Atlantic States Marine Fisheries Commission

Executive Committee

October 18, 2017
8:00 – 10:00 a.m.
Norfolk, Virginia

Draft Agenda

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

A portion of this meeting may be a closed session for Committee members and Commissioners only

Please Note: Breakfast will be served when you arrive; you may arrive as early as 7:30 a.m.

1. Welcome/Call to Order (*D. Grout)*	8:00 a.m.
2. Committee Consent • Approval of Agenda • Approval of Meeting Summary from August 2017	8:00 a.m.
3. Public Comment	8:05 a.m.
4. Consider Approval of Fiscal Year 2017 Audit **Action**	8:10 a.m.
5. Consider the Continued Need for Technical Meeting Weeks • Review Survey Results • Review Assessment Science Committee Recommendations	8:20 a.m.
6. Discuss Quarterly Meeting Schedule	8:35 a.m.
7. Discuss Process to Develop the 2019-2023 Strategic Plan	8:45 a.m.
8. Discuss Officer Nominations Process	9:00 a.m.
9. Discuss Secretarial Response to Request for Additional Information on Compliance Issue	9:15 a.m.
10. Other Business/Adjourn	10:00 a.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk VA; 757.627.4200

MEETING SUMMARY OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

EXECUTIVE COMMITTEE

Westin Alexandria
Alexandria, VA
August 1, 2017

INDEX OF MOTIONS

ATTENDANCE

Committee Members

Doug Grout, NH
Dennis Abbott, NH (LA Chair)
David Pierce, MA
Mark Alexander, CT (proxy for Craig Miner)
Jason McNamee, RI
Jim Gilmore, NY
Russ Allen, NJ
John Clark, DE
Roy Miller, DE (GA Chair)
David Blazer, MD
John Bull, VA
Michelle Duval, NC (proxy for Braxton Davis)
Robert Boyles, SC
Spud Woodward, GA
Jim Estes, FL

Other Commissioners

David Bush, NC (LA Proxy)
Adam Nowalsky, NJ (GA)
Ed O'Brien, MD (LA proxy)
Lance Stewart, CT (GA)
Dan McKiernan, MA (AA Proxy)

Staff

Bob Beal
Laura Leach
Toni Kerns
Deke Tompkins

Others

John Bullard, NOAA Fisheries
Sean Donahue, Donahue & Goldberg, LLP
Lindsay Fullenkamp, NOAA Fisheries
Derek Orner, NOAA Fisheries
Bill Anderson, MD DNR
Heather Konell, ACCSP
Brian Fredien, NOAA Fisheries
Hannah Hafey, NOAA Fisheries

CALL TO ORDER

The Executive Committee of the Atlantic States Marine Fisheries Commission convened in the Bell Room of the Westin Alexandria in Alexandria, Virginia August 1, 2017. The meeting was called to order at 8:00 a.m. by Chair Doug Grout.

APPROVAL OF AGENDA

The agenda was approved as presented.

APPROVAL OF PROCEEDINGS

The summary minutes from the May 10, 2017 meeting were approved as presented.

PUBLIC COMMENT

There was no public comment.

COUNCIL/COMMISSION LINE IN NOAA BUDGET

Executive Director Beal gave a brief presentation on the background of the Council/Commission line in the NOAA Budget.

In 2008 the fisheries commissions and the Regional Fishery Management Council (RFMC) lines were combined in the Federal budget. Since that time the line has gone up approximately $10 million and the Atlantic Coastal Act ACA had not received any of the increase, until 2017. In 2017, the budget line increased ~$800,000 and ACA was increased by $171,000, which was allocated among the states. After discussing possible solutions, the Executive Committee agreed the funds in the ACA/RFMC line of the Federal budget should be allocated to restore the 2008 ratio, which was 72% RFMC and 28% ACA. Executive Director Beal will convey this to the National Marine Fisheries Service and to the Congressional appropriations staff.

SECRETARY OF COMMERCE DECISION REGARDING SUMMER FLOUNDER

This discussion was conducted in two parts; the first was "lessons learned", and the second, conducted in a closed session, was "where do we go from here."

Several observations were made by Executive Committee members regarding the Secretary's decision:

- The analysis by the Technical Committee (TC) was not supported by the Secretary, without any justification . Technical justification would help the TC and Commission understand why the Secretary did not support the Commission's decision. Usually when there is uncertainty responsible management errs on side of conservation.

- It was concerning that the Secretary did not ask NOAA Fisheries for its opinion.

- Concern was expressed about this being solely a political decision given the link between the Administration and the New Jersey Governor, as we as Secretary Ross being from New Jersey. It was noted that New Jersey did a good job making its case.

- An existential question was posed – "Are the states the best venue to manage interstate fisheries?"

- Should we have had a discussion with NMFS prior to sending future non-compliance letters to the Secretary of Commerce?

Chair Grout summed up the "lessons learned" discussion by saying that the role of the Commission is the states working together to manage fisheries. The concept of conservation equivalency is a key part of the Commission's success. It is the responsibility of our Federal partners to support the ACA. He does not think our Federal partners did their job this time. There is significant concern for this scenario repeating itself in many species. We have to do things better and will challenge the Federal government to do their job better.

CLOSED SESSION

The Committee went into closed session to discuss "where do we go from here" regarding the Secretary's decision on summer flounder; and the Executive Director's Performance Review. (A summary of the closed session has been recorded)

ADJOURN

CHAIR DOUG GROUT adjourned the Executive Committee meeting at 10:35 a.m.

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

Douglas E. Grout (NH), Chair *James J. Gilmore, Jr. (NY), Vice-Chair* *Robert E. Beal, Executive Director*

Vision: Sustainably Managing Atlantic Coastal Fisheries

TO: ASMFC Executive Committee
DATE: October 18, 2017
SUBJECT: Results of Survey on Proposed Change to Technical Meeting Weeks

Traditionally, ASMFC has condensed all technical meetings into three Technical Meeting Weeks each calendar year, typically held in spring (April), summer (June), and fall (September). The intent of Technical Meeting Weeks was to gain efficiencies, minimize travel demands on committee members, and provide advance notice of ASMFC meeting dates. Technical Committee members serving on multiple committees would travel less, and result in cost savings for travel. The practice was considered successful for many years.

In the last few years, there have often been:

- Fewer technical meetings needed in general, in part due to increased use of webinars.
- Minimal membership overlaps in Technical Committees that did need to meet at similar times.
- Conflicts from Technical Committee members scheduling other activities over the pre-set Technical Meeting Weeks, causing members to miss Technical Meetings.

For these reasons, ASMFC is reconsidering the utility of Technical Meeting Weeks. ASMFC is considering a new process to replace Technical Meeting Weeks:

1) Use recent board meetings' tasking to determine which Technical Committees need to meet in the next 3+ months
2) Identify potential overlap in the Technical Committees that need to meet
3) Where meeting needs and Technical Committees' memberships overlap, schedule those meetings within a single week

ASMFC's intent is to maintain the efficiencies gained by holding meetings together when overlaps occur, while reducing the schedule and conflict burden. The most notable change would be scheduling activity by the FMP Coordinators and Technical Committee Chairs immediately following each ASMFC Meeting Week. Additionally, the annual Technical Meeting Weeks memo would no longer be distributed to all Technical Committees at the beginning of each year.

To gauge Technical Committee members' thoughts on potential changes, ASMFC surveyed Technical Committee members about Technical Meeting Weeks. A complete list of the survey questions and answers can be found on page three of this document.

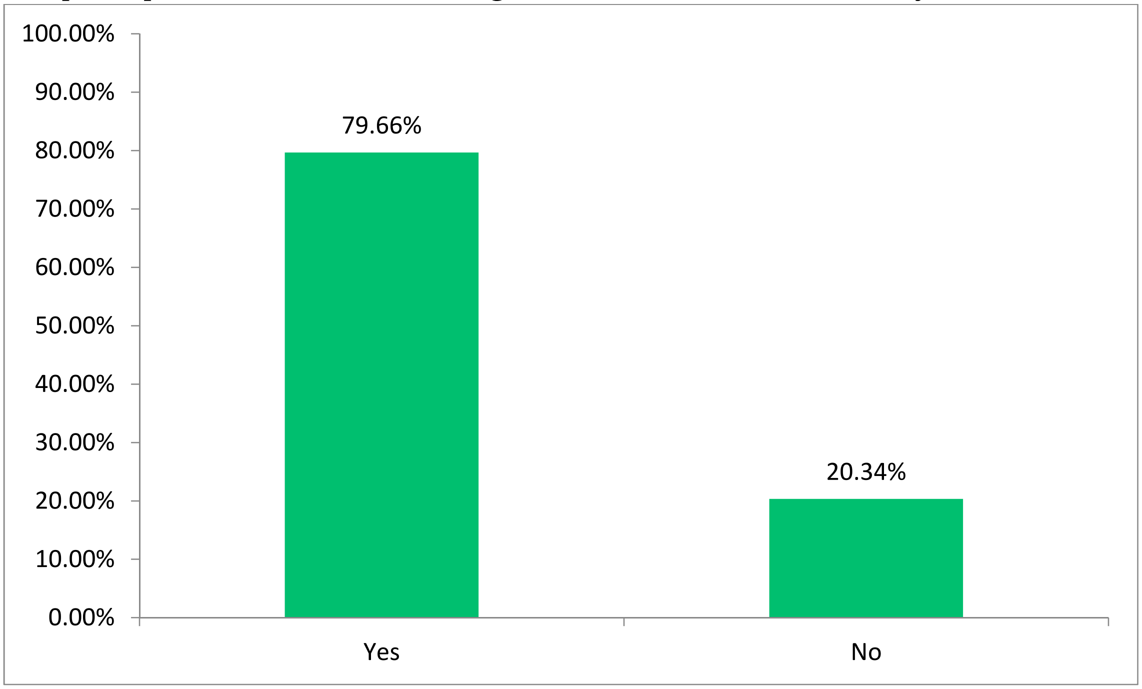
Overall, responding Technical Committee members considered both Technical Meeting Weeks and the practice of combining multiple meetings into one week useful. Respondents were split over maintaining the current system which provides more advance notice or shifting to a more flexible system with shorter notice. Comments in favor of the advance notice noted the requirement by some states to have 4-6 weeks notice for state authorization. Only 40% of the respondents block off and hold TC Meeting Week dates as a priority. Members felt less active

Technical Committees might not require Technical Meeting Weeks and could conduct their business by webinar or conference call. Technical Committees with heavier workloads would benefit more from face-to-face meetings, especially during stock assessments, but it should be determined further ahead of time which Technical Committees needed to meet during these weeks.

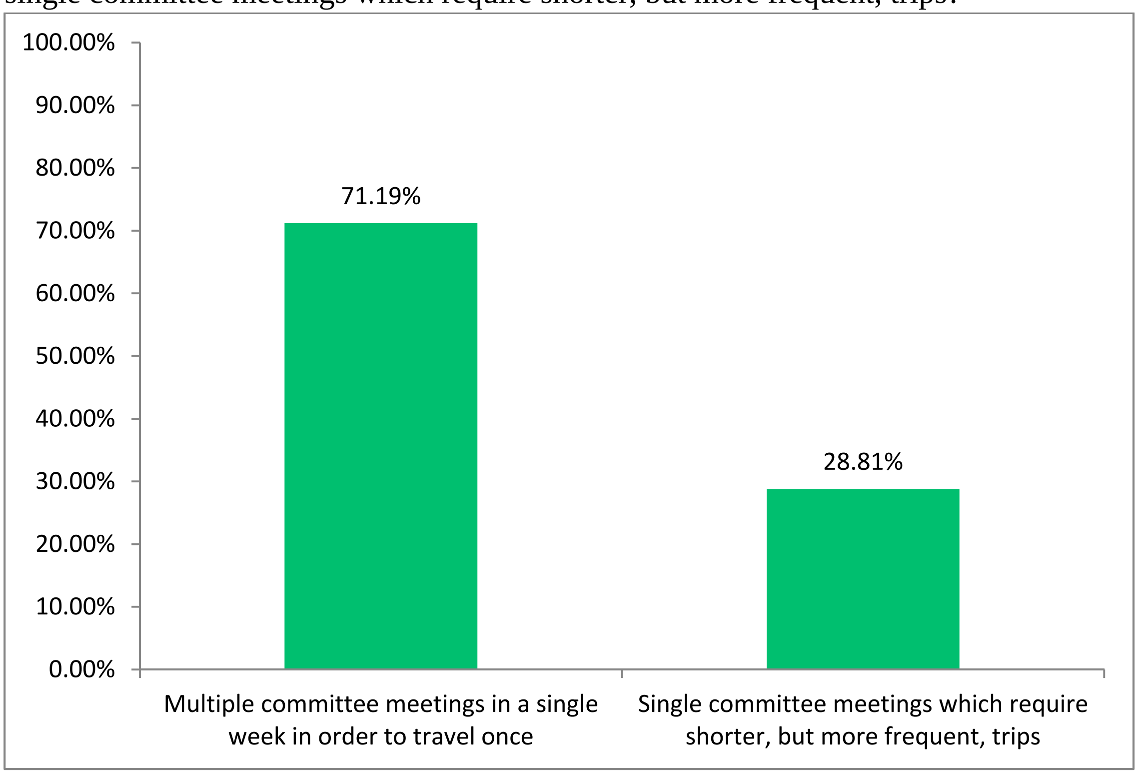
The Assessment Science Committee (ASC) provided the following recommendations regarding Technical Meeting Weeks:

