narrow sort of window in recent years. But I was just looking to see if that has been updated to see if we are starting to see a decline in SSB, because I think you had said we're kind of riding the last sort of relatively good recruit events that happened a number of years ago when we should start to see a further decline in SSB. Like I said, it looks here like it is generally stable, but I wanted to know if we had any updated information.

MR. GLENN: At this point, no. We have not updated that since the assessment. It is something we would have to rerun the models with all the updated survey indices and catch to do that. But it is something we could do.

CHAIRMAN BORDEN: Any other questions?

MR. McNAMEE: I've been thinking about this plot a little bit. Bob, there is a static assumption that goes into this plot, the lag between SSB and recruits. Isn't there a static year assumption between the two? He said yes, and so my question is; based on how the model works, if growth has changed through this time period in either direction that would change the look of this plot, correct?

MR. GLENN: Absolutely. It assumes a constant growth lag in between recruitment and SSB. In this case if growth rates have either increased or decreased over time this would change dramatically. As you know, the difficulty is we don't have updated estimates of growth in southern New England. It is extremely hard to do studies to look at lobster growth. You either have to do it in a laboratory or through tagging studies, or get enough recaptures to be able to model that. We don't have the information to do that.

We have looked at, more recently, stuff from Millstone, with the tagging study that they have. The work that they've shown is that in recent years the moult probability, how often they moult has stayed about the same, but they're growing slower. They are having a smaller increment; the percent increase in their carapace size has declined some. The other complex factor to this is that changes over time. We wouldn't have the information, I don't think, to be able to demonstrate that change in growth over time and incorporate into this. It is an important caveat for sure.

CHAIRMAN BORDEN: I would just like to follow up on that just so everyone is clear. The Technical Committee in their recommendations to us of October 2nd, I think it was 2015, identified a number of different sources of uncertainty. On this particular question, I'll just read it to you. It is only a couple of sentences.

Increases in water temperature over the past several decades have likely resulted in changes to size at maturity and growth parameters. Maturity data currently used are more than 20 years old. The changes in size at maturity will subsequently affect growth rates. Then they go on and basically say that it is critical to collect updated information on maturity and growth, in order to appropriately assign moult probability for the lobsters.

The TC has already noted this as a problem. I would note that in that same document, if you go back and look at the document that they sent us, there are like ten different issues that require research that affect all of this type of analysis. One of the things, I think, the board has to do and the commission has to do is figure out ways to fund this; because it is all uncertainty that we're trying to deal with. Okay further questions?

MR. SIMPSON: Just on that. You say profoundly, or whatever term you used, affects this curve. I'm not quite sure how it would affect it, but I'm thinking that we may be substantially overestimating SSB then currently, if the growth increment, they are not growing as quickly, then maybe we are overestimating SSB. This curve would be closer to the origin then than it appears right now?

MR. GLENN: I would have to think more about that. I wouldn't want to answer off the cuff. It certainly -- the difference in the lag would change the nature of the relationship, but it wouldn't change the fact that the recruit indices are extraordinarily low.

CHAIRMAN BORDEN: Anyone else?

MR. ADLER: In reading the memo that was in our packet, I get the result that the trap reductions are not good. The gauge increase will help, but I just look at more food for the predators. What they said in the memo is; what is done, success will only be if environmental conditions are favorable.

Another thing that you had mentioned in your report about trap hauls, or hauling soak times. You showed that the soak times were going so they hauled them more often. Usually, if you're not catching a lot, as you saw in the Connecticut one, you let them sit longer; I know this.

Apparently, what is happening is, if people are hauling more often it is because there are more lobsters around, which you indicated probably there are, because there are less people fishing for them. I think I am getting it that way, because normally, soak time would be lengthened if they're not catching anything, as you saw in Connecticut. You were right about the soak time in Connecticut. I just wanted to make that a fact in your report.

MR. BURNS: I just want to reiterate what a great job that the TC did on this analysis and all the analyses that we've asked for on this. It has been very helpful information. I think some of the information -- yes it is very sobering. I heard John say that it was kind of depressing. We know that we can't rebuild the stock, given the current environmental conditions that we have.

We know that it is a really high bar to even stabilize it. But I think that we need to do what we can. We have a responsibility to try to act to do the best we can to try to improve stock conditions as much as we can. Even though the environmental conditions make it look very sort of a high bar, I think there are still some things that we can do, and we should keep those in mind as we move forward looking at our management in southern New England.

REPRESENTATIVE CRAIG A. MINER: If we were going to try and make a change, and protect as many females as possible, is it conceivable that we could consider an increase in gauge size to protect the egg production, and still provide an opportunity in the fishery for the males, and not hurt the scenario that you've presented?

MR. GLENN: One of the assumptions with this increase in egg production is that every egg that is produced is actually viable. Research conducted on lobsters indicates that females need a similar size male to successfully reproduce. The problem with, if you were to have a differential size limit on males and females, you would really jack the exploitation rates up on males; probably drive the size structure down, and the egg production you were hoping to get would not be realized, because you wouldn't have successful mating.

REP. MINER: In terms of Long Island Sound, if there is a recruitment, a migration from offshore to inshore occurring at some level; that wouldn't be sufficient to make up for that imbalance that might occur if you had to different gauge sizes?

MR. GLENN: That would be tough to speculate. I don't think we have an exact sense of the magnitude of what portion of mating success or the total reproduction comes from inshore males and females basically finding each other. I do know, though, that we would be really concerned in any scenario whereby you really skewed the sex ratio or the size distribution of one sex versus the other. It could cause problems with the mating system.

CHAIRMAN BORDEN: Okay, on my list I have Pat Keliher. Does anyone else want to ask a question before I go back and afford Jason an opportunity to make whatever statement he was going to make: No hands up, so Pat, you've got the last question and then Jason you're up.

MR. PATRICK C. KELIHER: I am going to throw a little bit of a curve ball just to make sure we don't lose the fact that – first of all, Bob, it was a great presentation and it just continues to instill in me the concept of getting ahead of this curve for the Gulf of Maine is so critically important, so we don't have this conversation again.

As we continue to talk about increasing the minimum gauge size, I just want to raise for the board that it may further create a disincentive or a conflict frankly, with the lobster market; because you are going to impact market availability in southern New England from lobsters from the north. I just want to raise that issue as something that should be considered if we move forward with gauge increases, and how that might come into play.

MR. McNAMEE: I just wanted to offer a perspective, and particularly because I heard the notion of trap reductions come up amongst the commissioners, as well. I'll be brief. I just wanted to offer another perspective that I don't necessarily think is inconsistent with what the Technical Committee has offered.

I both understand and respect the opinion and the comments of the Technical Committee, and appreciate the itemization that they did of all of the potential uncertainties that are involved with that analysis. I guess what I wanted to offer is that those biases are not necessarily all unidirectional, the biases can go in either direction above or below that median; as far as how they influence.

But at its core, I think there has to be a relationship between the number of traps that are put in the water and the number of lobsters that can come out of the water. I think we all sort of logically understand that. I think we can also appreciate that it is nonlinear, for a lot of the reasons that both Bob and the Technical Committee have offered.

Just to illustrate an example, the soak time aspect, Bob mentioned that the Technical Committee discussed that as an important aspect with regard to the effort. You saw a divergence between what's going on in Connecticut, what is going on in Massachusetts. There are arguments that can be made, other reasons for decreasing soak time; my pots are filled with predators like black sea bass, so I have to kind of turn them over quicker. That reason for decreasing soak time would have the opposite effect. The point of all that is there is certainly uncertainty in the analysis.

That was why I really appreciated the extension that Burton made to that analysis, adding in the bootstrapping and giving the board a sense of the uncertainty bounds that exist in the analysis. For me, I think the extensions that the Technical Committee made with that analysis improved it greatly.

Now we can judge, depending on which of those things that the Technical Committee itemized out. We can judge, well, are we towards the lower bounds of uncertainty, are we towards the upper bound of uncertainty, and so we have more information with which to make a judgment on. I just wanted to offer those thoughts.

CHAIRMAN BORDEN: Okay, any other questions? Bob, do you have anything else to report or does that pretty much complete it? Okay, so we're finished with that agenda item.

DISCUSS MANAGEMENT OPTIONS TO BE INCLUDED IN LOBSTER DRAFT ADDENDUM XXV

CHAIRMAN BORDEN: Everyone knows where we're going next. Discuss Management Options to be Included in Lobster Draft Addendum XXV We're going to move into the next agenda item. Now, everyone is clear, I think a little history.

We've had three different meetings; one was a subcommittee meeting at David Simpson's office, which went on all day. There were very extensive minutes that were completed from that effort, and then we've had two board meetings where the board just recently agreed to move forward with an addendum; and at the last meeting, basically what we agreed to is to move forward with the selection of goals and objectives with an egg production objective of somewhere between 20 and 60 percent.

The thing that to me is most useful, because there are a number of questions that came up about the appropriateness of egg production. But the conversion that the Technical Committee did in Appendix 1, or Table 1 in the supplemental, where they converted the egg production into SSB and declines in catch.

I thought that was really a useful document, and it was done as an example per the request of the board. You can actually look; if you pick an egg production target you can transfer that into a decline in catch and a decline in exploitation. I would hope that everyone would look at that as we get into this next item.

Now as far as the format here, I think what we need to do is to establish a clear and quantifiable goal for the addendum. I think we need to specify a timeline for action, and I personally would urge us to pick a narrow window and not drag this out; a few years would be my preference. Then I think we need to have a discussion on a range of management measures that we want, without getting into all the minutia of the analysis that will come out.

The process that I would envision on that is once we pick a clear goal that is quantifiable, and once we have a clear timeframe, then what we would do is provide the PDT with a range of management strategies that we want to see them develop. Now, I would note for the record that a number of those analyses have already been done. If you pick, for instance, a 60 percent egg production target, and then decide on a specific timeframe; with those tables you can look at what the impacts are. That is fairly easy to do, particularly if you want to achieve it with a minimum and maximum size. That analysis has already been done. Let's start with a goal. Rather than just having a discussion, I'll open the floor. I think this should be done by motion, and I'll open the floor to anyone that wants to make a motion on a goal for this addendum.

MR. McKIERNAN: Recognizing that this clearly is an environmentally driven problem with a fair amount of uncertainty, although the Technical Committee certainly does project a depressing level of certainty at times. But there are some other signs in the fishery that at least the participants are holding on to that things could improve.

I would make a motion to the following; recognizing the impact of climate change on the stock, the goal of Addendum XXV is to arrest the decline of the southern New England stock while preserving a functional portion of the lobster fishery in this area. This addendum is intended to be an initial response to the southern New England stock condition.

I would recommend that the PDT develop options with status quo 20 percent, 40 percent and 60 percent as various egg production targets. The PDT should be tasked with developing specific management options that meet these goals, using the tools as developed by the TC over two years, and reviewed periodically to determine the progress.

CHAIRMAN BORDEN: All right, we have a motion on the table, is there a second; Jason McNamee. Ritchie White, discussion.

MR. WHITE: I don't think when you are using the words "arrest the decline", that can't be accomplished with a 60 percent increase in egg production; from what the Technical Committee just told us. I guess I would want to see different wording in there than that, or you have to include something that accounts for an 85 percent reduction in harvest, from what the Technical Committee reported to us.

CHAIRMAN BORDEN: Dan, do you want to respond to that?

MR. McKIERNAN: It's a fair argument, Ritchie. I can't imagine us being able to successfully implement, short of a moratorium throughout southern New England, a set of rules that creates something as extreme as that. But I take your point.

MR. WHITE: I'm not suggesting that that is the course of action, but I think we need to be honest with our course of action, and that is why I have a problem with "arrest the decline"; that that needs to be reworded if we're going to do something that is less than 85 percent reduction in harvest.

MR. SIMPSON: Yes, I was just going to concur with Ritchie's comment that if we reworded that to be clearer about what expectations of this action might be; to preserve additional spawning stock or something more general like that. But I don't think we should create false expectations for this addendum. I don't have specific words to offer, but along the lines of saving a little more spawning biomass in hopes of preserving, you know, enough stock to take advantage of improved recruitment should it ever occur. That is too long for this, but that is how I'm thinking.

MR. MUFFLEY: I support the motion, but I asked this question of Bob, I think at the last meeting; that the 85 percent reduction is under current size limits and current regulatory measures. If you were to change the size limit structures, those projections in terms of what would be required to stabilize the stock would then get changed.

Is that correct? My understanding was 85 percent reduction to stabilize the stock under current conditions, and by modifying current conditions through a size limit change potentially, that it is not necessarily an 85 percent reduction required to stabilize the stock.

MR. GLENN: Yes, I mean that is correct. The projections are based on, as you indicated, constant recruitment levels, constant rates of natural mortality and the current minimum and maximum sizes that we have in the fishery. If all those things stay constant, the projections would indicate that you would have to reduce the stock by 85 percent to stabilize it. If any of those parameters change that analysis would change.

CHAIRMAN BORDEN: Brandon, do you want to follow up? No, okay, so on my list I've got Adam and then Peter.

MR. NOWALSKY: I was going to propose that we change arrest to respond to the decline, and also include respond to the decline of the southern New England stock and its recruitment; because I think that that is really what we're doing by trying to increase egg production. We're trying to help recruitment. That is the goal here, in my opinion. That would be my proposal would be to change it to; to respond to the decline of southern New England stock and its recruitment, while preserving a functional portion.

MR. MUFFLEY: I'll accept that as a friendly amendment.

CHAIRMAN BORDEN: I actually prefer to deal with this in a motion, but let me ask Dan and Jason if you would agree to that perfection, and then let me ask the board, does anyone object to that perfection? If somebody objects, I am going to ask for a motion to do this.

MR. DENNIS ABBOTT: Would he repeat his suggestion.

CHAIRMAN BORDEN: Okay, Adam, if you would, would you read slowly into the record so we can modify this so everybody can look at it. If somebody objects I am going to ask for a motion.

MR. ADAM NOWALSKY: After Addendum XXV; to respond to the decline of the southern New England stock, and its decline in recruitment, while preserving – yes that is my proposal.

CHAIRMAN BORDEN: All right, let me ask again. Is there an objection to this perfection? David Simpson.

MR. SIMPSON: Not an objection, but we can't put everything in a motion and then the goal statement, but as long as in the document we're clear about what would be required to stabilize the population; what we would expect to happen under these various scenarios. I think this will be fine.

CHAIRMAN BORDEN: All right, one more time. Any objection to this; if not the motion has been perfected by the consensus of the board. That is the motion as it appears now. Further discussion on the motion; yes, Roy.

MR. ROY W. MILLER: Mr. Chairman, it seems to me, based on what I've heard this morning, that this particular motion alone is not going to get us to where we need to be; that some other measures will be necessary, in addition to the modeled increases in egg production, from what I understand from Bob Glenn's excellent presentation.

Is this just the first step, or are there more actions that others are contemplating taking in order to restore this stock and arrest the stock decline? The reason I say this, Mr. Chairman, just to remind you. You well remember and others in this room, a few of you will remember. We were in this position seemingly with striped bass in the early 1980s.

At the time there was a perceived decline in reproductive success of the Chesapeake stocks and other stocks, and we had to make some very, very difficult choices in the early 1980s, sacrificing fishermen, which caused grave economic repercussions up and down the coast. I wonder if we're not in a similar position with this entirely different animal.

CHAIRMAN BORDEN: Roy, I think you've raised a good point. If this motion were to pass I think we need some discussion on the range of approaches that we want to consider. I would hope that we could do that without motions. I actually have a list of the alternatives that have been recommended by both the Technical Committee and the industry to date, and we can put those up on the board and everybody could look at them. I'm glad you raised that point; further discussion on the motion, Peter Burns, and then Jason.

MR BURNS: I certainly understand Roy's point, because we are in a dire situation here with the condition of the stock. We know that it is going to take 85 percent just to stabilize it. But I think the goal is very clear here that we're really responding to this and this is just a first step moving forward. We've taken several steps in the past, and I think that this is one more step.

This is something we're going to have to keep a close eye on. I am happy that there is some wording in here that says that we're going to be monitoring this periodically over time to make sure that we know the effectiveness of any of these measures that come from this, and will be able to respond accordingly to that.

I am also glad that there is a clear goal here, and there is also a wide range of options that are in this document for public hearing, because I think that is going to give the public a lot more opportunity to comment on the different ranges that are available here, and it is going to allow the commission to provide a real full analysis of these options. I support it.

CHAIRMAN BORDEN: All right, on my list I have Jason and then I've got Ritchie, and there was one other hand up. Michael.

MR. McNAMEE: I just wanted to offer some thoughts on why I support the motion. I think with the range in there as Peter just mentioned, it sort of bounds the issue. You go all the way from status quo up to 60 percent increase, and as the board had indicated in the past, it wasn't inclined to do anyhing and it wasn't inclined to completely shut the fishery down. I think we've kind of bounded that here. The important parts are those ones in the middle, and I think this provides an opportunity for the board to get some feedback from the LCMTs from the public to help us determine where that tipping point is, where the economics kind of kick in and create that situation where you are in a de facto sense shutting down the fishery.

I just wanted to make one final comment to emphasize the importance of the PDT coming up with specific options to review, because I think it would be very difficult to provide the tools as they currently exist out to the public; and have them cobble together specific options that would meet these goals, because they are important interactions.

You can't simply take a trap reduction and a gauge increase and add them together. They interact, and so those interactions need to be accounted for, which I think would be difficult to do in a public forum. I think it will be important for the PDT to think through those and develop very specific options.

MR. LUISI: Following up on Mr. Miller's comments, and speaking in support of the motion. Difficult decisions are definitely going to be a factor here. But when I look at the range of alternatives, and I look at the table that was provided by the Technical Committee, and understanding how our fishery in the DELMARVA Region operates.

I'll speak for Maryland, but I assume that Delaware and Southern New Jersey and potentially even Virginia both operate very similarly, given the nature of the fishery. Anything more than a 0 to 25 to maybe a 30 percent increase in egg production as it relates to catch reductions, is going to essentially be a moratorium for our region.

Our fishermen operate, they travel too far and the conditions are such that anything more than a 20 to 30 percent cut in catch is going to be it. The Technical Committee might as well even assume that anything more than that -- just take Delaware, Maryland and Virginia out of the picture; as far as what we're taking from the stock.

I know this is kind of going in the wrong direction as to what I've spoken with Megan about, about trying to focus. But I wonder if the makers of the motion would consider something between 20 and 40, perhaps a 30 percent egg production scenario; which might be at the tipping point, but at least it gives us something more than just 20 percent, because I feel like 40 percent and on is it for us.

CHAIRMAN BORDEN: Mike, to just comment, from my perspective I would just like to emphasize that this is a range of options for a public hearing document. The process here will basically lead us to having the PDT develop these options. Then at our fall meeting we'll review those options and further refine those options, see what the actual analysis is.

I think that would be the point where if we wanted to change some of the elements of the motion, that would be appropriate, because then it would be based on whatever the analysis is. The second point here is that at least having served on the council for a long period of time, NOAA always gives us the advice.

No matter what the species is they have a full range of options in order to garner public input on it, even if it's negative. In other words you want that to be a part of the record. I don't know whether Peter wants to comment on that; but I would imagine they would provide us with the same advice on this.

MR. BURNS: Yes, I agree, and I think that certainly this is a public information document. We want to be able to just provide the widest array of measures that we can, so that we can allow the Technical Committee to come back and the PDT to come back with some measures so that we can see how those fit into place.

I could certainly see where that we could see the difference between a 20 and 40; if you needed to pare it down that way. I think that that possibly could come from that. But as far as the analysis goes, I think this is a positive step and a good approach, because if these objectives were narrowed down any more and the commission was to make a recommendation to us for complementary federal action; we would have to really look at that broad scope anyway.

It is better, I think, to have the public and the commission involved in the whole process of the development of the addendum up front, to get that analysis. Within the Lobster Board and the commission's own process before it comes to us; rather than having a more narrow range of options and then having NOAA Fisheries have to expand that. Then the commission would only be in a situation where they could only just comment on it. It wouldn't be necessarily involved in the analysis. I think this is a good approach.

CHAIRMAN BORDEN: Mike, you want to follow up?

MR. LUISI: Yes, real quickly, please. I just wanted to make sure I was clear and that I wasn't looking to remove 40 and the 60 percent option. I was only looking at the options and thinking that we might be able to survive some way in between 20 and 40. I think, going forward, as long as there is an option in the future to potentially add another level of egg production to the addendum; then I'm happy moving forward as is.

CHAIRMAN BORDEN: Okay, I have Ritchie White, does anyone else have a question they want to raise or a point they want to make? Doug Grout.

MR. WHITE: The line preserving a functional portion of the lobster fishery in this motion allows me to support it. But I would like to see wording in there that describes the results to the fishery for each of these; or in general to the bunch, because none of them are going to create what we were first talking about.

I think some wording showing the continued decline of the stock; no matter which one of these we pick, should be in there for the public to understand. Then a question for Bob as to the review where it says, review periodically what does that mean? What do you think you're going to be able to tell us as to the success of any of these?

MR. GLENN: I mean as far as review is concerned, it would really be up to the discretion of the board to task the TCs how often they would want us to review it. You could do that at each benchmark assessment. If tasked, we could do specifically for southern New England on a shorter timeframe. There are multiple options.

CHAIRMAN BORDEN: To that point, and I'm glad you raised this, Ritchie. To me, one of the keys here is you take action, it is a short action, and then I think it is a responsible action for the commission. If the technical people can do it as part of the annual review, basically comment on how this is going. They can't obviously redo the whole assessment. But to the extent that they can evaluate the impacts of the management measures and provide annual advice; I think that would be desirable, would be my own.

MR. GLENN: I should have spoken the first time when I had the opportunity. One thing to keep in mind is that lobsters are a long-lived species, so any responses to any changes in the management regime are going to take a while to take effect. That is why for example in the projections that we gave for the minimum size increases, the answers that you're getting are when the stock hits equilibrium condition; which for this analysis was ten years.

The board needs to also keep in mind that to put in a gauge increase and expecting to see immediate results in two years is not a likely scenario. Any changes you make to the minimum size, improvements in recruitment are going to take a long time to be recognized.

CHAIRMAN BORDEN: When I was referring to annual, I'm thinking more in the context of if we want this measurable and quantifiable, and we want to make sure that all the states have met that standard. I think that is something that you can actually do. You may not be able to measure the effects of the change, as you point out; that may require years to do that. But at least we know that we're meeting the objectives we're setting forth. I think that is an important step in the process. I've got Doug Grout.

DOUGLAS E. GROUT: Again, thanks to the commissioners that worked to try and put this kind of motion together. You know it is a good first step. My main comments were going to be a little bit of a follow up on what Ritchie was saying, and what we have to communicate to the public here in the information document that is going to be developed here. That is first and foremost that none of these options is going to stabilize the stock, the best thing it is going to do is slow the decline in the stock.

The reason that the commission is going this route is one, to try and slow it so that if we do have, by some miracle, environmental conditions that we try to maximize to the extent practicable the amount of spawning stock we have to produce a good recruitment, if environmental conditions occur. But clearly I think we have to be straightforward with the public about what we are trying to accomplish here, and what we can do.

CHAIRMAN BORDEN: Anyone else on the motion? Adam and then Dan.

MR. McKIERNAN: Yes, David.

CHAIRMAN BORDEN: Adam first.

MR. NOWALSKY: I would defer to Mr. McKiernan if he would like, but it appears you would like me to speak first, so I will. I was just giving additional thought to Mr. Luisi's comments and had a question about that if we go forward with the 20, 40, 60 increments right now, we look at those measures and decide there is just too great of a jump in between those; and want to change them to say 15, 30, 45, 60 in the final document that we decide to send out as the draft addendum. How much work would that entail at that point? Would the PDT come back to us and say, boy we wish you would have told us this then, or is that going to be minor recalculations when we actually send the document out?

CHAIRMAN BORDEN: Megan, to that point.

MS. MEGAN WARE: That's a good question. I think I would have a better answer for you once I started working on this with the PDT and how much effort it is going to take to draft some of these. But I think if we come back in annual meeting and the board is interested in other options, we'll make it work to get that document out for public comment as quick as we can. I think it is an important issue, so we'll do our best.

MR. McKIERNAN: Yes, I just want to point out to the board that I think the message we need to send to the public is how we're going to manage what I would describe as the remnant of the southern New England fishery. We already embarked ten years ago in the Massachusetts, Rhode Island portion of southern New England to scale the fishery to the size of the available resource; and we still have five more trap cuts coming.

People are going to be making those changes. There are already transactions being made. People are leaving the industry now. But it is also important that the PDT, many of whom are knowledgeable administrators of fishery and permitting rules, need to really sort of reveal how we're going to manage this fishery in its totality.

This board a year and a half ago created the Jonah Crab Plan, and the Jonah Crab Plan allows directed fishing with lobster traps for Jonah crabs, and that is what is happening in the Area 3 portion of southern New England. Bob has got a great analysis on trap hauls, et cetera, but what we know from practical experience and from the insights of the industry, a lot of those traps are being set specifically for Jonah crabs.

We have to allow the industry to transition to that fishery, and so that is really the message I want to get across to the public is; this stock is low, it is likely to decline, and as fishery managers we need to point the way to how the fishery infrastructure and fishery participants survive the decline of this environmentally driven stock.

MR. LUISI: Thank you for the second opportunity, I'll be very brief. Tapping into what Dan was just talking about, about the message to the public, and looking at the wording in the motion; preserving a functional portion of the lobster fishery in this area. Based on my previous comments, there are certain options here which will not allow for a functional proportion of the fishery in our area.

I think we need to be clear that s all the different LCMAs that fall within southern New England, it doesn't necessarily mean that the selection in the end to meet the goal, will allow all those LCMAs to continue the functional operation of a lobster fishery. I think that we just need to be clear that southern New England is being looked at as the larger area rather than the different LCMAs.

CHAIRMAN BORDEN: That's part of the balancing act that the board is going to have to meet the challenge of. I'm sure there will be significant debates about how we do that. I have no doubt that the industry will come forward and point out some of the implications of these larger cuts, in terms of, and we haven't talked about this, infrastructure loss. In other words, you've got an industry that exists. If you eliminate 50 percent of the catch and the boats go out of business, then the infrastructure gets used by some other gear type and it's gone at that point.

Those types of points I'm sure will be made by the industry. Any other discussion on this? May I suggest that we've had a good discussion? It seems like we've got a consensus on this. I give you a one minute caucus, and then I would like to call the question. Are you ready to vote? Everyone ready to vote?

If somebody needs another few seconds, I am happy to accommodate you. If not, I would like to see a show of hands; put your hands up. **All those in favor of the motion, put your hand up; leave it up so we can get a count, please. I've got 11 in favor, opposed, any opposition; no opposition, any abstentions? One abstention, any null votes; motion carries unanimously.**

Okay, we're going to break for lunch. I'm going to ask the staff, this goes back to the question that Roy Miller raised, and ask the staff to put up some language which identifies the range of management measures that have been suggested by either the Technical Committee or the PDT, or the industry; and this is the range. What I would like to do is avoid trying to deal with these in a motion, but as you eat lunch, you can all caucus among yourself and see whether or not this is an appropriate range of issues.

In other words, if people agree with this, then the PDT would look at this range and basically use this to start to formulate analyses on minimum size, maximum sizes, standardizing regulations; just the whole gamut of the suggestions that various PDTs and Technical Committees have made. Please discuss this among your group. We'll take a 20 minute break for lunch and then we're going to convene. We have to stay on our timeline.

(Whereupon a recess was taken.)

CHAIRMAN BORDEN: We're going to start again. I encourage everyone to keep eating; and there is dessert out there. Before we broke, I put this list of items up on the board. My preference would be to just provide the PDT with a little bit of guidance on some of the types of issues we would like them to look at; in terms of changing the management measures.

As I indicated before, a number of these items have actually been analyzed. In other words, you've got a document where minimum and maximum size changes and some of the tradeoffs have been made. Is there anything that is not on this list that somebody thinks should be on the list?

MR. McKIERNAN: Closed seasons.

CHAIRMAN BORDEN: Okay, closed seasons. David, anything else?

MR. SIMPSON: No, that is what I had in mind.

MR. LUISI: I just want to ask the question whether or not it is even applicable here, but we've talked during the course of the week about the habitat work that is being done at the New England Council and the coral amendment at the Mid-Atlantic Council, and the fact that there are these areas that have been designated for protection of corals. At this time lobster fishing is still permitted. But I wonder what the impacts might be if those areas were to be considered some sort of sanctuary for lobster fishing.

I know the monument discussion came up a few times as well this week. If at the end of the year, there is a designation for a national monument, what impact might that have; if lobster can't take place in those areas? I don't know if that is something that the Technical Committee or PDT can look into as a possible alternative.

CHAIRMAN BORDEN: I guess my own response would be, I'm glad you raised the question. I think that will be an important question for the board to review; once we figure out what is actually going to take place in federal waters. One of the congressmen, and Eric Reid can comment on this better than I can.

But one of the congressmen from Connecticut sponsored a bill either today or yesterday; to basically close all of the canyons from Oceanographer all the way to the Hague Line. There are probably 20 or 25 offshore lobster boats that seasonally fish in that area. Now depending upon the depth range, I think they're talking about a total closure of all fishing all the way up to 100 meters; but Eric, have you got any more details on that?

MR. ERIC REID: There is actually what the senator refers to as a map, I would call it a chart because I'm in the fish business; it's a chart. You have to go to his website and look at his press release, and you can analyze for yourself what kind of damage that thing will do. The inshore boundary of his proposal is inside of 100 meters.

Of course, the ASMFC has presented a proposal for a process, which the senator from the great state of Connecticut has seemed to totally ignore. As far as displacing of effort, Mike, if this proposal from Senator Blumenthal were to move forward, there would be a tremendous displacement of effort into other areas.

What is it going to do for the lobster population offshore? They are probably pretty happy about it, which I suppose is maybe why that box is the way it is. But the reality of it is that lobster business offshore will cease to exist, and the trawling effort and all the other effort that is offshore right now will come inshore.