- The ASC recommended that Technical Meeting Weeks go back to being scheduled the year before, with ASMFC staff meeting to discuss what Technical Committees need to meet for the next year to get those on the calendar ahead of time. States are continually increasing the amount of time necessary for them to gain clearance for travel. Giving only a month or so notice for a meeting is not viable.
- The group recommended that we move away from the model of only scheduling Technical Meeting Weeks after a Board meeting and be more proactive vs reactive to Board needs the year before. Many of the staff already know their meeting needs the year before, especially if they have an assessment, update, or other large task to get through, but they have not been allowed to schedule meetings ahead of time for those weeks.
- Tasks the Board gives a Technical Committee that can be fit into a Technical Committee Meeting that is already taking place will work, while tasks that require another whole meeting be squeezed in may need to be moved into the Technical Meeting Week after. For example, if a Board tasks a Technical Committee in May, but that Technical Committee is not meeting at the June Technical Meeting Week and it’s a large undertaking, we can schedule the Technical Committee Meeting for the September Technical Meeting Week instead. ASC was cognizant of tasks that require a quick turnaround, however, so there will obviously be some exceptions and meetings will sometimes need to be scheduled quickly anyway.

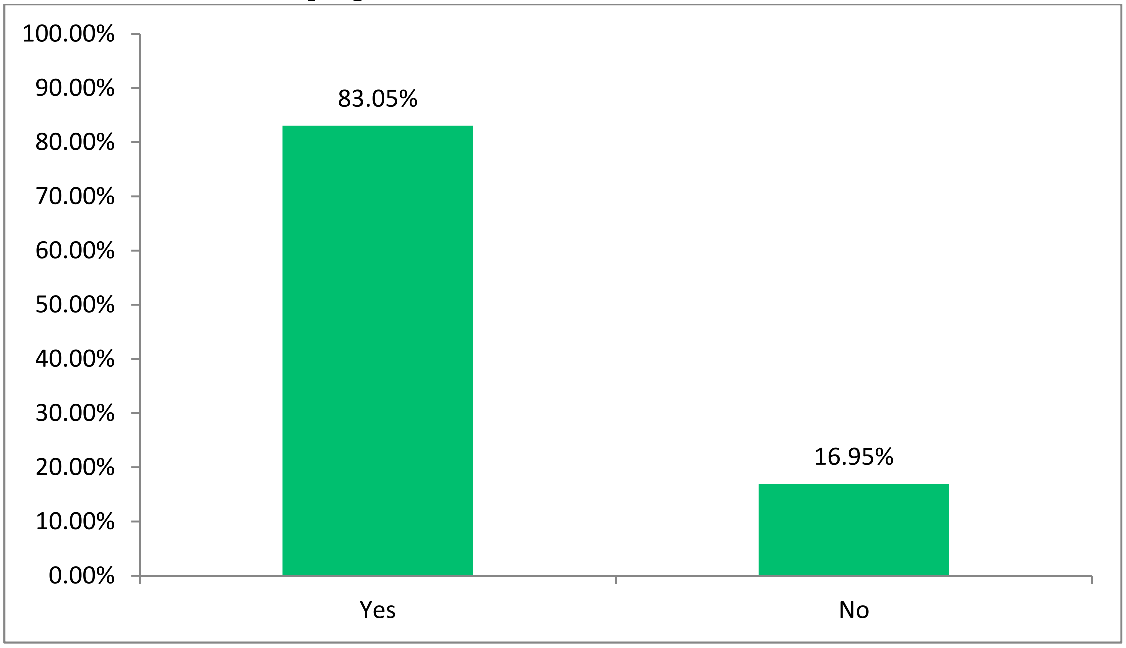
1. Has participation in Technical Meeting Weeks been an efficient use of your time?



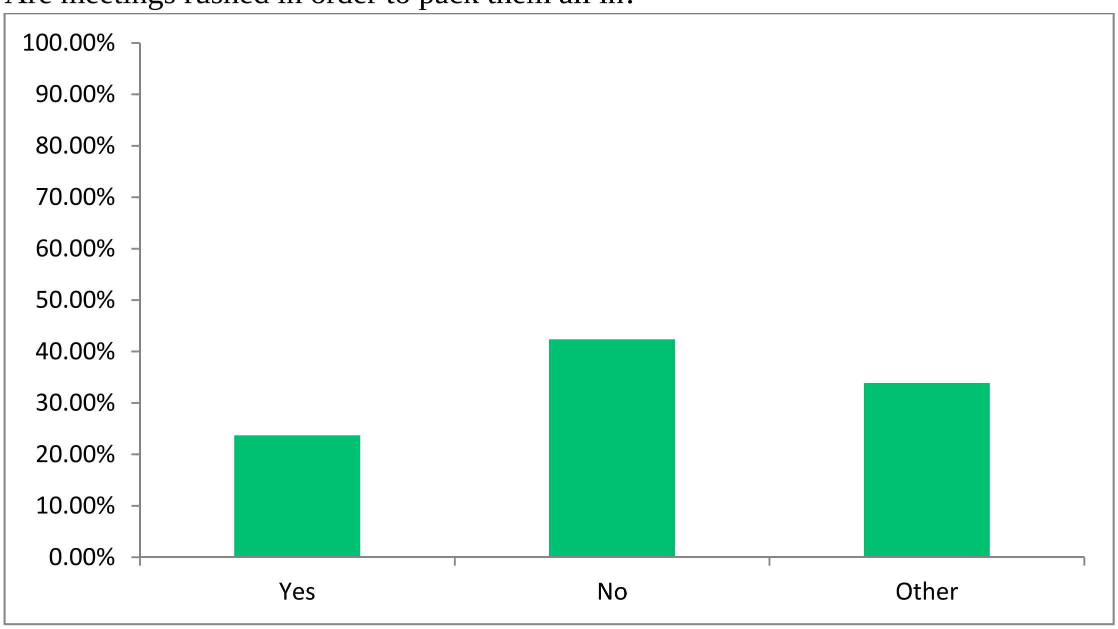
2. Do you prefer multiple committee meetings in a single week in order to travel once or single committee meetings which require shorter, but more frequent, trips?



3. If you serve on multiple committees, do meetings during Technical Weeks allow for focused discussion and progress?

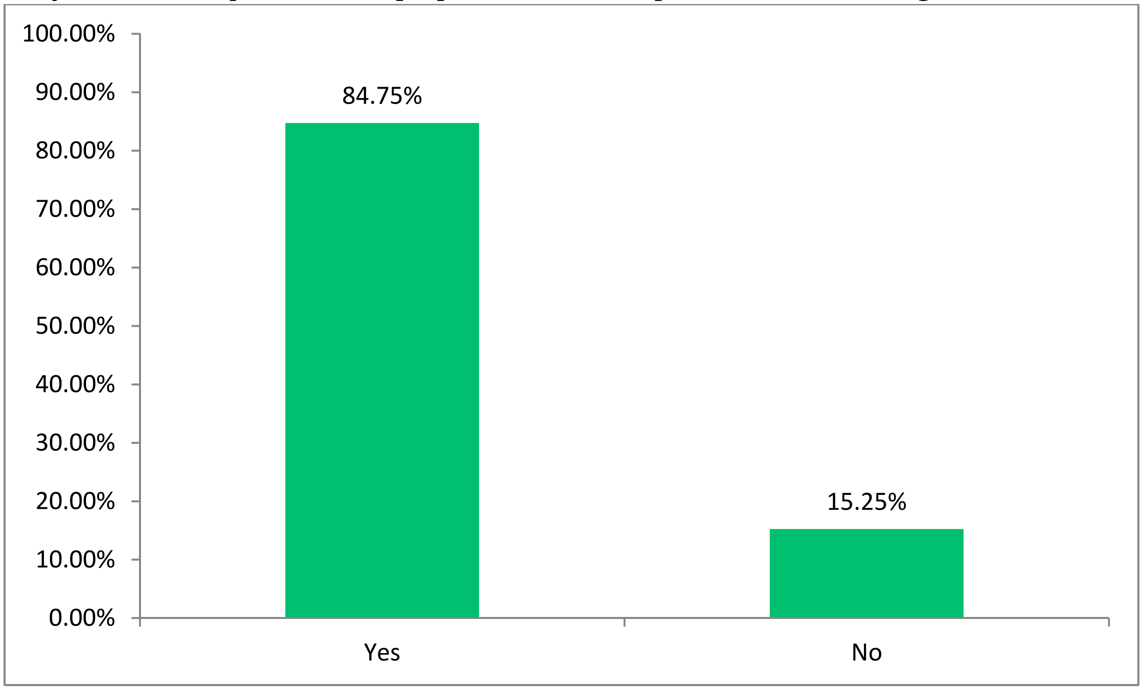


4. Are meetings rushed in order to pack them all in?

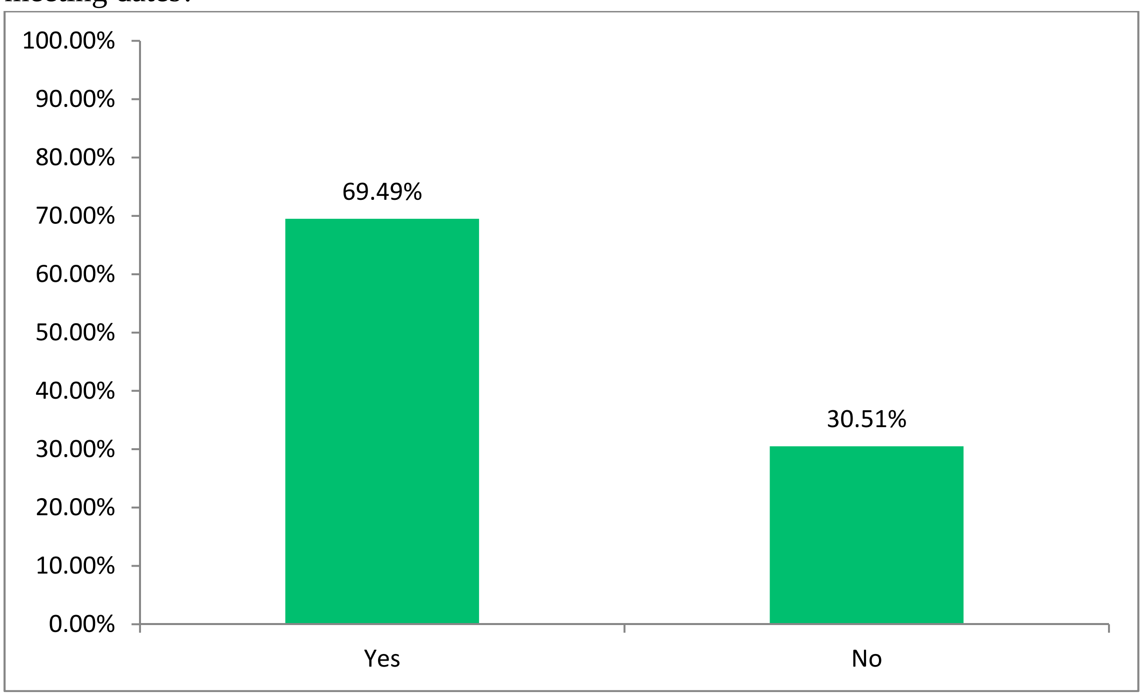


Comments from those who chose other: About half do not participate in multiple committees and therefore did not have experience to comment on this. The respondents with experience felt that meetings were sometimes rushed, especially during stock assessments, if a committee meets more infrequently, there is a heavy workload, or if there are committee overlaps. One member advocated that the Lobster Technical Committee start meeting during Technical Meeting Weeks.