You can all imagine what kind of consequences that is going to be. But if you want to see what it looks like, you go to his website and you just kind of have to chase it down. It will certainly have a neg1ative impact on the fish business. Is that enough comment about it? I can go on for another while; but I will not.

CHAIRMAN BORDEN: My own take on this, once we get further details on this, I think we'll have to factor that into any considerations. I would also encourage you as the Vice Chairman of the Mid-Atlantic Council, the Mid-Atlantic Council has all sorts of major fisheries; particularly for squid and a number of other species that are taking place in that same area. You've got a council meeting coming up next week. I would encourage you to look at it and provide your input on it. Bob Beal.

MR. ROBERT E. BEAL: We'll forward you the press release and the map out to this board right now; so folks don't have to chase it down on the website and spend their valuable Lobster Board time digging around on the internet. We'll send that to you in a minute.

PUBLIC COMMENT

CHAIRMAN BORDEN: On this list we will add to it; closed seasons. Dick Allen.

MR. DICK ALLEN: My name is Dick Allen; I am representing the Little Bay Lobster Company. I note that you don't have anything on v-notching up there; which not too long ago was a pretty important part of all the talks about recovery from oil spills and things like that and seemed to enjoy some success, and of course is in effect.

But we get reports that the enforcement of the v-notch law is pretty variable throughout the region. I would suggest that you add v-notching to one of those potential things. I'm sure it will come up in the discussions, and particularly uniform enforcement of the v-notch regulations. You're trying to leave lobsters in the water; that is probably one of the most effective things that you can definitely say you're leaving a lobster in the water with the v-notching requirement. Thank you.

CHAIRMAN BORDEN: Thanks, Dick. At least it was my intent under standardizing regulations. If you look at the figure that is in a whole series of technical documents about the regulations in a lot of the LMAs we have a range of v-notch definitions. That would be one of the items that would be considered under standardizing; and unless we have objection, this issue of enforcement, standardized enforcement procedures could be added. Anybody object to that?

MR. SIMPSON: I'm not sure when you say standardized enforcement. I think frankly, from Addendum XVII, the v-notch regulation in Area 2 is wholly unenforceable and not monitorable. I would be very concerned unless there were some mechanism -- to provide an enforcement mechanism -- that we not include v-notching.

Frankly, since I have the microphone, if I were going to take something off that list it would be standardized regulations, because it is fundamental to lobster management to recognize the differences in fisheries geographically; and I don't see at all where something that would fit for Area 2 in a 60 or 80 foot lobster boat would be equitably applicable to a 20 or 30 foot boat in Long Island Sound. That one even being up there troubles me.

REPRESENTATIVE SARAH K. PEAKE: I join in that concern about standardized regulations. I guess for me it raises the broader question of, what is the role of the LMAs. Yes, we have different regulations regarding v-notch, gauge size, all of that as we look from area to area. But those were developed as part of a collaborative process by each one of those LMAs.

I think if we're going to look at standardizing regulations, we have to have a bigger conversation about what the ongoing role is. Are they still going to have a role? Are we going to pay attention to their input, or is the ASMFC just going to take all of that over and we'll make all the decisions about what gauge size is and v-notching and all of that?

CHAIRMAN BORDEN: I would just offer my own perspective on that. I kind of look at this laundry list as the LMAs, the Lobster Conservation Management Teams, I think have an important role to play in the process. In my view, the sequence here would be that the PDT would take this kind of laundry list and develop some options. The board would review it at the fall meeting, and then at that point if the board is comfortable with the options and they've been analyzed and vetted technically. I think that is the point where we go to the LCMTs and ask them; and at that point they can come back to us with any recommendations they want.

In other words, they can say for instance, we like this option we don't like that option. We like standardizing, we don't like standardizing. It is really up to them to kind of formalize their own recommendations. My own interpretation of this is they have the ability to do that; and I think we want to encourage them to do that; which I think is what you're saying. Anyone else on this point? Yes, Joe.

MR. CIMINO: I just want to make a couple quick points. One, well I truly support where we're going with our first motion and the way we were headed with this when we first tasked the Technical Committee. But I think for the PDT, it will really help the public if they have that other form of currency to compare.

That would be having some of these measures put into what that means, as far as either harvest or exploitation reductions; because I think that is a little easier to understand from their perspective, and I think even we as managers have struggled a little bit on what these measures mean for egg production, as opposed to what it is going to mean kind of for the bottom line.

CHAIRMAN BORDEN: I agree with that. That is the reason I said, I think twice already today that I think the table that the Technical Team put together that Table 1 that does that. We're going to need that same type of evaluation to guide the board decisions when they come back. I think to a large extent the industry is going to want that. They're going to want to see the technical implications of the decisions right up front. I agree with that.

MR. GROUT: I think we've got a good list here, particularly if we add the one that Dan put up there, closed seasons. At least, at this point, I think having each of those as an option to be able to look at and put in the PID, and come back with some options including standardized regulations; obviously minimum and maximum sizes. I think it's important to keep that kind of flexibility in there with our options. I would support the list that we've come up with so far.

MR. ADLER: A couple of things. First of all, on the list, and I know the biologists indicate that culls don't produce as well. But the thought that was on the table at some point, it got thrown off and it may, was the fact of not allowing female culls to be landed. Now what this does is -- it would for one thing -- a low priced lobster is a cull.

They get the lowest price. It also would protect on the treatment of the lobsters; if they're moved around on the boat, because if they drop a claw they can't take it in. It was just an idea of leaving more females on the bottom, and I know Bob would say that they don't do a good job, and they may not, of reproducing.

But you've cut exploitation rate, you've kept a creature that isn't a good market product anyway, and you have protected perhaps better treatment of handling of the lobster. It was just one of those things that was put on the list and might be thrown off; but it was just an idea of a way to put more females back down in the water for better or worse, and do another couple of things. It was just one of those things on the laundry list that might get displaced. Another point while I have the microphone. It is very important that the LCMTs remain a factor, because that was one of the factors when lobster was moved from the federal council to the ASMFC; and I remember this. That when we were dealing, and at the time the federal councils were dealing with lobster, and they weren't really listening to the fishermen.

We had advisory panels and they would go off, and then they would come back and the council would say, thank you very much for your information; now we're going to do what we want to do. It was the lobster industry that stood up and said, no. When the whole process was basically changed over to the Atlantic States the Atlantic States Marine Fisheries Commission said, "Yes, we will listen to you."

"Yes, we will get you into the process"; which you did, and it has always been a positive part out there in the world, in the industry when they said, "Well, yes, they did listen to us." They sat us down; they told us what the problem was. They said, you figure it out, and then we came back to the boards and basically the board said, well did they fix the problem?

Science said yes that they fixed it, and this commission pretty much adopted what those fishermen; it made them feel good. I think the LCMT and of course, it is better for getting compliance too, because it was their idea. The LCMT issue is a positive thing. The other reason for different rules in different areas had to do when it went back to the fact of the biologist had indicated that the stock of lobster in different areas along the coast were in different states of either overfished or not, or whatever.

They were also given a range of where they had to get to be back. Naturally, one area would have to do more work than another area, given what the biology and the stock size conditions were in that area. This is why it had evolved into having different rules for different areas; because somebody had to do a little bit more than somebody else. That is the history behind why the LCMTs should be there, and why the Atlantic States Lobster Board has actually done a good job.

CHAIRMAN BORDEN: Brandon, you're next. Anyone else? Okay, Peter, you're going to be the last one, and then we're going to have to move on.

MR. MUFFLEY: Two points, I guess. One, I support the addition of adding seasonal closures as an option to consider. But I think we should ask the PDT to also evaluate those seasonal closures in relationship to the Jonah crab fishery and the impacts that it may have there, because if we are going to have seasonal closures and gear needs to be removed from the water, we're going to impact the fishery that these lobstermen have begun to transition to.

I think they need to evaluate seasonal closures, not just for lobsters but impacts that it may have. My other point is, I just have a question. I am just trying to understand the difference, or what you're thinking of. You have effort reduction, and then there's an application of effort reduction. I am just trying to find the nuances between just the general effort reduction and then the application of effort reductions. Are you thinking in terms of effort reductions just trap reductions or are you thinking something beyond that to decrease effort?

CHAIRMAN BORDEN: Well, this isn't my list. It's just a list of ideas that have been put forth by both the industry and by the PDT and actually the TC. Effort reductions I think can be similar to what the effort reductions that have taken place in Area 3 and Area 2. Acceleration of trap cuts is an idea that came up.

The LCMT-3 group met before our last board meeting, and one of their recommendations was to the existing trap cuts that are being implemented, which require a 25 percent reduction in traps going ahead. They actually recommended a schedule that would accelerate those trap cuts. For instance, next year you do I think a 5 percent trap cut, and then that would be followed by say, a 10 percent trap cut instead of a 5 percent.

I mean there are kind of two ways of looking at it. They also recommended additional trap cuts in the years that followed that; which I think amounted to 10 percent. Take a year off and then do two 5 percent increases in trap cuts. All this is, is basically allowing some flexibility, I think, for the PDT to consider the types of things that the industry has recommended or that the PDT is recommending.

MR. SIMPSON: Again, on trap reductions, given all that we heard from the Technical Committee on how they, frankly, don't recommend that. I am wondering beyond that if we actually know the number of traps that are actively fished in each LMA, because that would be the number we would have to cut by to achieve the reduction theoretically in exportation.

Do we even know that number, and if we do and that is what should be going into the addendum, then that just needs to be clear to the public and fishermen; that we're not talking about for Connecticut the 235,000 traps. We're talking about maybe 20,000 traps, and we're cutting from there.

CHAIRMAN BORDEN: Yes, if I'm not mistaken, at one point didn't Connecticut and Long Island have a million traps in Long Island Sound, if you went back 15 years? I mean, the numbers I think were astronomical.

MR. SIMPSON: I think it falls into the area of folklore. But we have an allocation of 235,000 traps in Connecticut. It is history based. Some of it is calculated number of traps fished. But another way to qualify this, is to answer your question, which was how many traps do you put on your application? Clearly, there were some people who were forward thinking in the number of traps they indicated. Even the 235 is a probably a bit on the high side.

CHAIRMAN BORDEN: My answer to your question, David, is yes. You would start from the lower number, not the higher number. I've got Peter Burns.

MR. BURNS: While we're looking at a whole list of options here, what about the concept of trip limits? Is that something that maybe the board might want the PDT to consider? I know that that opens a new door in how we've managed lobster; especially with respect to the trap fishery. But we're entering a new chapter now in lobster management in southern New England.

In some cases that kind of approach may even be more palatable for businesses then maybe a change in the minimum size, for instance. That may be something to think about, and I know that along with that comes a whole host of issues that have to do with administration and record keeping and reporting and things like that. Because we're going to be talking about that later, maybe this is a good time to talk about that. But if we're going to include something like that in there now, we could also address that in our discussion about what we need for record keeping and reporting requirements moving forward.

CHAIRMAN BORDEN: Okay, so anyone else on this list? I don't think we need a motion.

MR. SIMPSON: Yes, just so I can feel better. That looks like a Word document and not a power point or anything. Could you add closed season, trip limits; whatever else has been suggested, so that we know that it has been captured?

CHAIRMAN BORDEN: Good point. Anything else? Bill Adler. I'm having difficulty getting off this item.

MR. ADLER: I keep pushing culls just to talk about it.

CHAIRMAN BORDEN: Does anyone object to adding culls to the list? We have no objections, so culls are on the list, Bill; v-notching is part of it, Dennis, standardizing the regulations is part of the v-notch issue. Steve Train.

MR. TRAIN: I have one other suggestion that could be vent size increases. It makes the traps a little less efficient.

CHAIRMAN BORDEN: Any objections to adding that to the list? Okay, so Steve got the last word.

RESPONSE TO THE NOAA LETTER ON INCREASED REPORTING IN THE LOBSTER FISHERY

CHAIRMAN BORDEN: We're going to move on to the next issue here. The next issue is Discussion of the Response to the NOAA Letter. I'm going to let Megan comment on this, and then we'll get into a discussion on how we should respond.

I just point out that we've had this advice before about the need to improve reporting. The TC has, I think, given us at least two, if not three, memos that included various types of advice on the need to improve reporting, in order to improve the stock assessment. We've had a response from NOAA on the issue. Let's get into a discussion and decide how we want to handle this.

My take from the NOAA letter is that if, in fact, we want to make changes in terms of the federal requirements for reporting, we're going to have to include those requirements as part of the commission FMP. Megan, do you want to follow up and provide a little bit more background, please?

TECHNICAL COMMITTEE RECOMMENDATIONS

MS. WARE: Yes, just for some context on this discussion. In February, the TC presented a report, and it was one of the first reports that they've done in response to a request from the board. It was asked to look at a section of a previous addendum that highlighted data limitations or biological data limitations in the lobster fishery.

Basically, the TC said that many of these limitations are still there. In response, the board sent a letter to NOAA Fisheries requesting 100 percent reporting in the federal lobster fishery. As David alluded, they replied and said, if you would like that we should probably go through the ASMFC process so that can be vetted through the public. We should really stick to the ASMFC process, which would be an addendum. That is one of the things that have led us to this discussion. I think the second thing is in your meeting materials there was a letter on the Atlantic Large Whale Take Reduction Team. They've started to talk about their co-occurrence model, and updating that in terms of the lobster data that is included there. I am not really sure where that is going, but it is just an issue on the horizon that we might want to be aware of.

It's always better to be ahead of issues than behind them. I think, since we were just talking about the monument issue, the Habitat New England Council Deep Sea Coral Amendment, all of these issues are kind of bringing to light some of the data limitations we have; specifically in harvester reporting and where that catch is coming from. That is just kind of setting the stage for this discussion. I think we need to think about where we want to go with this.

CHAIRMAN BORDEN: All right, so I think we've got a couple of options here. We do have time limits. This type of issue could take extensive amounts of time if we want to get into all the issues that Megan just itemized. The other way to deal with data reporting, and I would just add that there is a lot going on here.

NOAA has a -- and Peter can explain this better than I can -- NOAA has an internal working group that is looking at this whole issue of data reporting. I think the conclusion of that will probably be reached in another year. One of the alternatives for us would be to form a subcommittee from this group, I think to meet, get briefings on what is taking place in terms of the NOAA internal actions on this; and kind of go through this list of data deficiencies that the technical people have raised.

Then bring a formal recommendation back to the board at a subsequent meeting. That would be a way for a smaller group to take this on as opposed to all of us trying to deal with it at this stage. I'll open the floor to discussion. As you speak on the issue, please tell us what your preference is. Anyone? Pat.

MR. KELIHER: Mr. Chairman, I think the idea of a smaller subset discussing this in more detail is appropriate. I do want to, just for the record, make it known, because at the Executive Committee the other day, I incorrectly stated a number after I reviewed a spreadsheet that my staff prepared for me last night and found a mistake.

I just want to be clear, 100 percent reporting for the state of Maine means going from 30,000 trips that we would look at and audit on an annual basis to 300,000 trips. The cost associated with that would be an increase of well over $300,000.00 over $350,000.00 to the state of Maine. I just want to make sure that is clear and on the record, and is taken into account as we're talking about increasing data needs and what it would mean to the state of Maine.

CHAIRMAN BORDEN: Thanks, Pat, for that. I just make the observation that I think if we follow the path of having a subcommittee, they can consider that and actually get into some of the details. In other words, there may be other alternatives that we can use, other technologies that we can bring to bear on this type of issue. I think that if we get a smaller group to actually focus on the details of this, we'll be better served; so other comments?

MR. BURNS: Yes, real briefly. I think that this is a good approach, to get a working group together to try to look at what it is that the TC needs to better manage the stocks. In our response, I think it is important to note that we're willing to work with the commission and we want to work collaboratively, in order to improve reporting so that we have the resolution and the data elements in there that the TC can use to better manage the stock. Maybe it isn't 100 percent reporting that we really need, or the vessel trip report may not be the exact tool for that. I think that would be a good opportunity if we have a working group, to kind of think a little bit more closely about what exactly is needed and how to get that.

CHAIRMAN BORDEN: All right, so let me ask, is there any objection to doing that? Then I'll work with the Executive Director and put together a subcommittee on this. If you're interested, either talk to myself, or Megan, or Bob Beal, or Toni, and we'll try to keep it small and functional.

I think the goal for the subcommittee is to look at all of these different data needs that have basically been identified in various technical reports, and then bring recommendations back that solve the problem. In other words, these data deficiencies are going to continue to hunt lobster management, the assessment process, if we don't' fix them; so we've got to figure out how to fix them.

I would point out we have the same types of issues going on in terms of the assessment needs and the biology and the technical people are going to review a motion from the last meeting that Pat Keliher made that tasks them with doing that. There is a lot of this type of activity that we simply need to improve our state of knowledge and improve the way we perform, in order to make this FMP work.

MR. KELIHER: I just think, as part of the working group or subcommittee, Mr. Chairman, there are some key staff that have been working on some of these alternative programs that we should bring to bear. My staff has been working with ACCSP on the swipe card technology. There may be some applicability there, as well, so we would be happy to participate in this process.

CHAIRMAN BORDEN: We'll move on. Please, if you want to be considered for the subcommittee, please talk to one of the people that I identified. The next issue on the agenda, and I think this will be fairly short; at least I hope it is going to be fairly short, is the Jonah Crab

Addendum II. I'm going to start and let Megan give a presentation. Then what I would envision is that the board will need to make a motion to authorize some form of this document for public hearing at the end of that.

JONAH CRAB DRAFT ADDENDUM II FOR PUBLIC COMMENT

MS. WARE: I'll be going through Draft Addendum II today for Jonah Crab. Again, this is in regards to claw harvest. This is a reminder of our timeline for the addendum. Last May the board initiated this addendum to consider a coastwide standard for claw harvest, and then we're here today to review a draft of that and potentially approve it for public comment.

If it is approved for public comment, we'll hold that between August and October, and then at the annual meeting we would potentially consider final action, after reviewing the public comments we've received. Just as a reminder for how the FMP currently establishes a claw fishery, it's a whole crab fishery; however, individuals from New Jersey, Delaware, Maryland and Virginia who can prove a history of claw harvest before the control date, are allowed to continue that practice. This was included in a way to accommodate the DELMARVA claw fishery, which are usually small boat fishermen that have practiced this harvest for a long time. There are two issues we're trying to address in this addendum. The first is that following approval of the Jonah crab FMP, we found that there are claw fishermen in New York and Maine. These fishermen are currently only allowed to land whole crabs.

Right now, we have some fishermen who used to land claws and can still land claws, and then we have some fishermen who used to land claws who can only land whole crabs. There is an issue of equitability right now. The second challenge is that in a letter from NOAA Fisheries, we've heard that it might be challenging for them to implement the current claw provision due to National Standard 4, which says that management measures cannot discriminate between residents of different states.

I think this is particularly an issue considering that the Jonah crab fishery is primarily executed in federal waters. One of the biggest challenges for the Jonah crab fishery is that our data is quite limited, and there are a couple of reasons for this. The first is that trip level harvester reporting has not been required in all jurisdictions.

Prior to the FMP, dealer reports were not required to delineate between whole crabs and claws. Then another issue is that a lot of the landings are for personal consumption, so those are not being well documented. Overall, it is unclear how many fishermen are harvesting claws and the number of pounds that are being landed.

In the effort to try and get some idea of the size and magnitude of the claw fishery, I did pull some data from the ACCSP data warehouse, and this is what came up. It would suggest that claw harvest between 2010 and 2015 was just under 150,000 pounds; but I think this is probably an underestimate, given the reasons I just stated that personal consumption landings are not included in this.

We don't have dealer reports that have always differentiated between the market grades. Harvester reports aren't required to say if it is claw or whole crab. This is the data we have, but it is likely an underestimate. I think what is important to see is there are a variety of gears that are landing claws.

It is primarily pots, and lobster pots could be from 45 to 95 percent. One of the issues in the data is that there is a significant portion of pots that aren't characterized as either lobster pots or fish pots. We're unclear exactly what percentage that lobster pot harvest is. However, there are also gillnets and otter trawls that are landing claws.

What I've heard is that for these fishermen, they end up harvesting the claws, because that is how they detach the crab from the net, so they actually have to break the claw off to get the crab out of the net; so that is why they're harvesting claws. Just like our landings data, our biological data is also limited.

However, there have been numerous studies that have been started, and we're starting to get preliminary data from that. I'll be presenting some of that today. This shows some of the morphometric data that we have. We have carapace width on the X axis, and claw length on the Y axis. This is from an SK grant that was funded in 2015, where they collected information on carapace width, claw length and different sorts of biological data in the Jonah crab fishery. We're able to plot that relationship. What this shows is that for the minimum carapace width of 4.75 inches, we would expect a claw length of around 2.5 inches. The crabs here are only male crabs, and they were taken from southern New England; both inshore/offshore and Georges Bank. But this is one of the relationships we have right now.

We also have some data on claw mortality. There is an ongoing small scale lab study that is taking place that is looking at the relationship between claw removal and survivorship in the Jonah crab fishery. What they did is they subjected the crabs to one of three treatments. You either had one claw removed, two claws removed, or both claws remained intact.

These crabs were monitored for four weeks. What they found was that 19 percent of crabs died when no claws were removed, 56 percent of crabs died when one claw was removed, and 74 percent of crabs died when both claws were removed. Clearly, mortality is increasing as we remove more claws. But this is some of the mortality data that we have thus far.

Just to kind of summarize where we're at. We know that there are claw fishermen in many states along the coast that are using a variety of gears. The current regulation does not provide equal opportunity to like participants across the fishery, and federal implementation of the current provision may prove challenging due to National Standard 4.

I am going to go into the options now in the addendum. There are four options. Again, our goal here is to create some sort of coastwide standard, and that is what Options B, C, and D will provide options for. But we also have status quo, so that would maintain a whole crab fishery. Individuals from New Jersey, Delaware, Maryland and Virginia, who have that history of landing, would be allowed to continue to land claws. Option B would create a coastwide whole crab fishery, so no claws would be able to be retained or sold.

Option C would create a coastwide whole crab fishery. However, there would be a five gallon coastwide tolerance of detached crab claws per vessel per trip, which may be retained and sold. The idea here is we've heard that some people are just harvesting claws for personal consumption; some just want to be able to harvest a small amount. This option would allow for that to happen.

In the addendum we do say that the claws must be the 2.5 inch minimum length, and that is because we have that 4.75 inch minimum carapace width, so we would want to make sure that the claws are being harvested from legal crabs; and two claws may be harvested from the same crab. Option D would establish a claw fishery coastwide, so fishermen could either land claws or whole crabs. We do say that the detached claws must meet a minimum size of 2.5 inches; and two claws may be harvested from the same crab.

In relation to bycatch limits, what we've suggested is that the bycatch limits remain so that fishermen, who currently are under the thousand crab limit, would be allowed to land up to 2,000 claws. The idea being there are two claws per crab, so that is how we got to that number. At this point, I would take any questions or comments on the addendum, and then we can talk about public comment.

CHAIRMAN BORDEN: Questions, Dan and then Bill.

MR. McKIERNAN: Megan, when you did the query from the data warehouse, do you know if some of those Massachusetts trips that we uncovered as being miscoded were corrected?

MS. WARE: I don't know. I would have to go back and check.

MR. McKIERNAN: Yes, because I am nervous about that. I know there were a few trips in the tens of thousands of pounds that were recorded by the dealer as claws; and when we called the dealer, they apologized, because their key punch person pulled down the wrong code. In fact, what is interesting is with the SAFIS reporting, you can repopulate or you can call up the same codes time and time again; so they were reporting claws all the time, but they weren't landing claws.

These numbers seem really high to me, so before this document goes out, I would ask that you give us a chance to sort of ground truth or test the validity of those figures; because that is a concern. My second question has to do with the option that allows the fishermen from certain states to retain crabs.

Maybe the only folks in the room who can answer my question are NMFS, but I still think there is a problem, because you're talking about possession of claws in federal waters, which is where this fishery takes place predominantly; and you're creating kind of an unequal opportunity for fishermen from four states. I don't know if Option A is approvable by NMFS, and I would just want them to comment.

CHAIRMAN BORDEN: Let me just ask somebody, Alli or Chip, do you want to respond to that? If you don't that's fine, don't feel an obligation.

MS. ALLISON MURPHY: I think our concerns definitely remain with the status quo option, but I think it is viable to keep that in the document to have a broad range of alternatives for public consideration.

CHAIRMAN BORDEN: I mean, just to follow up on that. My assumption is that once it actually is incorporated into a public hearing document, if NMFS has legal concerns they will provide written guidance on that. Anything further on this? Bill.

MR. ADLER: I just have concerns. Nothing against going out with all these options and stuff, but I do want to just voice concerns over if we do whatever we choose to do, and we run into the Federal Standard-4, how do we handle that dilemma; that is one thing. I am concerned about the mortality when they take claw1s off, based on what we just heard about the expected mortality of these crabs.

I don't know what to do about it, but I think that this is a concern about this whole idea of the claws, and then we have another gauge we have to get. We have to get a gauge for the claw, in addition to the size of the crab and the lobster. Now we have a gauge of 2.5, which is a good idea because otherwise they'll be bringing in claws from small crabs, true. But I can just see, we have to have gauges and v-notch machines and things like that. I just wanted to point out that these are the pitfalls that we might be running into with this.

CHAIRMAN BORDEN: I think all of those points are good points, and I think once we take this document to hearing there will be a record, and then once we get the record from the hearing, if there are legal issues or there are administrative problems that come up, then we have to consider those when we get to the point where we have to make a final decision on it. Thank you for raising those. Anyone else?

MR. LUISI: To Bill's concern over the mortality and the information that is going to be presented to the public. I think by suggesting that there are different levels of mortality associated with the removal of one or more claws, I think to complete the graph or to complete the table, and there should be a mortality associated with the whole crab being landed.

It kinds of paints a bad picture of the claw fishery without explaining to the public that if you bring the whole crab in there is obviously 100 percent mortality there. That was one thing. The second point I wanted to make had to do with the National Standard issue. I wonder if, I don't know how to articulate the question, but if there were some delineation made where either north or south of a particular area, rather than identifying the states; but a line that would delineate a claw harvestable area or a non-claw harvestable area, or a whole crab area.

Would that open the door for opportunity without specifying whether or not particular states have an advantage over other states? That would displace some effort, I would assume, in the areas, but I just wondered if that was something that could be a potential here; and then my third point has to do with the Option C, which is a whole crab fishery with a small volumetric claw harvest.

I just -- five gallons -- I understand how that was developed and why there would be some consideration for somebody who may want to enjoy the claws for personal consumption. But I just wonder if that small volumetric claw harvest, there could be multiple levels there to look at, maybe up to and including the bycatch allowance; so that under the bycatch limits you would have to land whole crabs if you exceeded that bycatch allowance of 2,000 claws. Just some points to throw out there to see if anybody has any thoughts about it.

CHAIRMAN BORDEN: Any other comments or reaction? Bill Adler and then Brandon. Then I am going to ask for a motion on this.

MR. ADLER: I am curious about Standard 4 again, and if this is the crab fishery, what law is it under; Atlantic Coastal or Magnuson, and do we have a Standard 4 in the Atlantic Coastal Act like Magnuson has? I'm not sure how that works.

CHAIRMAN BORDEN: Ali or Chip, do you want to respond to that?

MS. MURPHY: I'm a little new to the Atlantic Coastal side of things, so I may call in support if I get this wrong; but my understanding is that any regulations we issue under the Atlantic Coastal Act also have to comply with the Magnuson National Standards. That is where the National Standards enter in.

CHAIRMAN BORDEN: Thank you, Alli. Chip, do you want to follow up on that or add something to it?

MR. CHIP LYNCH: Chip Lynch; with NOAA General Counsel. No, what Alli says is essentially correct. The issue is that although the board, the commission would have a plan. The plan nevertheless makes recommendations to the states and the federal government.

The federal government would take those recommendations and turn them into regulations according to its statutes; and the Atlantic Coastal Act is the statute we would use here. That statute requires NMFS to issue regulations that are both compatible with the plan, but it is also consistent with the National Standards Bill. That is how it ties in.

MR. MUFFLEY: Two comments – one from National Marine Fisheries perspective -- what about an idea that Mr. Luisi had presented. Would something like that, where you're not specifically identifying states, be an alternative to that which we could consider? That is one question, and then two, I'm trying to understand the nuances a little bit between status quo and Option D.

Status quo, those states that have the claw allowance now, they do not need to retain the entire crab, correct? They are allowed to just bring the claws back. But under status quo or under Option D, the entire crab still needs to be landed under that option; correct? Because it says here that the crabs need to meet the minimum carapace length of 4.75 inches, and the detached claws need to meet the 2.5 inches. To me, in order to prove that, you have to have the entire crab aboard, you couldn't just land claws under Option D.

MS. WARE: Yes, sorry for some confusion on that. What the PDT and I were trying to get at is that you don't just have to land claws; you could land claws and whole crabs. Under Option D, you could land just claws, you don't have to bring the whole crab back. But a fisherman could decide that he wants to land 1,000 whole crabs and 1,000 claws; and that is also allowed, as long as the whole crabs meet the minimum carapace width, and the claws meet the minimum claw size. Is that clear?

MR. MUFFLEY: That's clear. I don't know if the language is in here. To me, it reads that you need to bring the whole crab back. I don't know if additional language needs to be in there to say that you can bring either/or back, as long as they meet those standards.

MS. WARE: I can work on that.

CHAIRMAN BORDEN: The one issue that I don't think we're totally clear on is this issue that both Mike and Brandon have raised about casting the option with the line in there as an alternative to singling out the states. If the board wishes to include that as an alternative to identifying the specific state exemptions, just to allow the public to comment on that. I think that is probably fairly easy to incorporate into the document. Steve Heins.

MR. STEVE HEINS: I'm just wondering what the justification would be, what kind of rationale we would provide in the amendment for drawing a line. I mean, I understand that the purpose is here is to avoid some legal issue. But is that what you take to the public, yes, we're trying to avoid a legal issue?