5. Do you have adequate time to prepare for and complete committee assignments?

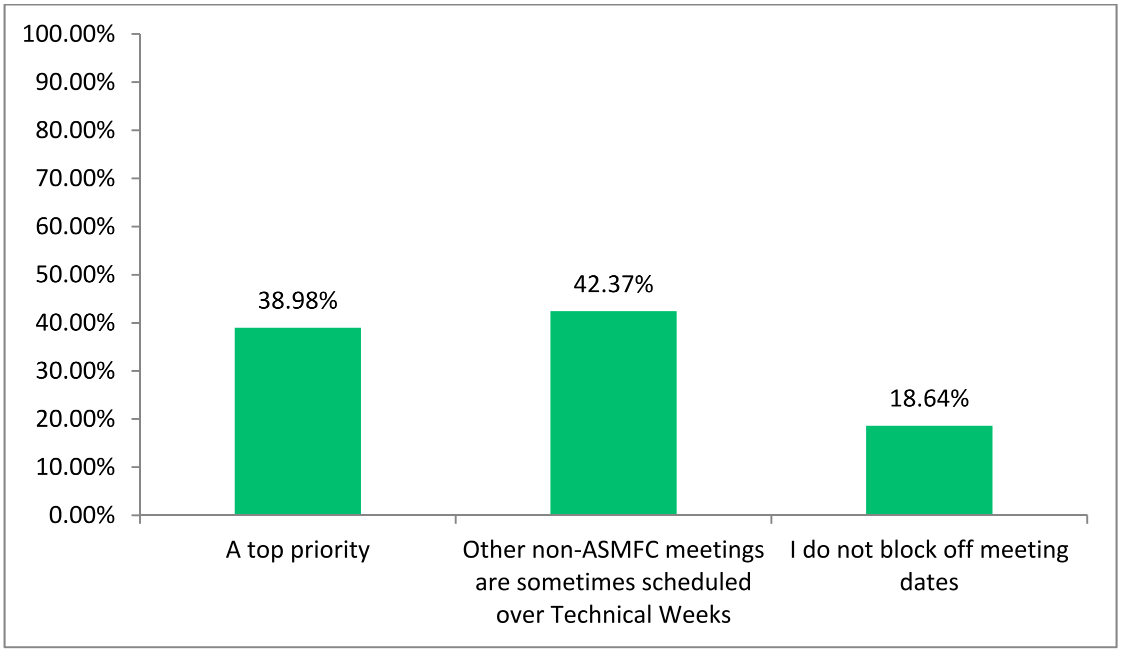


6. When the annual Technical Meetings Weeks memo is distributed, do you block off meeting dates?



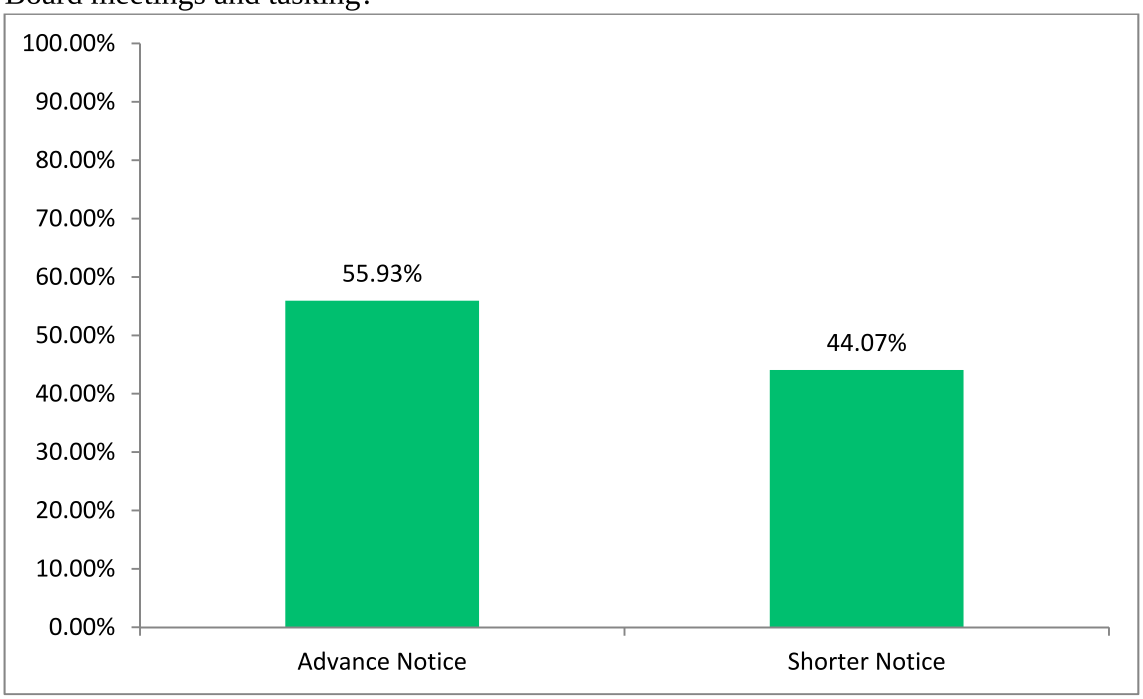
Comments: Some respondents ask their Technical Committee’s FMP coordinator whether they should hold the dates.

7. If so, are they held as a top priority, or are other non-ASMFC meetings sometimes scheduled over Technical Weeks?



Comments: Meeting weeks are generally held as a high priority, unless agency or state necessities preclude attendance.

8. Do you have a preference between advance notice, continuing to set Spring, Summer, and Fall Technical Meeting Weeks at the beginning of the year, or shorter notice, where ASMFC does not set weeks and determines technical meeting needs following quarterly Board meetings and tasking?



Overall Comments:

- 2 respondents prefer a new shorter term system
- 3 respondents don't mind having short notice
- 7 respondents prefer having more advance notice
    - 6 people noted their agencies required submission of travel permission 4-7 weeks in advance
- Needs to be recognition by ASMFC of state/agency needs
    - One agency has necessary meetings 4th week of each month
    - Travel authorization timeline
- Hybrid option: possible to have a set meeting week for high activity species and more timing flexibility for less active species
- Should keep meeting weeks, but have flexibility to allow for shorter notice meetings
- Meeting weeks are convenient, but might not be an appropriate system for Technical Committees
- Need to shift expectations so that Board demands are completed per the Technical Committee meeting schedules, rather than pulling Technical Committees together whenever the Board adds a task
- Technical Meeting Week should be disconnected from last minute Board tasks
- Need to decide earlier on which Technical Committees will meet, so that relevant people can block off the time
- Possible to achieve a lot through conference calls and webinars (4 respondents) – reduces costs/time
- Meeting weeks/face-to-face interactions are important (3 respondents)
    - Foster group connectivity and identity
    - Helpful for stock assessments and other key issues
    - Allow for cross pollination
- Could add social aspects to Technical Meeting Weeks to boost interest

Atlantic States Marine Fisheries Commission
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Washington, D.C. 20005
(202) 289-6400 phone
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MEMORANDUM

6 October 2009

TO: ASMFC Commissioners

FROM: John V. O'Shea, Executive Director

SUBJ: ASMFC LEADERSHIP NOMINATION AND ELECTION PROCESS

Attached please find the guidance document detailing the Commission's nomination and election process for Chair and Vice-Chair. This document reflects the decisions made by the Commission at the Spring and Summer Meetings earlier this year. This process will be used for the nomination and election of Commission leadership at the 2009 Annual Meeting and in future years unless modified by the Commission.

During the Business Session at the Summer Meeting, there was a discussion as to whether Commissioners should be allowed to vote independently for Commission Chair and Vice-Chair. This would be a change from the current one vote per state process. The Commission agreed there was not sufficient time to amend the Rules and Regulations for this year's election.

The Commission tasked staff with investigating what changes would need to be made to Commission guidance documents should the Commission decide to revise their current voting procedures. Staff will report the findings at the Annual Meeting.

Enclosure: ASMFC Leadership Nomination and Election Process

ASMFC Leadership Nomination and Election Process

September 18, 2009

Term Limits – The current annual election process and practice of a two-year term should be maintained when possible. The two-year term could be extended or shortened to accommodate circumstances with the leadership and Commission membership.

Regional Rotation of Leadership – The practice of having the chair and vice-chair rotate between the north, mid-Atlantic, and south should be maintained when possible. However, this practice should not be followed at the expense of electing the most qualified leadership.

Membership of Nominating Committee – The current three-member Nominating Committee will be maintained. The membership will generally consist of one Commissioner from the north, mid-Atlantic, and south and will be appointed annually by the Chair.

Role of Nominating Committee Prior to Election

- Contact all Commissioners to solicit recommendations for nominees.
- Follow-up on Commissioner recommendations to gauge the individual's interest in being included as a nominee.
- Develop separate ballots for chair and vice-chair based on input from Commissioners. A ballot will be prepared even if there is only one nominee in order to provide the opportunity to write-in a candidate.

Election Process

- Ballots will be distributed to state delegations at the Commission Business Session when the election is held (usually at the Annual Meeting).
- Each state delegation will receive one ballot and cast one vote based on the result of the Commissioner caucus from that state.
- State delegations may identify a write-in candidate. States should verify the interest of their candidate before submitting his or her name on the ballot.
- In the event that more than two candidates receive votes for either Chair or Vice-Chair, a run-off will be conducted between the two candidates that received the most votes.
- In the event of a tie, a vote will be retaken until there is a majority winner.
- The Nominations Committee will tally the votes and report the results to the Commission after each vote.

Atlantic States Marine Fisheries Commission

Atlantic Sturgeon Management Board

October 18, 2017
10:15 – 11:45 a.m.
Norfolk, Virginia

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*)	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.	2017 Benchmark Stock Assessment • Presentation of Benchmark Assessment Report (*L. Lee*) • Presentation of Peer Review Panel Report (*J. Ballenger*) • Consider Acceptance of Benchmark Assessment Report for Management Use (*A. Nowalsky*) **Final Action** • Consider Management Response to Benchmark Stock Assessment and Peer Review Report (*A. Nowalsky*) **Possible Action**	10:30 a.m.
5.	Review Status of Incidental Take Permits for Atlantic Sturgeon (*M. Appelman*)	11:20 a.m.
6.	Update on the Progress of the Endangered Species Act 5-year Status Review and Development of Recovery Targets (*L. Lankshear*)	11:30 a.m.
7.	Other Business/Adjourn	11:45 a.m.

The meeting will be held at the Waterside Marriott Hotel; 235 East Maine Street; Norfolk, Virginia 757.627.4200

MEETING OVERVIEW

Atlantic Sturgeon Management Board Meeting
October 18, 2017
10:15 – 11:45 a.m.
Norfolk, Virginia

Chair: Adam Nowalsky Assumed Chairmanship:	Technical Committee Chair: Ian Park (DE)	Law Enforcement Committee Rep: Brannock/Meyer
Vice Chair: Ross Self	Advisory Panel Chair: Vacant	Previous Board Meeting: August 2, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, VA, NC, SC, GA, FL, D.C., PRFC, USFWS, NMFS (19 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. 2017 Benchmark Stock Assessment (10:30 – 11:20 a.m.)
Background • The 2017 benchmark stock assessment was completed in July, 2017. • An external peer review was held August 14-17, 2017, in Raleigh, North Carolina. • The Peer Review Panel requested additional information and configurations of the analyses to support or revise portions of the stock assessment draft report for peer review. A description of the additional information, analysis, and conclusions is included in a supplemental report • The 2017 benchmark stock assessment draft report for peer review, the supplemental report, and the Peer Review Panel report are available in **Briefing Materials**
Presentations • L. Lee will present the 2017 Benchmark Stock Assessment Draft Report • J. Ballenger will present the Peer Review Panel report
Board Actions for Consideration • Consider acceptance of the Benchmark Stock Assessment and Peer Review Report for management use

5. Review Status of Incidental Take Permits for Atlantic Sturgeon (11:20 – 11:30 a.m.)
Background • In June, NOAA Fisheries published two proposed rules, one for each regional office, designating critical habitat for Atlantic sturgeon (**briefing materials**).
Presentations • M. Appelman will review the status of state ITPs for Atlantic sturgeon

6. Review Status of the ESA Listing 5-year Review and Recovery Targets (11:30-11:45 a.m.)
Background • In 2012, Atlantic sturgeon was listed under the Endangered Species Act (ESA or Act). • Section 4(c) of the ESA requires a review of the listing at least once every 5 years to ensure that the listed species has the appropriate level of protection under the Act. • Section 4(f) of the ESA requires the development of recovery targets to provide a measure of progress since the listing and help promote the conservation of the species.
Presentations • J. Crocker will review the status of the 5-year review and recovery targets for Atlantic sturgeon

7. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC STURGEON MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
August 2, 2016

These minutes are draft and subject to approval by the Atlantic Sturgeon 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 February 2016** by Consent (Page 1)

3. **Move to nominate Adam Nowalsky as Atlantic Sturgeon Board Chair and Ross Self as Vice-Chair** (Page 12). Motion by Michelle Duval, second by Russ Allen. Motion carried (Page 12).