CHAIRMAN BORDEN: My own view and one of the Mid-Atlantic members can correct this if I mischaracterize it. I think the rationale would be the same rationale for identifying the states originally. In other words, the practice was almost a geographical change in behavior; although since that time we've had information come forward from Maine and other states that the practice actually is more widespread than we anticipated. Let's get a couple of comments on this line. If somebody wants to include that as an alternative, I suggest you do it as a motion. Then I'll entertain a motion on the entire package. Does somebody care to make a motion on this? Mike.

MR. LUISI: Sure, I'll put a motion out there for discussion. **I would move to add an alternative to Addendum II which includes a delineation line at 41 degrees, which I believe, is about where Montauk is.** It comes across right, so Long Island and New York would be included south of that. I'm pretty sure I'm correct on that. To include a delineation line at 41 degrees for a Jonah crab claw-only fishery.

CHAIRMAN BORDEN: All right, is there a second? Any seconds, Brandon. Discussion. Any discussion on this?

MR. McKIERNAN: I'm having heartburn over this, because I think our entire Jonah crab fishery is south of 41 from Massachusetts. This basically creates a claw fishery throughout the range. I think this is a premature motion, and maybe we can dispense with this addendum until the next meeting and create a committee to look at this a little closer. I really don't want to see this done on the fly. I think this is premature and needs more work.

CHAIRMAN BORDEN: Other comments. Does anyone else want to comment on this? Eric.

MR. REID: I guess, in order to avoid problems with National Standard 4, if you want to have a claw fishery, you are going to have to do something like this, because a state-specific claw fishery will not fly. If the commission decides it wants to advance a claw-only fishery, something like this has to be put in this document.

Whether it is as specific as saying a line delineated by 41 degrees north; its 41 north, is one thing. If it says to develop a delineation line to separate a claw-only fishery from a whole crab fishery that might be a better way to go, because 41 degrees north, everybody fishes south of that; the entire fishery is there. But I think if it was less specific, it is only a public document for analyzation by the public.

If it had some much broader thing to include the development of a line delineating claw-only fishery versus whole crab-only fishery; that might be something that we would get some feedback on, and it would solve a lot of problems. But without something like this, you are not going to get a claw-only fishery, it is not going to happen.

CHAIRMAN BORDEN: Other comments, anyone else? Alli.

MS. MURPHY: I just wanted to say that I am going to abstain on this vote. I think, if this does go forward, we're going to have to take this back and shop it around and think through whether this has National Standard 4 implications or not, so I just don't want to prejudge that right now.

CHAIRMAN BORDEN: All right, so we have a motion to add this alternative to the document. Does anyone need me to read the motion? Seeing no hands up; are you ready for the question? All those in favor of the motion, raise your right hand. Leave it up, please. **We've got four in favor; opposed, seven opposed, any null votes, abstentions – one abstention, any nulls? Motion fails.** Okay, so on the document, I think we need a motion to take this document out to public hearing. Steve, you had requested.

MR. HEINS: **I am going to move that we approve Addendum II to the Jonah crab fishery management plan for public comment.**

CHAIRMAN BORDEN: All right, so we have a motion, is there a second? Second Pat Keliher. Dan, did you have your hand up before? Do you still want to speak? Anyone care to speak on this? Mike.

MR. LUISI: I was waving my hand trying to get your attention before this motion went up on the board, because I was hoping, in the interest of trying to secure some form of a claw fishery in our region, and maybe my comment earlier could be incorporated without a motion, but when I referred to Option C earlier and the small volumetric claw harvest, I was hoping to make a motion that would allow for a range of small volumetric claw harvests to be included in the document from five gallons to what the bycatch allowance would be.

That could be a way for us in our region to secure some form of a claw fishery; if in the end National Standard 4 doesn't allow the continuation of our status quo that we have currently. It is hard for me to approve this or support this motion just based on my hope that I was going to be able to maybe modify Option C; so I guess I'll seek your advice on that.

CHAIRMAN BORDEN: Well, Megan wants to comment, and then I'll provide my input.

MS. WARE: I just have a question, Mike, for clarification. Option D does allow for a coastwide claw fishery. Maybe you can elaborate more on what you're looking for in another option, because I feel like there is an option that gives your state a claw fishery.

CHAIRMAN BORDEN: I was going to comment almost similarly, but within the document there is an option that allows you to comment on the whole concept. I think, rather than change the document at this point, you can actually submit comments and make those suggestions; then the board can consider it as part of the public comments. Toni.

MS. TONI KERNS: Just a point of clarification of what will be within the realm of the board is allowed to vote on come final action. It would have to be within the range of options that went out for comments, so if the state did ask for a higher volume in Option C, as it is written right now that would not be within the parameters of the board; even if they ask for it in their public comment, just as a qualifier.

CHAIRMAN BORDEN: Okay, so you've got a couple of options here. Mike and any of the supporters of this concept are free to make a motion to amend to include that; if you would like to do that. Absent that, I am probably going to call the question.

MR. LUISI: The way I read it, based on Megan's interpretation, it is of my opinion that I don't envision at the end of the day when this addendum is finalized; that the board is going to be all that supportive of a claw harvest permitted coastwide. If we're able to go forward with a coastwide whole crab fishery with an allowance for claws greater than five gallons, I think that that might be where we find the compromise. **Given that, I guess I would move to amend to include in Option C a range of small volumetric claw harvest from five gallons to the bycatch limit of 2,000 claws.**

CHAIRMAN BORDEN: I'm going to ask for a second, and then I'm going to go to Dennis Abbott, probably on a point of order. John seconded. Dennis.

MR. ABBOTT: It seems to me it would be better, I don't think this should be part of the final motion. I would have suggested that we temporarily table the motion by Mr. Heins and go back to the discussion and either pass or reject this motion so we can get back to the middle. I just don't' think it fits with our final motion.

CHAIRMAN BORDEN: Yes, I also share that same concern, but you are quicker on the draw. In the interest of time, because I know a bunch of you want to get out of here by three o'clock. Does anyone have an objection to temporarily tabling the first part of the motion? Is there any objection? If there is an objection, I am going to ask for a motion.

We're temporarily laying the first part of this motion on the table to come up immediately after we deal with Michael's motion. Is everyone clear? Okay, so Mike, do you want to say anything further or anyone else wants to comment on this issue? Ritchie.

MR. RITCHIE WHITE: I guess I need to understand it. I guess I don't understand if you're allowed a 2,000 claw bycatch, you can always take less than that. I guess I don't understand why we need something five gallons to 2,000 claws. If you can do 2,000 claws, isn't it already covered?

MS. WARE: I think right now for that bycatch provision it would be whole crab only, so you wouldn't be allowed to put that into claws. That is why they're asking for this. In Option D it refers to the bycatch, and that is where that 2,000 claws came from.

CHAIRMAN BORDEN: I've got Steve Heins, anyone else? Steve and then Dan.

MR. HEINS: I was just trying to get your attention about, I was planning to move to table the first motion if that's okay; that's all. It's all good now.

MR. McKIERNAN: Yes, again, my feeling about this is I would really like to see us postpone action on this addendum until the next meeting, because I am seeing things coming up that haven't been well thought out. In looking at this motion, it talks about a bycatch limit of 2,000 claws, which suggests that we're going to have boats going out and taking their thousand crabs so called bycatch limit.

I thought this was designed to accommodate the legitimate crab fishermen/lobstermen who have been taking Jonah crabs forever and routinely bringing in claws because of warm water issues. Now, I'm looking at this up to 2,000 claws, I'm starting to sense that we're trying to accommodate a different user group; and I don't have a clue if it is true or not. I'm just really concerned that I don't think the subcommittee or the board itself or staff has really been consulted on where this is going. I really think that we should postpone this addendum until we do more work on it.

CHAIRMAN BORDEN: I've got Tom Fote, does anyone else want to comment? I'll make a suggestion after this.

MR. THOMAS P. FOTE: I think we've postponed this long enough. It talks about a whole bunch of Jonah crab fisheries; not just for the lobstermen, for other lobstermen. It is going out to public hearing, the comments will come in. We can rehash it there. But I think postponing this anymore just gets kind of pushing the can down the road; and we've been doing that long enough.

CHAIRMAN BORDEN: All right, anyone who has not had an opportunity to comment on this? Toni.

MS. KERNS: Not a comment, but I think it would be helpful if we were able to translate claws into a volumetric quantity; because for enforcement purposes it will be easier for the public to understand how those two numbers compare, as well as I think enforcement has told us they would like to have volumetric quantities in order to enforce this type of regulation. That would be helpful to have the liberty to change those 2,000 claws into some sort of volume, if this motion does pass.

CHAIRMAN BORDEN: Does anyone object to following Toni's suggestion? I mean, there is no reason you can't do both; in other words have a volumetric standard and the count.

MR. LUISI: Some of these new things that have come up. I do feel that in a way a little bit of what Dan is feeling here about some of these considerations given National Standard 4 and I think there is certain interest in certain regions of the range of the species. I would be okay with postponing until the next meeting. I am discussing that with my neighboring states. I think we would be okay with that.

I don't know the procedure at this point on whether or not a motion needs to be made to postpone any further action until the following meeting; but I just wanted to put that on the record that I would prefer to postpone and give this some thought and come back again and discuss it, rather than have an option that may eliminate a claw fishery for our region not be voted through, just because people haven't had an opportunity to think about it.

CHAIRMAN BORDEN: Does anyone disagree with the concept that Michael and Dan are suggesting here that we postpone all of this and have a small group try to look at the details and bring a recommendation back at the next board meeting? Does anyone object to it? There is no objection to that.

So the record is clear process-wise, Dennis, do we need a motion to postpone at this point? **All right, does someone want to make a motion to postpone until the next meeting? Steve Train. Is there a second to it? Seconded by Steve Heins.** Are you ready for the question? All in favor signify by saying aye.

MR. ADLER: **Mr. Chairman, are we voting on the Option C; five gallon to 2,000 or are we voting on the whole addendum to be postponed?**

CHAIRMAN BORDEN: The whole thing. **Postpone everything, including the tabled motion**. Everything is postponed. We'll sort through all this at the next meeting where we will have loads of time to get into the minutia. Okay, does anyone disagree with postponing?

Then postponing has been adopted by a consensus of the committee.

MAINE'S CONSERVATION EQUIVALENCY PROPOSAL

CHAIRMAN BORDEN: The motion is postponed, so we're going to move on to the next item, which is Maine's Conservation Equivalency Proposal. I'm going to introduce -- Pat, do you want to introduce this item?

MR. KELIHER: Megan, were you going to go through that or did you want me to?

MS. WARE: I was going to have you take the lead on the first slide and the pictures, and then I'll do the AP and PRT report.

REVIEW OF MAINE'S CONSERVATION EQUIVALENCY PROPOSAL

MR. KELIHER: Okay, great. While we're waiting to bring the Power Point up, just some background. In the spring of 2015, DMR was given approval by the board to put together a pilot program dealing with trap tags and our replacement tags. If you would go right to the next slide, we request approval of a conservation equivalency now to continue that trap tag pilot program.

Currently, harvesters are allowed to bring traps back to shore and cut the existing tags and reattach those same tags with a hog ring to the new gear. This has eliminated the issuance of 20,000 exchange tags within our fishery. We firmly believe that we've removed a lot of illegal gear from the water.

It was clearly shown last year patrol hauled over 13,000 traps and inspected thousands of traps dockside; and we saw very, very few tags that had actually been hog ringed back in; leading us to believe that these exchange tags were used in a way, probably to expand the fishery within the state. It is tough to see, but here is a trap tag that has been reattached on the bridge of the trap. You can see on each end of where those small stainless hog rings are. Here is another one where they've just wrapped it around and then re-hog ring it.

PLAN REVIEW TEAM REPORT

MS. WARE: I'll quickly go through the PRT report. We had a conference call with the PRT and the PRT supports Maine's proposal. Some of the comments were that it will reduce the number of potential counterfeit tags in the water. It will alleviate burden on the Marine Patrol to trace the extra tags, and given reports of malfunctioning tags in Maine this year, hog rings have provided another viable way to attach the tags to the trap.

ADVISORY PANEL REPORT

MS. WARE: We also had an AP call on this proposal, and the AP **s**upports Maine's proposal. Some of the comments were; the ability to transfer tags between traps is a time and money saver. It relieves burden on Marine Patrol to enforce exchange tags, and it allows fishermen to use tags for the duration of the year.

CHAIRMAN BORDEN: Any comments on that report? Bill, and then I'm going to call on Mark to give the enforcement report.

MR. ADLER: Okay, because I was going to make a motion to accept this. I read all the stuff. I didn't understand the conservation equivalency. Why are we using that word? Is it one of those things, conservation equivalency?

MS. WARE: I think that that is the best category that this fits into right now, and so that is why we're doing that, Bill.

CHAIRMAN BORDEN: We've been fairly creative today, so this is in the spirit of being creative. Any further questions for Megan? If not I am going to turn it over to Mark and give the enforcement report.

LAW ENFORCEMENT REPORT

MR. MARK ROBSON: The Law Enforcement Committee heard a detailed presentation on the pilot project from the folks in Maine at our May meeting of the ASMFC here in Alexandria. We've also provided a written summary of our comments and recommendations available to you in a memo form.

But briefly, after hearing the report from Maine and having some discussion about how the program was working there, the LEC recognized that this was providing a significant advantage by eliminating these exchange tags; which tend to be very generic in nature and subject to counterfeiting and other problems.

We agreed that it had improved the accountability in the fishery, and the only other discussion point and sort of caveat was that it was recognized by LEC members that there may be differences in other states as to how tags are distributed or redistributed or replaced. We wanted to acknowledge that there ought to be flexibility among the states to either utilize exchange tags, or some other form of trap-to-trap exchange program; as they deem necessary or as it fits in with their existing trap tag distribution process. That's my comment, Mr. Chairman.

CHAIRMAN BORDEN: Questions for Mark? Any questions on the Enforcement Committee Report? Seeing none; I think the next order of business here is for someone to make a motion.

MR. ADLER: So move. I make a motion to approve Maine's request for conservation equivalency on trap tags.

CHAIRMAN BORDEN: Is there a second? Seconded by Pat Keliher. Discussion on the motion. Ritchie White.

MR. WHITE: If this is approved, I would assume another state that wanted to adopt this would just apply under conservation equivalency.

CHAIRMAN BORDEN: Any other questions? Do we have any objection to this? **No objection, then it is adopted with the concurrence of the board by consensus**.

UPDATE ON THE OFFSHORE LOBSTER ENFORCEMENT COMMITTEE

CHAIRMAN BORDEN: Next item on the agenda is the update on the offshore Lobster Enforcement Committee by Mark. Just as an introduction, this board has discussed the need to improve and raise the priority of law enforcement; trap enforcement, specifically, in all areas including the offshore areas.

The Enforcement Committee, much to its credit, formed a subcommittee and Mark is going to report on the results of that.

MR. ROBSON: Yes, the Law Enforcement Subcommittee to look at particularly offshore enforcement needs and areas for moving forward in the future, has met a couple of times and will continue to work through a variety of issues. At the last meeting there was quite a bit of discussion about the fact that, of course, we were talking about offshore fishing issues.

Dealing primarily in federal waters, and some of the practical and logistical problems of enforcing trap activities out in those deep far offshore waters, particularly with regard to the ability for enforcement vessels to haul and check traps out on the water, and to conduct boardings and other various activities that are necessary for good enforcement.

During the discussions, which have included also our Law Enforcement Committee representative from NOAA Office of Law Enforcement, it became pretty obvious that there is a strong sense that if NOAA Office of Law Enforcement could somehow increase their level of priority given to this lobster offshore enforcement work through the NOAA Office of Law Enforcement prioritization process; that that would be a good first step.

That currently, it doesn't necessarily receive the highest rating from an enforcement perspective;

at least in their prioritization process. By extension, this would also include hopefully making it a greater or higher priority in that process, and then also allowing a higher funding priority through the joint enforcement agreements for offshore enforcement work that needs to be done.

This might include additional vessel capabilities, or other funding mechanisms that would allow the states to do more offshore enforcement work through their own resources and capabilities. It was felt that a letter would be appropriate to be sent to the NOAA Office of Law Enforcement, requesting that NOAA make this offshore enforcement issue a high priority in their prioritization process, and to make it also a funding priority through the joint enforcement agreements with the states.

Megan, I believe has -- we've provided a draft letter for the board's consideration that makes that request. I would also like to point out that we have again tried to involve this discussion with our NOAA Office of Law Enforcement partner on the Law Enforcement Committee; and we've gotten some good feedback and input from them as to how to proceed on this issue.

CHAIRMAN BORDEN: All right, so any questions for Mark on his report?

MR. KELIHER: Mark, thank you very much for that report. The state of Maine has been having many conversations over the last two years with the office of OLE in regard to prioritization; in particular to the work that we're doing with our large offshore boats. I would fully support having the commission sending a letter; and Mr. Chairman, I would be happy to make a motion to that point.

CHAIRMAN BORDEN: Are there any further questions or statements? Toni, did you have your hand up?

MS. KERNS: Not a question. I just wanted to update the board on some discussions or conversations that I've had with enforcement or through from NOAA staff. The priorities for NOAA Law Enforcement have been set through 2017. There is no harm in us sending a letter about priorities, but they have already set those priorities through their 2017 year. I am not sure we'll be able to influence on paper what those priorities have been set at. But states, themselves, can work through their JEA agreements on those priorities, and how they work through those to try to get some more enforcement going in the offshore areas.

But one of the questions that came back is; what does offshore mean? I think that we would need to be quite specific in our letter about what we mean by offshore, and exactly what we are looking for, in terms of increased enforcement. It would be great if we could get some clarification here today in what we mean by that; because I'm not sure staff has that information.

CHAIRMAN BORDEN: I think that is a good point. I listened to and actually participated in a couple of the conference calls with the subcommittee. Actually, they've discussed this, and Mark can correct this if I mischaracterize this. They've discussed this in the context of improving enforcement.

It is not just offshore enforcement, they want to improve enforcement, raise the priority of trap enforcement; and that would apply to any areas that the enforcement officers are engaged in a practice. The discussion really evolved around the need for different strategies in different areas. In other words, some of the states, and I'll single out Maine as an example, have excellent enforcement capabilities and do a really active job of enforcing in the nearshore areas.

Then it may require other techniques to do that; and the Mid-Shelf may even require different size vessels, because the gear changes. The size of the rope that runs through the haulers is all different in those areas. Then when you get into offshore, what I consider offshore, which is like

Area 3 boats that are fishing 100 miles off the coast.

It is a completely different type of capability that you need. Maybe a way to address this is to remove offshore from the letter, so it is generic. It's we want to improve trap enforcement and compliance. But I'll defer to Pat and some of the other members of the board. Pat, do you want to speak?

MR. KELIHER: I was trying to craft a motion that did just that, Mr. Chairman. If you will bear my indulgence, I'll try to spit it out here and try to capture it. **I would move to have the ASMFC send a letter to NOAAs Office of OLE, asking for lobster to become a higher priority within their JEA program.**

CHAIRMAN BORDEN: All right, so we have a motion on the table. Is there a second to the motion? Anyone want to second it, Dan McKiernan. Discussion on it. Doug, did you have your hand up to discuss it?

MR. GROUT: Just for seconding.

CHAIRMAN BORDEN: Any discussion on it? Adam.

MR. NOWALSKY: I'm not sure, I'm assuming this is just an issue of ongoing importance and isn't a matter of great timeliness today. From a procedural perspective, generally, we do this through the Policy Board. Would we try to do a reconvening of that board here this afternoon, do this via e-mail, or would this get put off until the annual meeting at this point? I wanted to raise that point, because of the potential need for timeliness on this matter.

CHAIRMAN BORDEN: Doug, do you or Toni, do you want to comment on that? Doug.

MR. GROUT: Unless you folks think otherwise, I don't think there is timeliness. Toni just stated that they've already set their priorities for 2017. It potentially could come back to the Policy Board at the annual meeting for final approval; that the commission sends this letter. Unless this board wants to try and push it, I know we're trying to reconvene the Policy Board for some other issues via a conference call sometime between now and October. We could add it on to that. But if it is not a hurry, I would just as soon put it off until our fall meeting.

CHAIRMAN BORDEN: All right, we've heard a suggestion from the Chairman that if this motion passes it will be a recommendation and it will go to the annual meeting.

MS. KERNS: Just a perfection of the motion then, it would be move to recommend to the ISFMP Policy Board that ASMFC send a letter.

CHAIRMAN BORDEN: Any further discussion on this? Let me ask if anyone objects to the motion. Peter, do you want to abstain?

MR. BURNS: Just abstaining as a NOAA representative. Thank you, Mr. Chairman.

CHAIRMAN BORDEN: **Okay, so there are no objections. The motion is adopted with the concurrence of the board.** I would ask the recorder to make a note that NOAA abstained from the vote. Further business on this item?

UPDATE ON THE NEFMC OMNIBUS DEEP-SEA CORAL AMENDMENT

CHAIRMAN BORDEN: If not, we're going to move right into Deep Sea Corals. I think that is the next.

MS. WARE: Just to provide a quick update. I was at the New England Council's Habitat PDT meeting last week, I believe it was. At that point I presented the results of the lobster survey, which are included in your briefing materials. There was discussion on how the council might move forward.

There is a Habitat meeting on August 18th, and I think at that point they will continue to review the data on lobster catch, especially in Gulf of

Maine, and at that point they might make a recommendation to the council. Any decision, from my understanding, on inclusion of lobster traps as a prohibited gear in that amendment would have to go through the full council. That is where the process is right now, and I'll keep the board updated as things progress.

CHAIRMAN BORDEN: Questions for Megan? Terry.

MR. STOCKWELL: Not a question so much as a request. At last week's PDT meeting the need was identified for some map page of the lobster catch, particularly in the Gulf of Maine; it is critical information for the PDT to provide more information to the council. I would be informally requesting the Lobster TC to add that to their work list; with yours and Megan's concurrence.

CHAIRMAN BORDEN: Any comments on that? Does anyone want to comment? Any objection to tasking the PDT; is what you're recommending this go to? TC, Terry.

MR. STOCKWELL: For our Lobster Technical Committee to provide the council's Habitat PDT that information.

MR. ADLER: Terry, what is the progress on this omnibus thing in timelines? Do you have any idea when something is going to actually start to bubble out?

MR. STOCKWELL: This action had been tabled while the council did a significant amount of work on the Habitat Omnibus. The final rules have still not been brought back to the council, so meanwhile the council Habitat Committee is working concurrently on measures that impact the clam fishery on Georges and renewing effort on the work on the krill amendment. That is all subject to whatever the council receives in terms of proposed action on the Habitat Committee. It is at the very beginning, but it is going to go quicker than slower.

MR. ADLER: If I may, are we talking a year?

MR. STOCKWELL: The Habitat Committee works at the will of the council, and just for everyone's reference the Habitat Amendment took, I don't know five years plus, Doug, maybe more. It could get derailed. It could happen as quickly as a year. I would tend to say probably a couple years.

MS. KERNS: Terry, do you know, is this a chart that the committee will need on the 18th, or is there a timeframe in which we have to get back to you? Just so we know how quickly we need to respond.

MR. STOCKWELL: Megan attended last week's meeting, so no this would be to the PDT. Next week's meeting is a committee meeting. My sense is that the TC has a time it needs to develop the quality of the data that is available.

CHAIRMAN BORDEN: Any further discussion on this issue? There is no action required, other than the fact that we're going to refer the issue to the TC. The next issue is update on status for the Jonah Crab FMP implementation schedule.

UPDATE ON STATUS OF THE JONAH CRAB FMP IMPLEMENTATION SCHEDULE

MS. WARE: I'll be very brief. States were required to implement the Jonah crab FMP by June 1st of this year. Most states have done that. We have three states that are still in that process; New York, Delaware and Maryland. But they are all well on their way. I don't have concerns about them getting too further delayed. But if there are concerns or questions from the board, now would be the time to ask.

OTHER BUSINESS

CHAIRMAN BORDEN: Questions for Megan. No questions. Okay, we're down to other business. Does anyone have anything to raise under other business? Dan.

MR. McKIERNAN: If we're going to convene the group to iron out the challenges of the Jonah crab claw details, I would like to also iron out the issue of what incidental bycatch is, and specifically, I think if there is an incidental bycatch allowance for Jonah crabs, it ought to be the minority of the retained catch aboard, at least not more than 50 percent. I don't want this incidental catch to be like we see in some other fishery management plans; where it is simply just like an artisanal or low level allowance of catch. It needs to be incidental bycatch taken in gears targeting other species. If we could add that to the task of the committee or the group that we're going to convene to iron out that issue, that would be great.

ADJOURNMENT

CHAIRMAN BORDEN: Any objections to doing that? No objections. Any other business? Any objections to adjourning? Meeting is adjourned.

(Whereupon the meeting was adjourned at 2:04 o'clock p.m. on August 4, 2016)

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: Megan Ware, FMP Coordinator

DATE: October 5, 2016

SUBJECT: Trap Cap Call Summary

On September 7th, members of the American Lobster Management Board (Board) and industry met via conference call to discuss trap caps in Lobster Conservation Management Areas (LCMAs) 2 and 3. Addenda XXI and XXII were developed to modify the trap transfer program to address latent effort and scale the Southern New England (SNE) lobster fishery to the diminished size of the resource. These addenda established individual ownership caps, also known as trap banking, which allow for the purchase and accumulation of traps above the active trap cap. Aggregate ownership caps were also established for entities or companies which hold multiple permits. In addition, Addendum XXI outlined a schedule of active trap cap reductions in LCMA 3 over a five year period (Table 1).

Table 1: Active trap caps and individual ownership caps for LCMAs 2 and 3 as established in Addenda XXI and XXII. LCMA's trap caps are reduced by 5% for five years while LCMA's 2 is held constant. The federal active trap cap in Area 3 is currently 1945.

		Active Trap Cap	Individual Ownership Cap
LCMA 2	All Years	800	1600
LCMA 3	Year 0	2000	2333
	Year 1	1900	2216
	Year 2	1805	2105
	Year 3	1715	2000
	Year 4	1629	1900
	Year 5	1548	1800

In their July 21st letter to the Board, NOAA Fisheries stated it was suspending its rule-making process for Federal trap caps and banking measures as recommended in Addenda XXI and XXII until there is a better understanding of future management action in SNE. Moreover, given the poor condition of the SNE stock and uncertainty surrounding the Board's management response, NOAA Fisheries stated it was imprudent to continue regulatory efforts on trap caps and banking because it could encourage fishermen to invest significant funds in a fishery which could be severely restricted in the near future.

The purpose of the September 7th conference call was to discuss trap caps and trap banking with members of the Board and industry. Participants on the call included Commissioners from Massachusetts and Rhode Island, representatives from NOAA Fisheries, Lobster Plan

Development Team members, and fishermen from LCMAs 2 and 3. Overall, industry members supported federal implementation of trap caps and banking in LCMAs 2 and 3. Participants from LCMA 3 noted that many fishermen have been purchasing traps to prepare for expected reductions in the active trap cap and the delay in implementation is affecting industry's ability to make future business decisions. Area 2 fishermen noted the conservation benefit of having 800 traps tied to a permit that cannot be fished. NOAA Fisheries reiterated its concern that trap banking encourages fishermen to invest in a fishery which the 2015 stock assessment concluded was collapsing. They expressed greater concern with implementing individual ownership caps, which could encourage industry investment, than with the annual reductions in the LCMA 3 active trap cap.

One of the major concerns highlighted on the call is the growing disconnect between state and federal regulations. Since Addenda XXI and XXII outline a 5 year reduction in the active trap cap and individual ownership cap for LCMA 3, each year of delay creates a greater difference between the trap caps specified by the Commission and those adopted by NOAA Fisheries.

Moving forward, there are a couple of options for the Board. Given the primary concern of NOAA Fisheries is the implementation of individual ownership caps, the Board could recommend that NOAA Fisheries implement the active trap cap for LCMA 3, as specified in Section 3.2.3 of Addendum XXI. This would align state and federal regulations for the active trap cap in LCMA 3 and provide a means of reducing fishing effort commensurate with the annual trap reductions already in place. Or, the Board could also revisit this issue in the spring of 2017 when further management action has been taken in response to the poor condition of the SNE stock.

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1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: Lobster Reporting Work Group

DATE: September 27, 2016

SUBJECT: Reporting Recommendations in the Lobster Fishery

On September 26, 2016 the Lobster Reporting Work Group (Work Group) met to discuss data deficiencies in the lobster fishery and ways to improve them. The Work Group discussed several aspects of harvester and dealer reporting, including temporal and spatial data deficiencies, the prevalence of electronic reporting, and the percentage of trip level reporting by active harvesters. The Work Group also reviewed the collection of biological data in the lobster fishery, including port and sea sampling, and whether this meets the needs of the current stock assessment model.

As a part of their discussion, the Work Group came up with the following goals for reporting in the lobster fishery:

1. Improve the spatial resolution of harvester reporting.
2. Utilize the latest technology to improve and increase reporting.
3. Collect greater effort data in harvester reports.
4. Define inshore versus offshore areas in the lobster fishery.
5. Proactively address data concerns of the Atlantic Large Whale Take Reduction Team (ALWTRT).

In order to achieve these goals, the Work Group compiled a list of recommendations to improve reporting in the lobster fishery. The recommendations are categorized as short-term, intermediate, and long-term goals.

<u>Short-Term (less than 1 year)</u>

- Recommend that Maine's 10% active harvester reporting only include commercial license holders who have actively fished in the previous two years for which data is available. Currently, recreational license holders are included in the 10% of lobster harvesters selected to submit trip level reports in Maine. Removing non-commercial fishermen from the sampling pool will ensure that the greatest amount of harvester data is collected from the current reporting requirement.
- Define the inshore fishery as occurring from 0-3 miles offshore, the nearshore fishery as occurring between 3-12 miles from shore, and the offshore fishery as greater than 12 miles from shore. There is currently no definition of inshore versus offshore in the lobster fishery. As a result, when asked to analyze effort or catch in the offshore or inshore fishery, the Technical Committee assigns NMFS statistical areas to one of the two areas. This is an imperfect system as some statistical areas span large distances from shore and include both inshore and offshore fishermen.