4. **Adjournment by consent** (Page 12)

ATTENDANCE

Board Members

Patrick Keliher, ME (AA)
Rep. Jeffrey Pierce, ME, proxy for Sen. Langley (LA)
Douglas Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Ritchie White, NH (GA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)
Mike Armstrong, MA, proxy for D. Pierce (AA)
Bill Adler, MA (GA)
Bob Ballou, RI, proxy for J. Coit (AA)
Rep. Melissa Ziobron, CT, proxy for Rep. Miner (LA)
Dave Simpson, CT (AA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Steve Heins, NY, proxy for J. Gilmore (AA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Emerson Hasbrouck, NY (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Tom Fote, NJ (GA)
Andrew Shiels, PA, proxy for J. Arway (AA)
Loren Lustig, PA (GA)
Tom Moore, PA, proxy for Rep. Vereb (LA)
Roy Miller, DE (GA)
John Clark, DE, proxy for D. Saveikis (AA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Lynn Fegley, MD, proxy for D. Blazer (AA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Rachel Dean, MD (GA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Cathy Davenport, VA (GA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Jerry Schill, NC, proxy for Rep. Steinburg (LA)
Michelle Duval, NC, proxy for B. Davis (AA)
Ross Self, SC, proxy for R. Boyles (AA)
Patrick Geer, GA, proxy for Rep. Nimmer (LA)
Spud Woodward, GA (AA)
Malcolm Rhodes, SC (GA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Wilson Laney, USFWS
Kim Damon-Randall, NMFS

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

Ex-Officio Members

Staff

Robert Beal
Toni Kerns
Katie Drew
Max Appelman
Amy Hirrlinger
Kirby Rootes-Murdy

Guests

Colleen Giannini, CT DEEP
Peter Aarrestad, CT DEEP
Justin Davis, CT DEEP
Stew Michels, DE DFW
Brandon Muffley, NJ DFW
Jason McNamee, RI DEM
Joe Cimino, VMRC
Jeff Deem, VMRC
Jack Travelstead, CCA
Joseph Gordon, PEW Trusts
Jacob Kasper, U CONN
Kelly Place, ASMFC AP
Arnold Leo, E Hampton, NY

The Atlantic Sturgeon 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 5:20 o'clock p.m. by Chairman Robert E. Beal.

CALL TO ORDER

CHAIRMAN ROBERT E. BEAL: I would like to call the Atlantic Sturgeon Board to order. The Atlantic Sturgeon Board currently does not have a Chair or a Vice-chair, and the commission procedures indicate that the Executive Director can step in and chair the meeting in the absence of a Chair and Vice-chair; so I will do that and Dr. Duval has her hand up.

DR. MICHELLE DUVAL: Thank you, Mr. Substitute Chairman. I am prepared to offer a motion for a Chair and Vice-chair if you would like to consider that at this time.

APPROVAL OF AGENDA

CHAIRMAN BEAL: Let's just go through the agenda, we'll do that at the end if that is okay; and keep it in order, in the interest of time and Kim really needs to take off, I think. With that, let's go ahead. We have an agenda that was distributed on the briefing materials. It is relatively brief. What I would suggest that we do in the interest of travel schedules is flip-flop Number 4 and 5; so we'll handle the Critical Habitat Designation discussion first, and then we will go through the Benchmark Stock Assessment Update; if that is okay with everyone.

Are there any other changes or additions to the agenda? Seeing none; it is approved.

APPROVAL OF PROCEEDINGS

CHAIRMAN BEAL: The last time this board met was February of 2016, and the minutes were included in your briefing materials. Are there any changes to those minutes? Seeing none; those minutes stand approved, as well.

PUBLIC COMMENT

CHAIRMAN BEAL: With that, we'll accept any public comment for issues not on the agenda today.

If there is public comment on the critical habitat or the timeline, we can accept those at that point of the meeting. Not seeing anyone's hand up for public comment, we will keep moving forward. With that, I will ask Kim Damon-Randall from GARFO to give a presentation on the two proposed rules for the Critical Habitat Designation for Atlantic sturgeon.

REVIEW AND DISCUSS COMMENT ON NOAA PROPOSED RULES DESIGNATING CRITICAL HABITAT FOR ATLANTIC STURGEON

MS. KIMBERLY DAMON-RANDALL: Back in February, I was here talking about the fact that we would be having these proposed rules come out in May, and that we would come back and talk to you about it; so I'm following through on that commitment. Our two proposed rules published on June 3rd, and the citations are there.

There is one for the Greater Atlantic Regional Fisheries Office; that covers the Gulf of Maine, the New York Bight, and Chesapeake Bay DPSs, and one for the Southeast Regional Office that covers the Carolina and South Atlantic DPSs. We have a 90-day public comment period that is still open on this. It closes on September 1st. Just to familiarize some of you with some of the critical habitat basics, I'm just going to run through them pretty briefly. The Secretaries of Commerce and Interior share responsibilities for implementing most of the provisions of the ESA, and authority has been delegated down to the Assistant Administrator for Fisheries and to the Director of Fish and Wildlife Service. Under Section 4 of the Endangered Species Act, critical habitat is supposed to be designated when we list a species; if we're able to determine what the critical habitat is.

If not, then we have an additional year to designate critical habitat. Critical habitat is those specific areas within the geographical area occupied by the species at the time its listed; upon which are found the physical and biological features that are essential to the conservation of the species and which may require special management considerations or protections.

It also includes specific areas outside the geographical area occupied by the species at the time it's listed; upon a determination by the Secretary that those areas are essential to the conservation of the species. A critical habitat designation is not anticipated to create new regulations or restrictions on fisheries. It is not going to create new preserves or refuges, and it is not going to directly affect private landowner's use of their lands.

It will guide federal agencies in avoiding and minimizing impacts to habitat that's critical to the recovery of the Atlantic sturgeon, and it will continue to require ESA consultations for actions that are funded, carried out or authorized by federal agencies; so things like dredging projects. This is through the Section 7 provision of the Endangered Species Act, where the federal agencies have to consult with us, and this is under Section 7(a)(2) of the Act.

If federal agencies are authorizing, funding or carrying out an action, they have to make sure that it's not likely to destroy or adversely modify that habitat. They also have to make sure that it doesn't jeopardize the continued existence of ESA listed species; and we've had that jeopardy standard since the Atlantic sturgeons were listed, so now this brings the critical habitat provision in.

If the activity is going to destroy or adversely modify critical habitat, then they have to modify it to avoid that destruction or modification. At the time of listing in 2012, we couldn't identify critical habitat for Atlantic sturgeon. We were sued by two non-governmental organizations for failure to designate critical habitat within the established timeframes, so we entered into a court ordered settlement that required that we propose rules to designate critical habitat by May 30th, with final rules no more than one year later. Our rule did file with the Federal Register by May 30th, and then it actually published in the Register on June 3rd.

Just to give you a little bit of background on how we went about identifying the features and designating critical habitat. The first thing we did was to identify the geographical area occupied at the time the species was listed. We then identified the physical or biological features that are essential to the conservation of the DPSs. We determined whether those features may require special management considerations or protection. We identified specific areas that contain these features and delineated those areas. We considered whether any unoccupied habitat is essential to the conservation of the species.

We also considered the economic, national security, or any other impacts of designating critical habitat; this is called the 4(b)(2) analysis; and whether to exclude any specific areas, but not if this results in the extinction of the DPS. This is a provision of critical habitat that is very different than listing. When you're listing a species, you don't take into account the economic impact. Then we determined whether any area cannot be designated because of an Integrated Natural Resource Management Plan that military facility has; that would provide a benefit to the DPS.

The geographical area at the time a species was listed was determined to be the entirety of the range of each DPS, with the exception of areas that are inaccessible to Atlantic sturgeon because of a dam, other manmade structure or a natural feature such as falls that are impassable by Atlantic sturgeon.

Habitat upriver of an impassable dam is considered unoccupied habitat. The physical and biological features that are essential for the conservation that may require special management consideration or protection, we first evaluated the marine and estuarine environment. We know there are some very specific areas that Atlantic sturgeon aggregate in in the marine and estuarine environment.

But we were unable to determine what the specific features of those areas are in the ocean and estuaries. We then evaluated the riverine habitats, and we were able to identify features that are important for spawning. These are hard-bottom and freshwater, it is almost fresh water, so there is a salinity component.

Growth and development, which is soft-bottom, such as mud, within a specific salinity range; in water of suitable temperature and with enough oxygen to promote growth and development and then migration and movement, so waters that are appropriately deep and that have unimpeded passage.

For the Gulf of Maine DPS, we proposed habitat in five different areas in the Penobscot, Kennebec, Androscoggin, Piscataqua and Merrimack Rivers; and this is the full bank width of the named river with specific upriver and downriver boundaries, and I'll get into those when I get to the maps. Here is the map of the Gulf of Maine DPS. This is the Penobscot River, main stem from the Milford Dam to where the main stem river drainage discharges at its mouth into Penobscot Bay.

Then for the Kennebec River, it is the main stem from Taconic Falls or Lockwood Dam to where the main stem river discharges at its mouth into the Atlantic Ocean; and for the Androscoggin River, it is the main stem from the Brunswick Dam to where the main stem river discharges into Merrymeeting Bay.

For the Piscataqua River, it is the entire Piscataqua River main stem, including the Salmon Falls River and the Cocheco Rivers downstream of their lowermost dams to the confluence of the Piscataqua River, and the Merrimack River is from the Essex Dam, also known as the Lawrence Dam, to where the main stem water discharges at its mouth into the Atlantic Ocean.

These maps may be hard for some people to see. We do have these on our website, if you want to look at them in more detail. For the New York Bight we proposed four areas, the Connecticut, Housatonic, Hudson and Delaware; and again it is full bank width. This is the Connecticut River; it is in the main stem from the Holyoke Dam downstream to where the main stem river discharges at its mouth into Long Island Sound. The Housatonic River from the Derby Dam downstream to where the main stem discharges into Long Island Sound, and the Hudson from Troy Lock and Dam, also known as the Federal Dam, to where the main stem river discharges at its mouth into New York City Harbor. This is just another map shot of the upper part of the watershed.

The Delaware River is from the crossing of the Trenton-Morrisville Route 1 Toll Bridge to where the main stem river discharges at its mouth into Delaware Bay. There is a specific line of demarcation that was identified in 1905 for the mouth of the Delaware River, and that is at Liston Point, Delaware to Hope Creek New Jersey.

This is just another shot of the lower part of the Delaware River Critical Habitat Unit. For Chesapeake Bay we proposed five areas in the Susquehanna, Potomac, Rappahannock and York River System, which includes the Pamunkey and Mattaponi. The Susquehanna is from the Conowingo Dam to where the main stem river discharges at its mouth into the Chesapeake Bay.

The Potomac is from Little Falls Dam downstream to where the main stem river discharges into Chesapeake Bay. The Rappahannock is from the U.S. Highway 1 Bridge to Chesapeake Bay. Then York River is from the confluence of the Mattaponi and Pamunkey Rivers downstream to where they discharge into the Bay, and then the Mattaponi at its confluence with the York up to the Route 360 Bridge and the same with the Pamunkey, it goes up to the Route 360 Bridge.

The James River is from Boshers Dam to the Chesapeake Bay, and then we're switching gears to the southeast. They have one single map as opposed to the individual maps that we had for GARFO. This is the map that shows the critical habitat designation areas for the South Atlantic and Carolina DPSs, and they have this on their website, as well.

Their proposed critical habitat units in North Carolina are the Roanoke, the Tar-Pamlico, Noose, and Cape Fear and Northeast Cape Fear Rivers. For South Carolina it is the Waccamaw, PD, Black, Santee, Cooper, Wateree, Congaree and Broad River; as well as the Edisto, the Combahee and the Savannah Rivers, and additional water bodies include Bull Creek between the PD and the Waccamaw.

In Georgia it is the Savannah, Ogeechee, Altamaha, Ocmulgee, Oconee, Satilla and St. Mary's, which is at the Georgia/Florida border. In the southeast they ended up designating, or proposing to designate unoccupied habitat; and that is because they identified areas above impassable barriers that are essential to the conservation of the species.

For North Carolina they identified in the Cape Fear River from Husky Lock and Dam, which is Lock and Dam Number 3, downstream to Lock and Dam Number 2, as unoccupied habitat. They identified several areas in South Carolina in the Wateree River, from the Wateree Dam downstream to the confluence with the Congaree River.