<u>Intermediate (1-2 years)</u>

- Require 100% active harvester reporting for all state and federally permitted lobster license holders. For those jurisdictions which are resource limited and unable to achieve 100% harvester reporting, at a minimum, states should require reporting from a statistically valid sample of harvesters. In a 2007 memo to the Board, the Technical Committee defined this as 30% active harvester reporting. The Work Group recommends the TC revisit this analysis to make sure 30% is still the minimum percentage of harvester reporting required for a statistically valid sample.

- Add the following data components to current harvester reporting coastwide: number of trap hauls, soak time, catch disposition, gear configuration, number of vertical lines, LCMA, and depth. Trap hauls and soak time are recommended as they are an important measure of effort in the fishery. Gear configuration and number of vertical lines directly address data concerns from the ALWTRT as this information helps determine potential interactions with protected resources. LCMA and depth will provide additional information on where the fishery is occurring.
- Further delineate NMFS statistical areas on harvester trip reports. While statistical areas are an important component of the current stock assessment model, these areas do not provide the spatial resolution needed to fully understand where the lobster fishery is taking place. This is a concern that more precise information on the location of the fishery is needed, especially as marine spatial planning and habitat protection continue in the Atlantic Ocean. At a minimum, NMFS statistical areas should delineate distance from shore (inshore, nearshore, offshore).

Long Term (greater than 2 years)

- Establish an electronic swipe-card system for harvester and dealer reports in the lobster fishery. A swipe-card system is currently used in the Maine elver and urchin fisheries and in the Massachusetts shellfish fishery. The system works by dealers swiping harvester cards during a transaction. Harvesters and dealers are unable to complete a transaction if reporting and/or permits are not current. Advantages of the swipe card system include ease of dealer reporting, quick linking of harvester and dealer reports, pre-programmed fishermen information which reduces data entry mistakes, and the ability ensure reporting compliance.
- Incorporate Vessel Monitoring Systems (VMS) or another locator beacon to all lobster vessels. As previously mentioned, spatial data in the lobster fishery is lacking and this hinders the ability to identify areas critical to the lobster fishery. By requiring a system like VMS, the fishery will be able to show not only where effort is taking place but also important transit routes for fishermen.
- Establish a fixed-gear Vessel Trip Report (VTR) for all federal permit holders. One of the major hurdles in lobster reporting is that current reporting forms are intended for a wide variety of gear types. This limits the detail of information which can be collected. A fixed-gear VTR would allow managers to address specific data needs in fixed gear fisheries such as the number of hauls, soak time, the number of sets (or panels for pound nets), and total gear in water. This VTR would only be offered in an electronic format and all federal lobster fishermen would be required to report electronically. A fixed-gear VTR would be applicable to pot gears, pound nets, and anchored gill nets.

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Draft Document for Board Review. Not for Public Comment.

Atlantic States Marine Fisheries Commission

DRAFT ADDENDUM II TO THE INTERSTATE FISHERY MANAGEMENT PLAN FOR JONAH CRAB

Coastwide Standard for Claw Landings

Vision: Sustainably Managing Atlantic Coastal Fisheries

This draft document was developed for Management Board review and discussion at the August 2016 meeting week. This document is not intended to solicit public comment as part of the Commission/State formal public input process. However, comments on this draft document may be given at the appropriate time on the agenda during the scheduled meeting. Also, if approved, a public comment period will be established to solicit input on the issues contained in the document.

September 2016

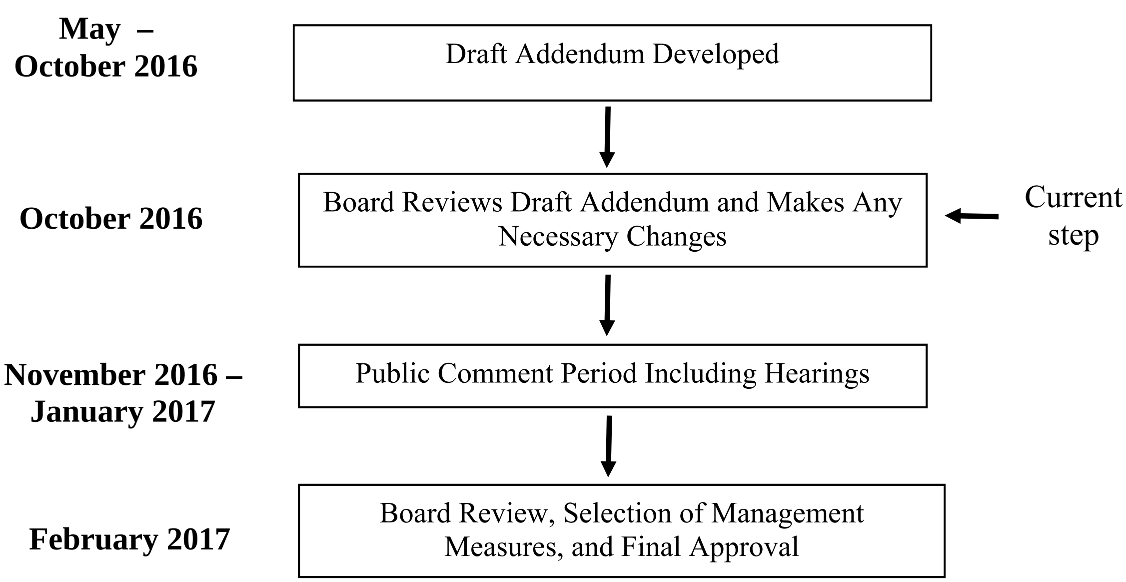
Public Comment Process and Proposed Timeline

At its May 2016 meeting, the American Lobster Management Board (Board) discussed concerns over the equity of the current claw provision in the Jonah Crab Fishery Management Plan (FMP). The Board initiated Draft Addendum II to consider establishing a coastwide standard for Jonah crab claw landings.

The public is encouraged to submit comments regarding the proposed management options in this document at any time during the addendum process. The final date comments will be accepted is **Month Day at 5:00 p.m**. **EST.** Comments may be submitted by mail, email, or fax. If you have any questions or would like to submit comments, please use the contact information below.

Mail: Megan Ware
Atlantic States Marine Fisheries Commission
1050 N. Highland St. Suite 200A-N
Arlington, VA 22201
Fax: (703) 842-0741

Email: mware@asmfc.org
(Subject line: Jonah Crab Draft Addendum II)



1.0 Introduction

The Atlantic States Marine Fisheries Commission (ASMFC) coordinates the interstate management of Jonah crab (*Cancer borealis*) in state waters (from 0-3 miles offshore). ASMFC manages Jonah crab through an Interstate Fishery Management Plan (FMP), which was approved in August 2015 under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (1993). Management authority in the exclusive economic zone (EEZ), which extends from 3-200 miles offshore, lies with NOAA Fisheries. The management unit for Jonah crab includes the Atlantic states from Maine through Virginia. The biological range of the species is primarily from Newfoundland, Canada to Florida.

The American Lobster Management Board (Board) initiated Addendum II to the FMP to consider a coastwide standard for claw landings in the Jonah crab fishery. The FMP currently specifies a whole crab fishery with the exception of individuals from New Jersey, Delaware, Maryland and Virginia who can prove a history of claw landings before the June 2, 2015 control date. The FMP allows claw landings for these fishermen due to the historic practice of declawing Jonah crab in the Delmarva Peninsula. After final action was taken on the FMP, claw fishermen were identified in New York and Maine. In accordance with the FMP, these New York and Maine fishermen are required to land whole crabs.

Given concerns regarding the equity of the current claw provision (namely that some fishermen with a history of claw landings are allowed to continue this practice while others must land whole crabs) and the fact that the fishery is primarily executed in federal waters, the Board requested NOAA Fisheries provide regulatory guidance on the claw provision in the FMP. In a letter dated February 29, 2016, NOAA Fisheries highlighted potential challenges with implementing the current claw regulation since it does not provide equal opportunities to like participants across the fishery.

The purpose of this Draft Addendum is to consider modifications to the claw provision for Jonah crab. The Board is considering a range of options which would establish a coastwide standard for claw harvest in the Jonah crab fishery.

2.0 Overview

2.1 Statement of the Problem

The Jonah Crab FMP established a whole crab fishery with the exception of individuals from New Jersey, Delaware, Maryland, and Virginia, who can prove a history of claw landings before June 2, 2015. However, following approval of the FMP, fishermen from New York and Maine who were landing claws were identified. These individuals are currently only allowed to land whole crabs. Given concerns about the equity of the current claw provision, as well as potential challenges implementing the regulation in federal waters, the Board initiated this addendum to consider establishing a coastwide standard for claw harvest in the Jonah crab fishery.

2.2 Background

Jonah crab has long been considered a bycatch of the lobster fishery; however, in recent years there has been an increase in the targeted harvest of Jonah crab. Since the early 2000s, landings of Jonah crab have increased 650%, creating a mixed crustacean fishery which can target lobster or crab at different times of the year based on slight, legal gear modifications and small shifts in the areas in which traps are fished. This rapid increase in landings can be attributed to a number of factors include a decrease in the abundance of lobsters in Southern New England, causing fishermen to supplement their income with Jonah crab, and an increase in the price of other crab (such as Dungeness), creating a substitute market for Jonah crab. There is also speculation that the increase in landings reflects an increase in abundance of Jonah crab. While a stock assessment has not been completed for the species, data from the Rhode Island Fish Trawl Survey suggests that the abundance of cancer crabs has increased since 1959. As a result of the immense growth in this fishery, ASMFC approved a FMP for Jonah crab to support the implementation of a unified coastal management program which promotes the conservation and full utilization of the Jonah crab resource.

Landings in the commercial fishery fluctuated between approximately 2 and 3 million pounds throughout the 1990's but steadily rose to over 17 million pounds in 2014. A similar increase occurred in the economic importance of the fishery as ex-vessel value rose from roughly $1.5 million in the 1990's to an estimated $13 million in 2014. Landings in 2014 predominately came from Massachusetts (70.4%), followed by Rhode Island (24.5%).

While the majority of Jonah crab is harvested as whole crabs, fishermen from numerous states, including Maine, New York, New Jersey, Delaware, Maryland and Virginia land claws. Jonah crab claws are relatively large and can be an inexpensive substitute for stone crab claws. As a result, they can provide an important source of income for fishermen. Claws can also be harvested for personal consumption; however, these landings are not well documented. A historic claw fishery takes place along the Delmarva Peninsula. These traditionally small boat fishermen harvest Jonah crab claws because they do not have a seawater storage tank on board to store whole crabs. As a result, landing claws avoids economic inefficiencies for this small fleet.

<u>Jonah Crab Claw Landings</u>

Information on the magnitude of the Jonah crab claw fishery is limited. As a result, it is unclear how many fishermen are landing claws or the magnitude of pounds being harvested. The primary obstacle in obtaining this information is that trip level harvester reporting has not been required in all jurisdictions. Furthermore, prior to the implementation of the Jonah Crab FMP, many states did not require trip-level dealer reporting to delineate between whole crabs and claws.[1] As a result, data on the Jonah

[1] As a part of the Jonah Crab FMP, states were required to implement Jonah crab dealer reporting which specifies market grade by June 1, 2016.

crab claw fishery is incomplete. Refer to Appendix 1 for a summary of state reporting in the Jonah crab fishery prior to the implementation of the FMP.

Table 1 shows claw landings reported to the ACCSP Data Warehouse between 2010 and 2015. Total claw landings from 2010-2015 were just under 150,000 lbs; however, this is likely an underestimate given that Jonah crab dealer reporting has not always specified market category and claws harvested for personal consumption are often not reported. Claws are primarily landed by pots and traps, with lobster pots accounting for up to 95% of the claw landings (a majority of pots and traps are not specified in the data reports so it is unclear what percentage of these landings are from lobster pots versus fish pots). Gill net and otter trawl fishermen comprise 2.7% of claw landings. When these gears encounter Jonah crab, fishermen harvest the claws because they are often forced to detach the claws in order to remove the crab from the net.

Table 1: Jonah crab claw landings in the management unit (ME through VA) from 2010-2015. (Source: ACCSP Data Warehouse.) The unspecified 'pots/traps' category could include lobster pots, fish pots, conch pots, and crab traps.

Year	Pots/traps (Type not specified)	Lobster Pot	Fish Pot	Gill Net	Otter Trawl	Total
Jonah Crab Claw Landings from 2010 – 2015 (lbs)	75,847	66,296	3,081	2,115	1,958	149,297
Percent of Total	50.8%	44.4%	2.1%	1.4%	1.35%	100%

While prior to the FMP Maryland did not require reporting to differentiate between claws and whole crabs, efforts were made to determine the market category of Jonah crab landings from trip level reports. ACCSP confidential dealer reports and state fishing report data were analyzed. Available fishermen were interviewed and a Jonah Crab Advisory Panel member described the practices of the fleet over the time period. From these efforts, Maryland staff determined that between 2000 and 2015, only one fishing vessel predominately landed whole crabs while the remainder of the fleet (n=18) landed both claws and whole crabs. The information also showed that the number of trips landing claws has increased from approximately 19 trips in 2011 to 70 trips in 2015. The amount of claws landed on these trip ranged from just a few pounds to a couple thousand pounds. These vessels used a variety of gears including lobster pots, conch pots, otter trawls, and gill nets.

<u>Jonah Crab Claw Morphometric and Mortality Data</u>

To date, the life cycle of Jonah crab is poorly understood. Several studies have recently been conducted to better understand the biology of this species. As part of a Saltonstall-Kennedy Grant awarded in 2015 to collect biological data in the Jonah crab fishery, the

Massachusetts Division of Marine Fisheries measured the carapace width and claw length of several hundred Jonah crabs from Southern New England (inshore and offshore) and Georges Bank. From this data, the relationship between carapace width and claw length was examined (Figure 1). The data suggests that, for a male crab whose carapace width meets the minimum size of 4.75" (120.65 mm), an average (expected) claw length would be 2.47" (62.84mm).

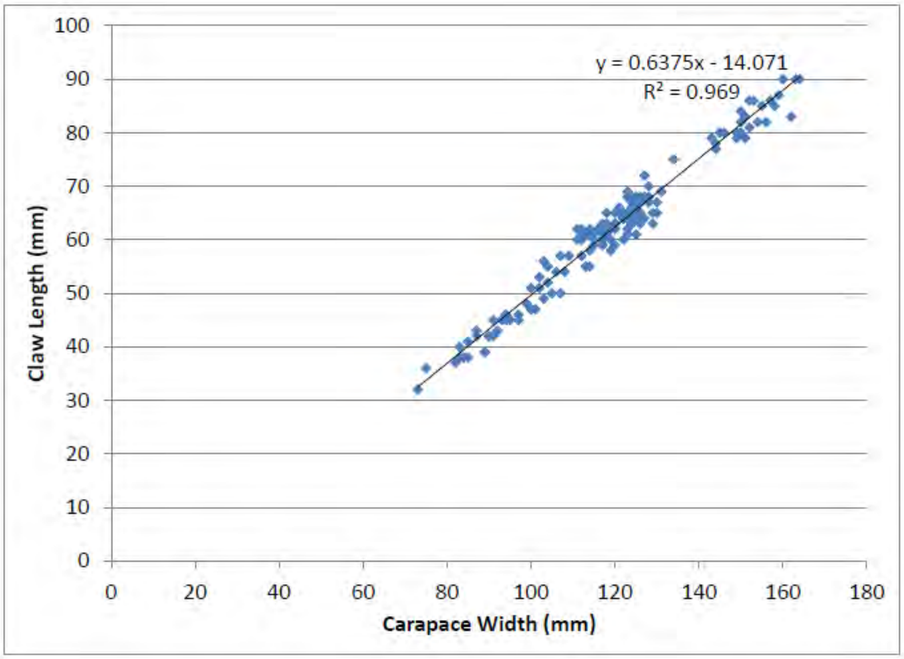


Figure 1: Linear regression between the carapace width and claw length of male Jonah crabs (n=153). Measurements from regenerated claws were removed using a least square method. Regional differences in claw length may be masked since crabs from Southern New England and Georges Bank are presented together (Source: MA DMF).

Morphometric data was also collected on female Jonah crabs in Georges Bank and Southern New England. Figure 2 shows that, for a female crab whose carapace width meets the minimum size of 4.75" (120.65mm), the expected claw length would be 2.06" (52.33mm). This is smaller than the expected claw length for males. Furthermore, 100% of female crabs sampled had claw lengths less than 2.75" (69.85mm).

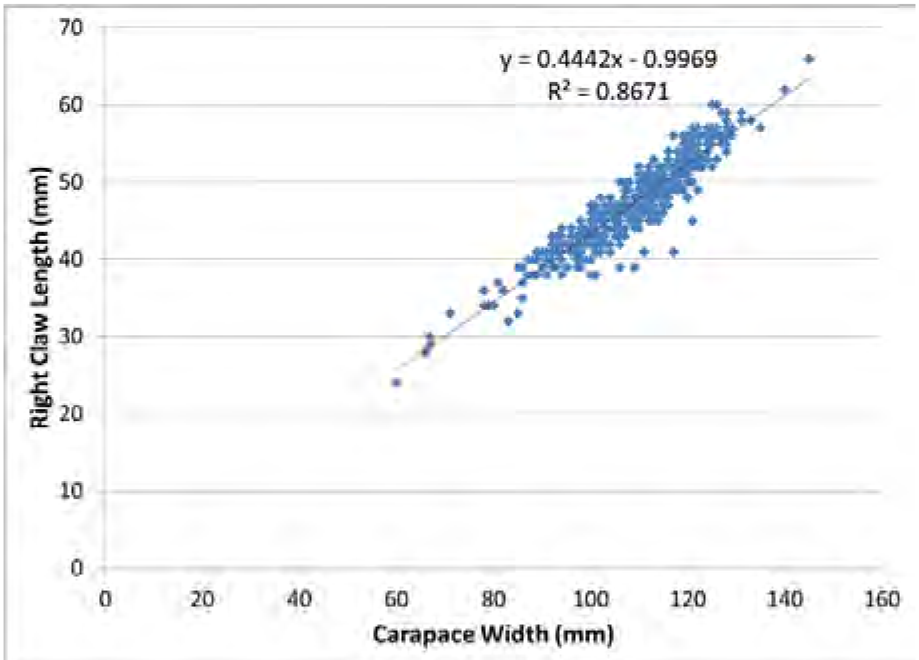


Figure 2: Linear regression between the carapace width and claw length of female Jonah crabs (n=480). Measurements from regenerated claws were removed using a least square method. Regional differences in claw length may be masked since crabs from Southern New England and Georges Bank are presented together (Source: MA DMF).

Preliminary data is also available from a small scale laboratory study which is investigating Jonah crab claw removal and its impacts on survivorship. The study, conducted by New Hampshire Fish & Game and the University of New Hampshire, looked at the biological implications of claw harvest by subjecting crabs to one of three treatments: one claw removed, two claws removed, and no claws removed. Crabs (n=232) were monitored in seawater trays over a four week period and their activity levels and survival were evaluated. Preliminary results suggest that 19% of crabs died when no claws were removed, 56% of crabs died when one claw was removed, and 74% died when both claws were removed. There is 100% mortality when whole crabs are harvested.

Federal Adoption of the Jonah Crab FMP

Given that the Jonah crab fishery is primarily executed in federal waters and there is a need for NOAA Fisheries to enact complementary measures in the EEZ, the Board sent a letter to NOAA Fisheries asking for preliminary guidance on the current claw provision. In a letter dated February 29, 2016, NOAA Fisheries responded to the Board's request, highlighting several concerns with a claw fishery in federal waters. Specifically, NOAA Fisheries reiterated the Law Enforcement Committee's position that a claw fishery could "complicate effective enforcement of a minimum-size standard, and introduce an opportunity to move undersized crabs through the system".[2] Additionally, NOAA

[2] John Bullard to Robert Beal. 29 February 2016. Re: Jonah Crab Claw Fishery.

Fisheries stated that it "may prove challenging"[3] to implement the current claw provision due to Magnuson-Stevens Fishery Conservation and Management Act's National Standard 4, which requires that management measures "not discriminate between residents of different states"[4]. NOAA Fisheries noted their support of the Commission's public process, encouraging the Board to consider changes to the Jonah Crab FMP through an addendum which encompasses a range of alternatives and is released for public comment. Refer to Appendix 2 for a copy of the NOAA Fisheries letter received by ASMFC.

Given that the current claw provision does not provide the same fishery opportunities to like participants, the Board initiated this addendum to the Jonah Crab FMP to consider establishing a coastwide standard for claw harvest. The Draft Addendum considers a range of options including a strictly whole crab fishery and the allowance of claw harvest coastwide.

3.0 Management Program

This section proposes to replace "Crab Part Retention" in *Section 4.1* of the Jonah Crab FMP.

<u>Option A: Status Quo</u>

Under this option, only whole crabs which meet the minimum size of 4.75" may be retained and sold with the exception of individuals who can prove a history of claw landings before the June 2, 2015 control date in the states of New Jersey, Delaware, Maryland, and Virginia.

The PDT notes that if the Board pursues this option, it may be necessary to specify the size and volume of claws which may be harvested.

<u>Option B: Coastwide Whole Crab Fishery</u>

Under this option, only whole crabs which meet the minimum size of 4.75" may be harvested and sold coastwide. Once landed, claws may be detached from the whole crab and sold. There is no minimum size for claws detached at the dock.

This option would eliminate the provision that those who can prove a history of claw landings before June 2, 2015 in the states of New Jersey, Delaware, Maryland, and Virginia can land detached claws.

<u>Option C: Claw Harvest Permitted Coastwide</u>

Under this option, claws may be detached and harvested at sea if they meet a minimum claw length of 2.75". This minimum claw length is a more conservative length than the expected claw length of 2.5" for a Jonah crab at the 4.75" minimum carapace width.

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[3] John Bullard to Robert Beal. 29 February 2016.

[4] Ibid.

This was chosen to ensure claws are harvested from neither sublegal crabs nor berried females, as it is not possible to discern at the dock the size of the declawed crab or whether it is an egg-bearing female. Two claws may be harvested from the same crab. Bycatch limits will remain in effect per Addendum I such that a fisherman fishing under the bycatch allowance may land up to 2,000 claws (1,000 whole crabs = 2,000 detached claws). For reference, 2,000 claws is equivalent to approximately eight 5-gallon buckets. Lobster permit holders are not constrained by the bycatch limit and can land an unlimited number of claws.

Fishermen may also harvest whole crabs which meet the 4.75" minimum size under this option. Once landed, claws may be detached from whole crabs and sold. There is no minimum size for claws which are detached at the dock.

This option would eliminate the need for the provision that those who can prove a history of claw landings before June 2, 2015 in the states of New Jersey, Delaware, Maryland, and Virginia can land detached claws.

4.0 Compliance

If approved, states must implement the management measures in Addendum II by Month, 201X.

5.0 Recommendation for Federal Waters

The management of Jonah crab in the EEZ is the responsibility of the Secretary of Commerce through the National Marine Fisheries Service (NMFS). The Atlantic States Marine Fisheries Commission recommends that the federal government promulgate all necessary regulations in Section 3.0 to implement complementary measures to those approved in this addendum.

6.0 Literature Cited

ASMFC, 2015. Interstate Fishery Management Plan for Jonah Crab. Atlantic States Marine Fisheries Commission, Arlington, VA. 73p.

The University of Rhode Island Graduate School of Oceanography. 2016. 2015 Annual Fish Trawl Survey Report. 6p.

Appendix 1: States Jonah crab reporting prior to implementation of the Jonah Crab FMP.

	NMFS	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA
Is it lawful for harvesters to land Jonah crabs and NOT report?	No for most federal permit holders. Yes for federal lobster-only permit holders and Jonah crab-only harvesters with no other federal permits	Yes	No	No	No	No	No	Yes, only if the vessel does not have a federal permit and is fishing state waters.	No	No	No
Trip-level harvester data collected delineates landings as whole crab vs. claw	No	No	No	No	No	No	No	No	No	No	Yes (though not always done in the past)
Trip-level dealer data is collected that would capture Jonah crab transactions	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes, through SAFIS for vessels with federal permit.	No	Yes	Only for federal water harvest that is sold to a federal dealer and can be tied back to a VTR
Trip-level dealer data delineates transactions as whole crab vs. claws	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No

Appendix 2

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

FEB 29 2016

Robert Beal
Executive Director
Atlantic States Marine Fisheries Commission
1050 N. Highland St, Suite A-N Arlington, VA 22201

Dear Bob:

Thank you for your February 17, 2016, letter requesting preliminary guidance on the development of a claw-only Jonah crab fishery under the Interstate Fishery Management Plan for Jonah Crab. As your letter points out, I cannot provide definitive, final guidance on this issue because the Lobster Board continues to discussion revisions to claw-only measures and my staff have not yet completed the rulemaking process to implement the management measures recommended in the Jonah Crab Plan. I can provide guidance on preliminary conservation, enforcement and legal issues associated with a claw-only fishery.

As you noted, I urged the Lobster Board in my July 16, 2016 letter to develop a whole-crab fishery, as the Jonah Crab Plan did "not contain information on the post-release survivability of Jonah crab after one or both claws has been removed." My staff echoed this concern at the August 2016, Lobster Board meeting. Since that time, the University of New Hampshire and New Hampshire Fish and Game have undertaken a small scale laboratory study to evaluate the impacts of claw removal on the health and behavior of Jonah crabs. Preliminary results from these trials indicate high levels of mortality (approximately 50 percent for crabs with one claw removed and approximately 75 percent for crabs with both claws removed). Unless additional information becomes available indicating that post-claw removal survival is higher than this preliminary study suggests, I believe the Lobster Board would have a difficult time justifying that a claw-only fishery is a sustainable practice and is consistent with the Jonah Crab Plan goals and objectives.

As you noted, the Law Enforcement Committee previously weighed in on the option for a claw- only fishery, stating "Introducing an option to retain parts or remove claws will complicate effective enforcement of a minimum-size standard, and introduces an opportunity to move undersized crabs through the system. Adding an additional measurement standard for claws, such as a count-per-pound or something similar, will greatly complicate enforcement requirements to monitor and inspect fishing." Staff from NOAA's Office of Law Enforcement participated in that discussion and concurred with the Committee's recommendation. In addition, the Office of Law Enforcement has indicated that implementing multiple sets of requirements, such as whole and claw-only provisions, in a single management area complicates and weakens enforcement. This is why we have historically supported one set of regulations that can be applied consistently across jurisdictions and areas. I believe the Lobster Board should discuss and closely evaluate the potential enforcement concerns associated with a claw-only fishery.

As you know, any regulation promulgated under the Atlantic Coastal Fisheries Cooperative Management Act must be in accordance with the Magnuson-Stevens Fishery Conservation and Management Act's National Standards. Your letter referenced National Standard 4, which states in part that "Conservation and management shall not discriminate between residents of different states…" During our rulemaking process, we would formally review whether the Commission- recommended Jonah crab measures comply with National Standard 4, including whether it is a conservation measure without discriminatory intent. It may prove challenging for us to implement the claw-only exemption, as constructed in the August 2015 Jonah Crab Plan because of National Standard 4. My recollection of the August claw-only discussion is that additional development of claw-only permitting requirements and management measures would be necessary prior to implementation. Once developed and recommended, these measures would be subject to a formal review under National Standard 4.

While I remain in favor of a whole-crab fishery, I am supportive of the Commission's public process. Changes to the Jonah Crab Plan should be considered by Lobster Board through an addendum that encompasses a range of alternatives and subsequently released for public comment.

Thank you for the opportunity to provide additional comments on this important issue. If you have any questions, please contact Allison Murphy at (978) 281-9122 or allison.murphy@noaa.gov.

Sincerely,

John K. Bullard
Regional Administrator

cc: David Borden, American Lobster Board Chairman
Megan Ware, ASMFC Fishery Management Plan Coordinator

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: Jonah Crab Working Group

DATE: September 21, 2016

SUBJECT: Bycatch Definition in the Jonah Crab Fishery

On their September 12th conference call, the Jonah Crab Working Group discussed the definition of bycatch in the Jonah crab fishery. The Jonah Crab Fishery Management Plan (FMP) established a 200 crab per day, 500 crab per trip incidental bycatch limit for non-trap gear. This bycatch limit was increased to 1,000 crab per trip under Addendum I to accommodate several mobile gear trips which were above the original allowance. Furthermore, Addendum I established a 1,000 crab per trip incidental bycatch limit for non-lobster traps, which include fish pots, whelk pots, and crab pots.

While the bycatch limits prescribed in Addendum I are intended to accommodate incidental catch, no definition of bycatch is provided in the Addendum. As a result, fishermen harvesting Jonah crab under the bycatch limit may, in fact, 'direct' on Jonah crab by landing 1,000 crabs per trip. Moreover, there is the potential for a small-scale fishery to develop in which fishermen can land 1,000 crabs per trip and nothing else. This does not reflect the intention of the bycatch limit: to account for Jonah crab caught while targeting another species.

To address this concern, the Jonah Crab Working Group is proposing that a second issue be added to Draft Addendum II. This issue would consider creating a coastwide definition of bycatch in the Jonah crab fishery such that incidental bycatch must remain under a percent composition of total catch. Language proposed for inclusion in Draft Addendum II is as follows:

Issue 2: Bycatch Definition
This section considers adding a definition of incidental bycatch in the Jonah crab fishery to Sections 3.1 and 3.2 of Addendum I.

Option A: Status Quo
Under this option, there would be no definition of bycatch in the Jonah crab fishery. Fishermen using non-trap gear and non-lobster trap gear could land Jonah crab up to the bycatch limit without having another species on board.

Option B: Bycatch Defined as Percent Composition
Under this option, Jonah crab caught under the incidental bycatch limit must comprise at all times during a fishing trip an amount lower, in pounds, than the target species the deployed gear is targeting.