The Broad River from the Parr Shoals downstream to the confluence with the Saluda River; the Congaree River from the confluence of the Saluda River and the Broad River downstream to the Santee River; Lake Marion from the Santee River downstream to the Diversion Canal; the Diversion Canal from Lake Marion downstream to Lake Moultrie; Lake Moultrie from the Diversion Canal downstream to the Pinopolis Dam and the Rediversion Canal; the Rediversion Canal from Lake Moultrie downstream to the St. Steven Powerhouse and the Santee River from the confluence of the Congaree and Wateree downstream to Lake Marion. Then in Georgia they identified in the Savannah River, the main stem from Augusta Diversion Dam downstream to the New Savannah Bluff Lock and Dam.

As I mentioned earlier, the public comment period is open until September 1st. Electronic submissions can be sent to Regs.gov at the address listed there. They can also be mailed to me at the Greater Atlantic Regional Fisheries Office in Gloucester. We did have a public hearing, and we did accept oral and written comments there, as well.

We do need your help in collecting information. The physical and biological features that we identified as essential to the conservation of the species, if you have more information or different information, it would be very helpful if you were to submit that during the public comment period.

We would love to have more information on the rivers that are included in our proposal. They were based on the availability of spawning habitat, so if there is more information out there on that, that would be very helpful as well. Bathymetric data for many of the sturgeon rivers is lacking and would be helpful to sturgeon recovery. If that is out there, and we couldn't find it, if you could send that to us, that would be great.

We also welcome any comments on the overall accuracy, quality, completeness and relevance of the scientific information and data that were considered; and any additional data that were not considered that you have, we would be happy to accept during the public comment period. That is for the GARFO rule. For the SERO rule, you can submit comments electronically; again, the address is in the presentation.

They can be mailed or hand delivered to Andrew Herndon in the Southeast Regional Office. Their list of request for help are very similar, so the physical and biological features, any information you have on those, the rivers that have been included or excluded in their proposal, based on the availability of spawning habitat.

Their proposal to include unoccupied areas that are essential to the conservation of the species, they are welcoming feedback on that; again, the overall accuracy, quality, completeness and relevance of the scientific information and data considered and any additional data that were not considered.

For more information on the Southeast Rules, they've provided links to their website in the presentation. Ours is if you go into the Greater Atlantic Regional Fisheries Office website, and go to the protected resources program and Atlantic sturgeon, you'll find all the information there as well; and that's it.

CHAIRMAN BEAL: Great, thanks Kim, and very impressive job of pronouncing some pretty tough rivers in there; so good job. First of all, I would like to thank NOAA Fisheries. One of the things this board asked NOAA Fisheries to do is to straddle one of our meetings with a public comment period so that we could get this board together and contemplate commenting on this as a board face-to-face rather than via e-mail or through some remote correspondence. On behalf of the board, thank you for doing that. Are there questions for Kim? I don't know if we want to get into specific rivers right now; but I think general questions are probably a good place to start, yes, Bill Adler.

MR. WILLIAM ADLER: Let me just go over a couple of things that you said. First of all, this is not going to put new rules on fishermen, and it is not going to establish sanctuary closed areas; and that I want to make sure you said. Then next thing is well, what does it do? I know you said protect the habitat of all these rivers and places. My question is what is behind this? I mean, I know what's behind this, but I want to know, what are the plans to protect the habitat in these rivers? Can you give me an example, and I'll stop there?

MS. DAMON-RANDALL: Yes, to your first question, and to the second question, what this does is it ensures that federal agencies when they're authorizing funding or permitting a project, have to come in and consult with us and they have to determine working with us, whether or not that project is going to adversely modify or destroy critical habitat.

It puts into place enhanced protections for the critical habitat. An example would be a dredging project. Normally, we would consult on that whether or not that is going to jeopardize the species. That's how we do it right now. But with the Critical Habitat Designation in place, we would be looking at whether or not it is going to adversely modify or destroy critical habitat. It is an enhanced protection for the habitat as well as the species.

CHAIRMAN BEAL: Follow up, Bill? Oh, you're all set; Tom Fote.

MR. THOMAS P. FOTE: I found it interesting that the South Atlantic actually put in places that were unoccupied and GARFO did not, because we could have put the Susquehanna River in there to be one of those unoccupied so if the dam ever was corrected, we would basically have that; and why didn't GARFO look at (?)Cappocke. That is my first question.

The second question, when you look at projects, I think of the Delaware River that widening that went on ten years ago that we tried to stop. Would this help us in that kind of battle to stop? Because there is going to be a whole bunch of projects to deepen channels to basically take care of these super boats that are coming in. I'm just wondering how that will be available, because a lot of that is sturgeon habitat in some of the rivers.

MS. DAMON-RANDALL: We did look at unoccupied habitat, and for your example, the Susquehanna, the best available information that we have, suggests that they didn't make it above Conowingo; that there was a natural falls there. In looking at that and then looking at the habitat above the Conowingo, where there are lots of other dams, there is not a lot of good quality habitat.

Right now, it is considered unoccupied. That would be something we would really want to get sturgeon to. There is habitat below that they can use for spawning, so we determined that that was what they really need for conservation and for recovery. That is why we didn't, and there wasn't any other case anywhere else where there is unoccupied habitat in the GARFO area that was essential to the conservation of the species.

Your second question, yes, this does help out. When we do a Section 7 consultation on a species and look at jeopardy, we do look at impacts to habitat. But it is generally, they are going to be long lasting impacts or when a species is there. This gives us the ability to really hone in on the things that Atlantic sturgeon need from that habitat that are essential to their recovery. If an action is going to take place that is going to cause those to no longer function to serve for the species recovery, then that is going to result in adverse modification or destruction; so it does give an added layer of protection.

CHAIRMAN BEAL: I've got Pat Keliher, Rob O'Reilly, Marty and then a number of other people on this side. We'll go Pat and then Rob.

MR. PATRICK C. KELIHER: Kim thanks that was a great presentation. I'm just looking for a little clarity. Looking at these maps, and especially at the mouths of the river where this is going to stop. I haven't gone into the details of the critical habitat in the draft. Is it very specific where this is going to end?

I'm looking at, for instance, the map for the Penobscot River; it kind of goes out into the Bay and stops, where others look like it really does stop at the mouth of the river. Is there some inclusion of the estuarine in marine habitat within this?

MS. DAMON-RANDALL: There is some in some rivers, so you're right, the Penobscot goes down a little bit into the Bay, but not fully through the Bay; because all of the features were not present in that lower part. The Kennebec goes all the way to the mouth of the river. You have to look very carefully at the maps. In the proposed rule, the areas are very clearly demarcated so that enforcement will know where the critical habitat is and where it is not.

MR. ROB O'REILLY: I guess my question is about timing, so you indicated September 1 is when the comments are due. Have you already incorporated what Section 6 exemption permits have for research? In other words, is NMFS already in touch with those folks in any one given region? In Virginia, VIMS, VCU, U.S. Fish and Wildlife is part of that permit, and there are others participating as well. Is that already taken into account here?

MS. DAMON-RANDALL: I think you mean Section 10, right; Section 10 Research Permits?

MR. O'REILLY: Okay.

MS. DAMON-RANDALL: Section 6 is the agreements that we have with states where the funding mechanism generally exists. Section 10 is the research permit provision of the Act. Those research permits were issued in 2012, and they're five year permits. Because they all kind of happened together because of the listing, those are all up for renewal and are in process.

CHAIRMAN BEAL: A follow up, Rob?

MR. O'REILLY: Yes, so I guess my question, Kim, is the improvement of the understanding of the river systems would definitely be on those folks who have those Section 10 Research Permits. Is there already a connection to them with National Marine Fisheries Service that is already determined here, or is that something that this information should be sent to them and say, you've got until September 1, if you want to make those improvements?

MS. DAMON-RANDALL: I am not sure if I am fully following your question, but they don't have to make any changes to their permits now. They are fine until their permits need to be redone in 2017. If they are collecting information, they know that they have annual reports that they have to submit.

If they are collecting information that is relevant to this, we have asked everybody to provide us with information. The Sturgeon Technical Committee for ASMFC actually peer reviewed the documents that we have that were the basis for this. They were able to provide us with information there, and I think most of the sturgeon researchers, if not all, know about this and will submit information if they have it. I'm not sure if I covered your question.

CHAIRMAN BEAL: One more follow up, Rob.

MR. O'REILLY: At the very end, yes. That is what I'm concerned about that the information about spawning areas and other critical areas; that that is already known to NMFS, based on those who are doing this research, and I think the answer is yes. Thank you.

CHAIRMAN BEAL: Next on the list was Marty Gary.

MR. MARTIN GARY: Thank you, Kim for your presentation. Kim, I think you know that I've exchanged correspondence with yourself and Julie on some Potomac issues. The entirety of the Potomac up to Little Falls and all of our jurisdiction falls within the listing or the ruling. We've documented Atlantic sturgeon at various life stages throughout that area and shortnose and possibly spawning shortnose.

My question is, as this rulemaking goes forward I think you're aware of this coal ash issue that we have on the Potomac. It has been highly controversial, and potentially concerning in terms of harmful impacts; physical or biologically to the sturgeon species. They may or may not be. But once this rule making is adopted, within a year of May I think you said, so by next May of '17.

I guess I'm wondering, it's not going to be retroactive is it? The process for the coal ash containment is ongoing. I don't know when it's going to end. But at some point, that is what our concern was. Should there be a consultation with NOAA? It appears it doesn't need to be done now, I think; and I'm wondering how this might affect it, if that makes sense.

MS. DAMON-RANDALL: To answer your question and not go into specifics about the coal ash, maybe we can talk offline about that. Once the proposed rule is out, there is a provision in the Act that requires that federal agencies conference with us on actions that they're going to take during that proposed rule phase.

In conferencing, they have to determine whether or not they think that the action is going to aversely modify or destroy critical habitat. If it does, then we do a conference opinion, so that is a step that we have to take with all the action agencies; with projects that are happening right now.

CHAIRMAN BEAL: Next is John Clark.

MR. JOHN CLARK: Thanks for all those explanations, Kim. You've already explained about why some of the rivers were designated all the way down to the ocean, some just to the Bay. Just following a little further on that in the ocean, not that I wanted critical habitat to be designated there; but for example, off of Delaware I know there is a relic shoal out there that seems to attract a lot of sturgeon. That was not considered a feature, yet the lower Delaware River is fairly featureless. I was just wondering how you made those determinations.

MS. DAMON-RANDALL: It was very difficult, because we know that there are areas in the ocean besides Delaware. There is an area off Long Island, there's an area off North Carolina, and there are several aggregation areas that we know they go to year after year. We just don't know why they go there, what is the habitat feature that attracts them to those specific areas. We dug through all of the literature and information that is out there, and we just could not identify what those features are.

Even if you could say something like depth or something like that; it is hard to say if that feature is going to require special management, so how do you change depth in the ocean? What is going to affect that feature? That was the hardship. If there is information that comes out afterwards that helps us to really identify what those features are, we can always go back and designate habitat in the marine environment and in the estuaries.

CHAIRMAN BEAL: Last on my list was Doug Grout.

MR. DOUGLAS E. GROUT: Just a brief question. You had identified in your presentation some of the habitat that is critical for spawning and for rearing. For example, varying salinity levels, also substrate type that varies between spawning and rearing. In the Proposed Rule, do you identify the studies that show that those habitat types do occur in the rivers that you've identified?

MS. DAMON-RANDALL: Yes, and that's how we base the areas that we designated, they had all of those features.

CHAIRMAN GROUT: Okay, but you've identified the specific studies that you drew from, correct?

MS. DAMON-RANDALL: Yes.

CHAIRMAN BEAL: That exhausts the list that I had of questions for Kim.

Now the board needs to decide what comment do they want to provide back to NOAA Fisheries? Max has a few slides to kind of frame the issue, so I'll ask him to go through those and then at the end, he has got some options spelled out on potential ways to move forward. Max, if you could do that.

MR. MAX APPELMAN: Just a quick overview of some comments on the proposed rules that are floating around the scientific and management communities. Staff solicited feedback from the Sturgeon TC, and also the commission's Habitat Committee on the proposed rules. As I go through some of these comments though, please keep in mind that states are developing comments individually. A lot of those are still preliminary, so this is by no means a comprehensive list. Having said that; overall, there is general support for the proposed critical habitat units and their boundaries. Most of the coastwide comments, as I'm calling them, were the comments that apply to both rules; in regards to the process and outcomes of Section 7 consultations. Those comments were more or less centered around timing and efficiency of the process; mainly noting that some projects in the proposed areas may be funded by time limited grants.

There were also concerns about additional administrative cost that may be associated with the processes. Also, that some federally funded sampling programs and research initiatives that use bottom tending gear may be impacted as a result of these consultations, so that, in turn, could impact several different species management and conservation programs.

Some other general comments were in regards to updating supporting information in the proposed rules; and I have one example up on the screen. That juvenile sturgeon captured in Connecticut River are genetically unique; whereas this was only suggested at the time of the proposed rule, and so obviously new information has become available since that rule was put together, so comments of that nature.

A few DPS specific comments that were received, as well. There were two general themes to these comments, one being in regards to the proposed habitat boundaries potentially being inappropriate based on the best available information. Again, another example on the board is that proposed upstream boundaries for the Ogeechee and Satilla Rivers are far upstream from known sturgeon populations.

Then another theme is in regards to areas that were not included in the proposed rules and perhaps should have been. Again, this is based on new information becoming available since the rules were formulated. Again, another example was evidence to support designating portions of the Marshy Hope and Nanticoke Rivers as critical habitat.

As Bob pointed out, there are a couple different routes that the board can go with this. I think the most obvious is that the board can submit comment directly. We could collect comments right here and now, or we could all go home and digest all this information you've heard today and submit comments via e-mail. But inevitably a draft letter would kind of be circulated via e-mail for comment and review.

The second option is for states to submit comment individually as some seem to be doing already. These would be kind of more specific to the proposed areas within their jurisdictions, or the third option would be to do both of these. Just a reminder of what the timeline is for submitting comment up on the board; so with that, that is all I have.

CHAIRMAN BEAL: Any questions for Max? Seeing none; look both ways, Dennis. What is the pleasure of the board? It sounds like a number of states are individually working on comments, and that's great. The board can supplement those and reiterate some of those if you choose to do that; draft a letter that's more sort of coastwide, large scale conceptual issues, rather than river specific concerns. The commission doesn't have to comment at all if the states want to do it individually. It is up to the group. What is the pleasure of the board? Rob.

MR. O'REILLY: Well, I think I would favor a letter, and whether or not states submit their comments directly or not, I think that the letter can include some of that if the states wish; as you're suggesting, and also get some input from the TC and others. I think it's important to submit that letter.

CHAIRMAN BEAL: One suggestion for a letter from the commission, and it probably makes sense since we asked NOAA to provide us this opportunity to get the board together to comment; that some comment should be provided from this board. We've got 29 days from now to pull this together. Is everyone comfortable with the process of Max continuing to work with the states, pulling together any additional comments that may come from the TC or the Habitat Committee and compiling the state specific comments.

We at staff can weave that into a letter and circulate that back to the board with maybe a week or so turnaround time before September 1st, then we can submit that to NOAA. Does that seem to work for everyone? We'll send out frequent and multiple reminders to provide some input to staff as we move forward. I've got Pat Keliher, then Doug Grout.

MR. KELIHER: I'm not sure that we need a letter from the commission, frankly. Many of these issues are very state specific. I'm just trying to think of what this letter would say, how we're going to construct it, and the timeframe that it will take to actually get it done if we can do it within the prescribed timeframe with a due date of September 1.

MR. GROUT: Well, my comment I just saw some suggestions from the Habitat Committee and the Technical Committee that are more broad in nature that I think could frame the board's comments. Clearly, each of the states is going to have some very specific things that they may want to comment on. Obviously, the states are going to do that no matter what, but there may be a few things that our Habitat Committee and Technical Committee come up with that Max already provided to us here that could form the framework for the board's comments.

CHAIRMAN BEAL: We've got a difference of opinion to some degree. What do other folks think? Dr. Armstrong.

DR. MICHAEL ARMSTRONG: I agree with Pat on this one. I think NOAA is looking for very specific information. I think that's the most useful. This board can give some very general stuff, summarizing with the Habitat Committee, but even the TCs are feeding information that is specific to individual runs. I don't think it's necessary to comment. All the states I've talked to will be providing comments, and I think that is more useful for NOAA at this point.

CHAIRMAN BEAL: Another hand, Tom did you have your hand up?

MR. FOTE: I think about all the difficulty that we gave them when they basically listed sturgeon. But something good came out of protecting habitat, so I have no problem with a board-based letter going out on this. I think if they do something that we asked them to do, then just to say even a thank you letter for basically putting this together.

That's a simple letter; include a few things on it. There is no problem there. It doesn't have to be a long, drawn out letter, but thank them for going through the process and putting this together; and the states will be sending their individual comments in; a simple letter.

CHAIRMAN BEAL: Good suggestion. Other thoughts? Dr. Duval.

DR. DUVAL: I agree with Tom Fote. I know. I think a general short letter that can capture some of the more broadly based comments that Chairman Grout referenced would be good. Certainly, as states continue to pour through the specifics of the designations, any very specific comments states can go ahead and submit that. But I would be supportive of a general letter from the commission, as well.

DR. MALCOLM RHODES: Well, I'll weigh in a little bit. As a commission, I mean, we can recognize what they've done, although it wasn't in any detail. I think South Carolina has been hit with more designated rivers than any state; we have eight or nine, and most of them extend 100 miles inland, because we have no falls and we have no dams on most of them.

It is an incredible amount of the state. The lower half of the state is essentially in the watershed that has been designated critical habitat. Our response to it will probably be very different than most other states; not that it's negative, but to be a commission that is representing the views of all the members, we don't have four rivers that go in 30 miles and that's it. We have nine rivers that go in 100 miles, and it extends from the North Carolina border to the Georgia border.

It would be hard for me to see any letter coming from the commission that's we could support in that way. I mean, there is a lot of information that will be coming in, and a lot of fish have been tracked in these rivers. In a lot of ways we think that the designation is probably not representative, and we have commented in the past on that. It will probably be along that line. We've got a lot of sturgeon everywhere. I'll take you on the rivers anytime.

CHAIRMAN BEAL: A lot of sturgeon is good news, so we're happy to hear that. Other thoughts? Seeing none; the board seems to be a little bit split. Does anyone object to the approach of staff drafting a letter, a very general letter, focusing on; thank you for the opportunity to comment? Given the specific nature of a lot of these habitat areas and river specific issues, many of the states will be commenting on their own.

I think it probably is worth highlighting the importance of some of the research that goes on in these rivers, and the commission would like to ensure that, with the least impediments possible, these research efforts that take place in these rivers can continue to happen; something along those lines.

Does anyone object to that type of letter being drafted and circulated to the board, I guess is the first step; and then once folks see that, if there is major heartburn with that, then we can regroup and figure out what to do? Any objections to that? Seeing none; we'll go that route. We'll work on a letter over the next ten days or so, and we'll send it around to the board and make sure we get it to National Marine Fisheries by 4:59 on September 1st, or one minute before the cutoff whenever it is, Kim.

Is there anything else on the critical habitat designations? Seeing none; Kim, thank you for coming down. I hope we didn't pinch you too tight on your flight schedule here. You can scramble for a cab if you need to and thanks again. The next agenda item in our re-ordered agenda is the update on the 2017 benchmark stock assessment; Dr. Drew.

UPDATE ON THE 2017 BENCHMARK STOCK ASSESSMENT

DR. KATIE DREW: Thank you, Mr. Temporary Chair. The Stock Assessment Subcommittee met in July to have an assessment workshop where we reviewed the progress on model development that we've been working on for this assessment, so we don't have any results yet. We didn't have any results to review.

But we focused on sort of questions about model development, model progress; to make sure that the best base data are going into these models to help answer some questions about assumptions that we should make, and to make sure kind of we're all on the same page about what the inputs are going to be.

This included models like the acoustic tagging model, a couple of data-poor models, egg-per-recruit and spawner-per-recruit type reference point models, as well as trend analysis and reviewing additional data that was not available to us at the data workshop and some analyses related to that. I think we made some good progress.

After this, we'll continue to work on developing these models and have another workshop in January or February of next year, where we will review the final model results, come to some conclusions about stock status and then be ready for a peer review in the early part of the summer of next year; so that we can present then the results to you in the middle of next year at some point.

I think we're pretty much on track for that. I should specify, we're looking at these at both the DPS and the coastwide level for a lot of these analyses, wherever possible. If anybody has any questions about the model development or the data, I would be happy to answer them now.

CHAIRMAN BEAL: Any questions? I think everything Dr. Drew said is good news. I would like to highlight, there is a lot of work being done on sturgeon; federal scientists, state scientists, Katie, Max, the whole group is pulling pretty hard on this one, and it sounds like they're still on track.

These river specific assessments are tough and time consuming, so I appreciate all their effort. Hopefully you'll have a very useable product in a year or so from now, maybe a little bit more. Any other things on the stock assessment? Seeing none; we get to election of Chair and Vice-chair. I think Dr. Duval indicated she had a motion.

ELECTION OF ATLANTIC STURGEON BOARD CHAIR AND VICE-CHAIR

DR. DUVAL: Thank you, Mr. Temporary Chairman, and I apologize for having jumped ahead on the agenda earlier. Maybe I just wanted to get to the adjournment. **But with that; I nominate Adam Nowalsky as Chair and Ross Self as Vice-Chair.**

CHAIRMAN BEAL: Thank you, Dr. Duval. Is there a second to that; Russ Allen, thank you. The motion is to have Adam Nowalsky serve as the Chair, Ross Self serve as the Vice-Chair; and that would effective at the next meeting, whenever that may be. Actually, it would be effective immediately and you would Chair the next meeting. Given that there is no Chair right now, any objection to the motion before the board? **Seeing none; congratulations, and Adam you are now the Sturgeon Board Chair**, as well as your other responsibilities, so thank you.

ADJOURNMENT

CHAIRMAN BEAL: With that; is there any other business before the Sturgeon Board? Seeing none; the Sturgeon Board is adjourned.

(Whereupon the meeting was adjourned at 6:05 o'clock p.m. on August 2, 2016.)

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Atlantic States Marine Fisheries Commission

Atlantic Sturgeon Stock Assessment Review Report

August 2017

Sustainably Managing Atlantic Coastal Fisheries

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Atlantic States Marine Fisheries Commission

Atlantic Sturgeon Stock Assessment Review Report

Conducted on
August 14-17, 2017
Raleigh, North Carolina

Prepared by the
ASMFC Atlantic Sturgeon Stock Assessment Review Panel

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Executive Summary

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are one of the largest and longest-lived anadromous fish in North America. They are broadly distributed along the Atlantic coast from Labrador, Canada to the St. Johns River, Florida. Adults spawn in tidal freshwater to riverine reaches of rivers. After hatching, juvenile Atlantic sturgeon reside in the freshwater portion of their natal river for their first year or two before beginning to transition into the estuary, and by ages 3-5 join the coastal migratory stock. Adults and sub-adults can range extensively along the coast, commonly comprising mixed stocks in both estuarine and coastal regions, though generally each natal river seems to support genetically distinct spawning populations. Relatively little is known regarding the maturity schedule and spawning frequency of Atlantic sturgeon. The limited data available suggest maturity occurs between 5 and 32 years of age with females spawning once every three years.

Atlantic sturgeon supported fisheries of varying magnitude along the Atlantic coast since before colonial times, though records of Atlantic sturgeon commercial harvest have only been kept since 1880. At that time, Atlantic sturgeon were among the top three species in weight of fish harvested commercially along the Atlantic coast, with coast-wide landings peaking in 1890 at 3,348 metric tons (mt). As the commercial fishery serially depleted natal rivers, total fishery landings began declining and collapsed coast-wide by 1901 (US Commission of Fish and Fisheries 1884-1905). Landings continued to decline and remained low relative to the historical peak through the mid-1990s. Acknowledging that restoration of the stock would not be realized without further management action, the Atlantic States Marine Fisheries Commission (ASMFC) implemented an Atlantic sturgeon Fishery Management Plan (FMP) in 1990. The FMP suggested the dramatic protracted decline in landings relative to the late 1800s was primarily caused by overfishing, although habitat loss and degradation, and impediments to spawning areas, likely also contributed to the decline. By 1996, Atlantic sturgeon fishery closures were instituted in ten states and jurisdictions along the Atlantic Coast. In 1998, ASMFC enacted a moratorium that banned harvest and possession of Atlantic sturgeon. In 2007, a Status Review Team (SRT) finalized its report on the status of U.S. Atlantic sturgeon, identifying five (Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic) distinct population segments (DPSs) with different physical, genetic, and physiological characteristics along the U.S. Atlantic coast. NOAA Fisheries published two final rules in February 2012, declaring the Gulf of Maine DPS as threatened and the remaining four DPSs as endangered; NOAA Fisheries has yet to develop a recovery plan for Atlantic sturgeon.

The purpose of the 2017 assessment was to evaluate the status of Atlantic sturgeon along the U.S. Atlantic coast. Data from a variety of fisheries-dependent and -independent sources were reviewed and used to develop bycatch, effective population size, and mortality estimates. An egg-per-recruit (EPR) model was developed as well as trend analyses and stock reduction analysis. The Review Panel accepted the suite of analyses presented in the 2017 assessment report as a body of evidence supporting *a stable to slowly increasing population of Atlantic sturgeon* following the 1998 moratorium. *The paucity of data available to develop reliable indices of abundance and the inability to distribute historical catches to specific rivers or DPSs precluded the application of traditional stock assessment methods, except at a coast-wide level.* The nature of the assessment

used (i.e., stock reduction analysis) and the nature of available data did not warrant the determination of conventional fisheries reference points.

The 2017 assessment indicates a *slight positive trend coast-wide for Atlantic sturgeon since the 1998 moratorium with variable signs of recovery by DPS*. ARIMA trend modeling suggests, at the coast-wide resolution, there is a moderate probability of Atlantic sturgeon abundance increase since the moratorium in 1998. The probability increased when binomial GLMs (Generalized Linear Models), as suggested by the Review Panel, were used to develop several fishery-independent relative abundance trends in place of the negative binomial GLMs initially posited by the SAS. The binomial GLMs were considered by the Review Panel to be appropriate because many of the fishery-independent surveys contained a low proportion of positive tows. *Results at the DPS level were more variable but in general suggest a positive increase in abundance, with notable exceptions for the Gulf of Maine and Chesapeake Bay DPSs*.

The EPR analysis was used to find the value of total mortality (*Z*) that resulted in an EPR that was 50% of the EPR at the unfished state for ages 4-21 ($Z_{50\%}$). Coast-wide $Z_{50\%}$ ranged from 0.085 to 0.094 though the paucity of life history information lends uncertainty in these values. Tagging data suggest a coast-wide estimate of Z of 0.04 (0.01-0.17). *Tagging analyses estimating Z coast-wide and at the DPS level suggest Z is currently lower than the reference Z calculated through the EPR analysis though notable exceptions existed in the north and south of the range.* It is not clear if these exceptions are due to increased tagging model uncertainty owing to low sample sizes and potential emigration, or actually reflect lower survival in these areas.

Depletion-Based Stock Reduction Analysis (DBSRA) estimated historic capacity coast-wide at a median estimate of 27,988 mt with a two-stanza (pre- and post-1950) capacity model having a median estimate for the first period of 27,724 mt and 12,777 mt post 1950. The stochastic Stock Reduction Analysis (sSRA) assessment produced a similar result for capacity as the single stanza DBSRA. *Neither method produced credible measures of current stock status though both methods predict a population increase in recent decades.* The recovery trajectories produced in both the DBSRA and sSRA assessments predict recovery rates that are more rapid than indicated by abundance indices, suggesting there may be unaccounted for sources of mortality impeding recovery or that existing survey are not adequate to capture the change in abundance.

Effective population size (N_e) estimates for 7 of 10 spawning populations distributed among the DPSs are less than the suggested minimum of $N_e = 100$ that is required to limit the loss in total fitness from in-breeding depression to <10% (Frankham et al. 2014). All N_e estimates lie below the suggested recommended minimum $N_e > 1000$ required to maintain evolutionary potential (Frankham et al. 2014).

Given historic removals and current effective population size estimates, the Atlantic sturgeon is currently depleted. The current analysis indicates that anthropogenic mortality (e.g., bycatch and ship strikes) may exceed acceptable levels, reducing recovery rates. There are indications that anthropogenic effects may be higher at the DPS level.

The following Review Report evaluates the data and approaches used to assess Atlantic sturgeon; gives recommendations on suitability of model inputs and model outputs, and provides recommendations for future research and data collection.

Terms of Reference (addressed individually by number)

1. **Evaluate appropriateness of population structure(s) defined in the assessment**

Overall, the stock assessment sub-committee (SAS) provides evidence supporting the idea that Atlantic sturgeon along the Atlantic coast of the U.S. exhibit a complex meta-population structure. It appears there are several small, semi-discrete sub-populations connected through migration. Evidence for this view of stock structure primarily stems from:

- Molecular analyses collected from river-resident juveniles (<500 mm TL) and adult (>1500 mm TL) Atlantic sturgeon used in the development and/or refinement of a genetic stock structure baseline
    - Genetic designations of DPSs are sound. The general delineations first suggested by the SRT in 2007 seem to accurately describe the geographic groups of Atlantic sturgeon encountered along the U.S. Atlantic coast, although sample size for the Carolinas DPS is particularly small
    - Cluster analysis of relative abundance trends in individual surveys support the current DPS stock structure
- Evidence of new spawning tributaries throughout the species range
- Identification of separate spring and fall spawning migrations in some tributaries of the Chesapeake Bay, Carolina, and South Atlantic DPSs via acoustic tagging and genetic analyses

The Review Panel concurs that the new research at a broad scale seems to support the meta-population construct implemented through NMFS' DPS classification, though they caution that refinements of this construct are likely necessary to better define spawning tributary membership within DPS units, particularly for the Carolina and South Atlantic units, in the coming years.

Despite the evidence of a meta-population structure along the Atlantic coast, several practical considerations present challenges to assessment of Atlantic sturgeon at the DPS or river level at this time. Chief amongst these are:

- A latitudinal gradient in life history parameters is expected but there are insufficient Atlantic sturgeon life history data to clearly define structure; therefore, assessments of the smaller DPS units are not tractable/feasible
- The current DPS level does not address life history characteristics specific to discrete river populations or groups of rivers
- Identification of new or more wide-spread spawning behaviors needs to be researched, including potential higher incidences of straying and the identification of fall spawning runs in some systems
- The lack of coordination between U.S. and Canadian Atlantic sturgeon assessment and research impedes our understanding of interactions between Canadian and U.S. populations and the effects of human activities on their status.
    - Significant mixing occurs between U.S. and Canadian origin Atlantic sturgeon

- Because affected animals are rarely genotyped, it is not possible to partition bycatch, ship strike, and/or other anthropogenic sources of mortality to individual DPSs

Given the data constraints, which increase the uncertainty at the DPS level, the Review Panel concurred with the SAS in their recommendation to focus on assessing trends and Z at a coast-wide level. Data paucity suggests conventional stock assessment analyses at the DPS level are not appropriate and coast-wide analyses are more appropriate, especially if the goal is to develop traditional stock assessment reference points. That said, there is concern that coast-wide evaluation may increase uncertainty due to variability in local indices.

2. **Evaluate the adequacy, appropriateness, application of the data used, and the justification for inclusion or elimination of available data sources. Evaluate the methods used to calculate indices, other statistics, and associated measures of dispersion.**

Overall, the SAS produced a very thorough collection and evaluation of all available Atlantic sturgeon data. When afforded the opportunity, the SAS made conservative decisions on how to use, or not use, the available data. This was particularly true concerning decisions of when and where to use potential relative abundance indices. The SAS wanted to ensure relative abundance time series were of sufficient length to capture potential changes in abundance given the maximum age of Atlantic sturgeon and avoid including information from surveys where the probability of Atlantic sturgeon encounter was exceptionally low. The final subset of data used emphasizes the data poor situation of Atlantic sturgeon relative to many other U.S. managed marine and riverine resources. Specifically, there is a lack of data for the South Atlantic fish, adult fish are not adequately represented in most data sets, and the age structure is not sufficiently documented for any DPS. These data deficiencies do not allow for an update or extensive use of life history characteristics or monitoring for changes in stock composition with time.

Fishery Removals
The only source of information concerning fishery removals of Atlantic sturgeon presented was a historical commercial landings time series spanning 1880-1997. Since the moratorium, there have been no directed US fisheries targeting Atlantic sturgeon and hence no estimates of fishery removals. Several potential sources of bias that can result in uncertainty in annual fishery removals were identified by the SAS and confirmed by the Review Panel, including but not limited to:

- Incomplete catch history
  - Landings for Atlantic sturgeon began prior to the start of the commercial landings data series
- Annual landings estimates are influenced by under/over reporting or inappropriate survey methods
  - Highly uncertain due to poor spatial and temporal coverage, particularly in the earliest years of the time series, and inconsistent reporting
- Lack of information on the sizes of Atlantic sturgeon harvested
  - No size information means the removals series can only be used to provide a biomass benchmark

To account for uncertainty in the historical fishery removals in the DBSRA and sSRA analyses, the SAS allowed for changes in uncertainty regarding the removals time series by varying the assumed lognormal CV through time. To account for the possibility that Atlantic sturgeon were not at carrying capacity when the removals series began, sensitivity analyses of the DBSRA allowed for varying ratios of initial year biomass relative to carrying capacity. While the Review Panel commends the SAS for incorporating this uncertainty into analyses, the possibility that the removal series for much or all of the time series was biased low (i.e., actual landings greater than reported landings) was not fully accounted for during sensitivity analyses or uncertainty estimation. Researchers should evaluate the potential effect of such bias in the future.

Finally, the SAS and Review Panel agree the removals time series is hampered by an inability to separate the historical fishery removals by DPS. The inability to separate removals by DPS or at other spatial scales will in the future limit the opportunity to conduct traditional stock assessments on Atlantic sturgeon at a spatial resolution finer than the U.S. Atlantic Coast.

Indices of Relative Abundance

The SAS' choice of indices was objective and well done. They established a set of criteria used for evaluating data sets and developing indices of relative abundance for Atlantic sturgeon. The SAS used thorough consultation with data collectors to understand methods, changes in methods over time, and how best to use data in analyses. There were, however, very few surveys specifically designed to catch Atlantic sturgeon, causing the exclusion of many canvassed surveys, due to low encounter rates.

Though the Review Panel generally endorsed the SAS' treatment of relative abundance indices in the assessment, the Panel made two suggestions relative to the description of indices in the assessment report.

- Survey descriptions were absent/insufficient and index standardization descriptions were brief. The Review Panel had to request clarifying information during the Review Workshop, particularly concerning size frequency of Atlantic sturgeon encountered, annual number of deployments, annual number of positive deployments, and annual number of Atlantic sturgeon captured by each survey. Such information is vital to understanding which segments of the population each survey captured and to evaluate the general utility of each survey as a measure of population relative abundance. While representatives of the SAS were able to produce all requested information during the Review Workshop, much of this information should have been included in the initial assessment report.
- The utility of Table 9 in the assessment report could have been expanded if more information was included. Examples of information that would have been valuable for inclusion in the survey summary table include:
    - Quantitative descriptions of size of Atlantic sturgeon encountered
        - Review Panel could not easily discern what segments of the population each survey was capturing. This was exasperated by inconsistency and/or ambiguity in the definitions of sizes represented by the terms YOY, small juveniles, large juveniles, and adults in parts of the assessment report
    - General location (i.e., DPS)

- Type of waters targeted (e.g., riverine, estuarine, coastal)
- Survey gear
- Survey design (e.g., fixed station or stratified random)
- Standardization error distribution (e.g., Poisson, negative binomial, etc.)
- Standardization covariates included in final model
- Average number of fish caught and average proportion of survey gear deployments positive for Atlantic sturgeon annually

The Review Panel raised similar concerns regarding the description of the bycatch data sets used during the assessment (see below).

Beyond general assessment report structure, the Review Panel did note several additional concerns and made recommendations regarding the treatment of relative abundance indices in the assessment:

- Many surveys appear DPS-specific given the survey location and age range encountered. However, it is unclear what proportion of DPSs are actually encountered in mixed DPS surveys, requiring concurrent genetic sampling.
- Three potential relative abundance indices (New York State Department of Environmental Conservation Juvenile Atlantic Sturgeon Abundance Monitoring Program (NY JASAMP), Northeast Area Monitoring and Assessment Program Trawl Survey (NEAMAP), South Carolina Edisto River Sturgeon Monitoring Project Survey (SC Edisto)) were excluded from consideration by the SAS in trend analyses due to insufficient duration (years). *The Review Panel recommended using the NY JASAMP, NEAMAP, and the SC Edisto relative abundance indices in trend analyses even though the time series are shorter than the pre-determined 15 years*. The 10-12 year durations and frequent catches of primarily juvenile Atlantic sturgeon in these surveys are informative and should be emphasized.
- Of the nine indices recommended for use by the SAS, the *Review Panel recommended development of abundance indices using a binomial error structure on a subset of six*:
    - Maine-New Hampshire Inshore Groundfish Trawl Survey (ME-NH)
    - Connecticut Long Island Sound Trawl Survey (CT LIST)
    - New Jersey Ocean Trawl Survey (NJ OT)
    - NEAMAP
    - Virginia Institute of Marine Science Shad and River Herring Monitoring Survey (VIMS Shad)
    - US Fish and Wildlife Cooperative Tagging Cruise (US CoOp).
- *The Review Panel recommended the six newly standardized indices be used in subsequent trend analyses and in the development of the coast-wide Conn index*. Given the infrequency of encounters, there was concern about the selection of error structure underlying the GLMs used in the generation of abundance trends for the six surveys. The Review Panel agrees the underlying error structure is likely negative binomial, or possibly zero inflated negative binomial, and under these assumptions, the assessment team effectively assessed the suitability of model structure given the metrics of dispersion calculated. However, the sparse nature of the positive encounters each year resulted in high error around the underlying relative abundance trend created. The ability to resolve the underlying error

distributions fully, given the quantity of data available, is a primary consideration for the choice of error distribution during index standardization, as the uncertainty around resulting year effects can reduce the utility of subsequent analyses.

- The cluster and dynamic factor analyses provided by the SAS were useful when determining how abundance trends of individual indices related to DPSs. The Review Panel notes this work could be further refined to address the suitability of indices to track sub-components of the Atlantic sturgeon population. Future work should explore how the refined treatment of indices recommended by the Review Panel would affect the outcome of these analyses.
- The Review Panel has some concerns regarding the suitability of the Conn method to develop an overall coast-wide relative abundance estimate. While the analysis provided in the Conn paper indicates that, on average, little bias is created when incorporating indices representing different proportions of the population, it is unclear under which conditions the method produces biased results. Further, the lack of data from the South Atlantic biases the overall abundance trend toward northern units. For now, however, the Conn analysis is the best estimate available for a coast-wide trend estimation.
- The Review Panel will defer to the judgement of the SAS and Atlantic sturgeon Technical Committee regarding whether the three indices the Review Panel recommended to be used in the trend analyses (noted above) are also included in a newly developed Conn index. The decision should be made after consultation with personnel from the NY JASAMP, NEAMAP and SC Edisto surveys. Personnel from the surveys should be made aware of the changes requested by the Review Panel with regards to treatment of their respective index.

3. Evaluate the estimates of Atlantic sturgeon bycatch and methods used to develop them

Bycatch information is limited for Atlantic sturgeon due to low observer coverage in ocean fisheries and a paucity of information on bycatch in many inshore, estuarine, and river fisheries. Bycatch data that were available to this assessment derive from three primary sources:

- Northeast Fishery Observer Program (NEFOP) and the Northeast Fishery At-Sea Monitoring (NEASM) Program,
- North Carolina Gill-Net Fisheries, and
- South Carolina American Shad Gill-Net Fishery

For both the NEFOP/NEASM and North Carolina Gill-Net Fisheries data sets, the SAS developed a GLM framework to estimate Atlantic sturgeon discards in federal waters that were represented by the these data sets. The Review Panel agreed with the SAS that the three data sources posited are sufficient to characterize and quantify bycatch of juvenile Atlantic sturgeon in those fisheries, but the data should not be used as a time series of relative abundance due to inconsistencies in sampling, responses by industry to regulatory changes, and uncertainty about the DPS composition of observed catches.

The SAS considered other fishery-dependent data sources for inclusion in Atlantic sturgeon bycatch estimates but these were ultimately eliminated due to short time series, low catch rate or reporting, or limited access to the fishery after the listing.

The Review Panel agrees with the SAS that bycatch mortality is likely underestimated for Atlantic sturgeon. Reasons for this determination include:

- Current bycatch estimates are derived from only a subset of fisheries potentially interacting with Atlantic sturgeon
- identification of effective effort on unobserved trips is difficult, making expansion of observed bycatch to coast-wide bycatch estimates difficult
- current bycatch mortality estimates do not account for potential delayed mortality of Atlantic sturgeon
- bycatch estimates are affected by underreporting or inappropriate survey methods, and
- the time series of bycatch is probably incomplete, with the earliest estimates acquired in 2000, though presumably bycatch of Atlantic sturgeon began prior to this time.

The primary use of bycatch data in the current assessment was in the DBSRA and sSRA, which require a complete removals time series. As such, bycatch estimates from the NEFOP (2000-2015) and North Carolina inshore gill-net monitoring program (2004-2015) were added to the commercial removals series. To account for uncertainty in bycatch estimates in the DBSRA and sSRA analyses, the SAS allowed for uncertainty regarding bycatch estimates by assuming a lognormal CV of 0.2 since 1996. While the Review Panel commends the SAS for incorporating uncertainty into analyses, the sensitivity analyses and uncertainty estimation did not fully account for the possibility that bycatch estimates were biased low (i.e., actual bycatch deaths greater than estimated bycatch deaths). Researchers should evaluate the potential effect of such bias.

Other specific comments/recommendations made by the Review Panel with regards to bycatch of Atlantic sturgeon are:

- Provide a summary table of the bycatch data used that includes size classes and modes, duration of survey, survey gear types, etc.
- Bycatch estimation may need to include additional fisheries in order to increase geographic scope, particularly in the Gulf of Maine, and in estuarine or riverine areas where DPS-specific bycatch may occur.
- DPS composition of bycatch is needed if assessment/management is to be at the DPS level.
    - Inability to separate bycatch by DPS or at other spatial scales will limit the opportunity to conduct stock assessments on Atlantic sturgeon at this finer spatial resolution into the future
- Bycatch mortality is poorly understood and needs further study. Specifically, bycatch in unmonitored fisheries that encounter sturgeon should be assessed, and delayed mortality has not been evaluated (see Beardsall et al. 2013 for estimates of trawl bycatch mortality rates).

4. **Evaluate the methods and models used to estimate population parameters (e.g., *F, Z,* biomass, abundance) and biological reference points, including but not limited to:**
    a. **Evaluate the choice and justification of the preferred model(s) or method(s) of calculation (i.e., was the most appropriate model or method chosen given available data and life history of the species?)**

The suite of models available for consideration during the assessment were limited compared to other more traditional stock assessments due to the inability to conduct age-based analyses. The current age data available are insufficient. Given the limitations, the Panel agrees with the SAS's decision to 1) evaluate total mortality estimates from the acoustic tagging model relative to EPR based reference points as a means to assess current total mortality rates, and 2) use the ARIMA models to evaluate recent trends in abundance.

Acoustic Tagging Model Review Panel Findings

- As sample size and the length of time series increases, the confidence intervals around Z estimates for juveniles and adults at both the coast-wide and DPS level will improve. However, there was discussion related to the categorization of adults and juveniles. There was concern, given the size distribution of tagged individuals, that spawning adults were underrepresented.
- The posterior distributions of the tagging models were informative and should always be shown. In cases where the posterior clearly indicates skewed distributions, a better measure of central tendency will be the median or posterior mode. The Review Panel recommended use of the median Z estimates in the current assessment.

ARIMA Model

- The Review Panel concurred with the SAS that the ARIMA model is most suitable for trend analysis because ARIMA accounts for autocorrelation and provides a mechanism for probabilistic determination of the likelihood of increase
- Preliminary assessment of the relative abundance trends using a power analysis is useful to determine the utility of the indices to detect population trends. In the future, a power analysis method that accounts for autocorrelation in the data would be more suitable.

b. If multiple models were considered, evaluate the analysts' explanation of any differences in results

The SAS provided results from a number of assessment methods, including effective population size (N_e), Mann-Kendall trends analysis, index power analysis, index cluster analysis, index dynamic factor analysis (DFA), population viability analysis (MARSS PVA and Dennis Model), conventional tagging model, stock reduction analysis (DBSRA and sSRA), and egg per recruit (EPR). The Review Panel commends the SAS for considering all of the different model structures during the assessment process, which confirms the main limitation to the assessment was available data. Many of the analyses contributed to the weight of evidence suggesting stable to slightly increasing trends in relative abundance since the 1998 moratorium. Below are specific comments and recommendations made by the Review Panel regarding each method:

Effective Population Size (N_e)

- N_e is useful for defining abundance levels where populations are at risk of loss of genetic fitness. For Atlantic sturgeon there are indications that some stocks are at risk for inbreeding depression ($N_e < 100$) and all may be at risk of loss of evolutionary potential ($N_e < 1000$). These results reinforce that at both the coast-wide and DPS level Atlantic sturgeon are depleted.

- N_e estimates, at either the coast-wide or finer spatial scales, could be a consideration during development of recovery targets for Atlantic sturgeon. While we have general recommendations on N_e that put the stock at risk for inbreeding depression or loss of evolutionary potential (Frankham et al. 2014), a better understanding of the meta-population structure of Atlantic sturgeon along the coast is needed before the most appropriate scale for measuring N_e can be determined.

Mann-Kendall Trends Analysis

- Given the large variance in the standardized relative abundance indices, the Mann-Kendall trends analysis indicates a very low probability of detecting a trend in population abundance. Unless the variance around the standardized indices can be reduced through the removal of observation error, the Mann-Kendall trends analysis on the individual standardized abundance indices is unlikely to produce informative results until the available time series are much longer.
- Mann-Kendall was informative, however, when applied to results of the ARIMA analyses on both individual indices and the Conn index as it allowed for probabilistic assessments of increases in relative abundance trends relative to reference levels.

Dynamic Factor and Cluster Analyses

- Given data limitations, the DFA was not very informative. Results may be an indication of high noise to signal ratios in the input data or may reflect that there is really only a single coast-wide trend in relative abundance.
- The DFA may be more informative in the future to identify indices that are representative of specific DPSs.
- Cluster analysis was more useful for supporting stock structure. For trends, it may give indication of where river stocks are diverging (i.e., helps define which indices to use within each cluster).

Population Viability Analysis

- Discontinue use of the Dennis method because it does not include observation error, which is clearly a component of the abundance indices.
- The MARSS PVA provides insights and should be explored further, although the analysis is premature without better input data. PVA provides an estimate of population growth rate that could be used in future assessments and/or as a recovery plan target reference point. In the future, the combination of census information and effective population size could be incorporated into PVAs to evaluate extinction risk.

Conventional Tagging Model

- The decision not to use the conventional tagging data for the development of mortality estimates should be reconsidered if there is a standardization of methods and data archiving in the future. A particularly fruitful avenue may be to explore the use of PIT tags, coupled with genetic data, to track migration movements and DPS specific mortality rates.

Stock Reduction Analysis

- The use of stock reduction analysis (both DBSRA and sSRA) was an attempt to use a more traditional data poor stock assessment technique with the available Atlantic sturgeon data. Both the DBSRA and the sSRA predicted an uptick in abundance since the moratorium, though the Review Panel is not confident in the magnitude of the signal. There is a lack of congruence between relatively higher recent population increases predicted by the SRA

models and the suggested increase in relative abundance from the observational indices. This suggests there are additional population losses (i.e., mortality) not accounted for in the recent catch, or a time delay that has not been fully accounted for. Although the models were not useful for the development of credible measures of current stock status, both gave an indication of the historic capacity of the coast-wide stock. Specific concerns:
  - The SAS did not specify if the assumed 5-20% current depletion level was relative to the first or second stage estimated carrying capacity in the two-stage DBSRA model. Sensitivity of the DBSRA to this assumption should be investigated in the future.
  - In the future, as data quality improves, add a retrospective analysis to stock reduction analysis models.
  - One of the challenges with the sSRA model is that the catch removal time series is taken to be deterministic and uncertainty in historic removals is not accounted for. As a result, the parameter space had to be constrained to produce trajectories that fit the relative abundance time series used. Given the uncertainty in historic and current removals from the population it may be necessary to more fully capture the uncertainty in removals in future sSRA assessment to avoid overly constraining the parameter space.
  - For both DBSRA and sSRA the current model does not carry forward uncertainty in life history characteristics fully.

Eggs per Recruit

- The Review Panel expressed concern about the robustness of EPR analyses and reliance of management on the point estimates of $Z_{50\%}$, due to two primary sources of uncertainty in the EPR analysis. The Review Panel nonetheless agrees with the primary outcome of the EPR analysis that Atlantic sturgeon are highly sensitive to human-induced mortality.
  - Life history inputs – the current analysis is based on stale, uncertain life history information that primarily derives from a single DPS (New York Bight), with some additional data from the Carolina DPS. Available, albeit limited, information indicates the biological traits of Atlantic sturgeon, notably growth rates and spawning behavior, vary considerably among rivers and among DPSs with latitude. The EPR model results, as reported by the SAS, are deterministic and do not account for variability in input life history parameters.
  - Bycatch and ship strike selectivity – For bycatch selectivity, the SAS attempted to derive a logistic selectivity curve based on empirical size frequency data. The resulting curve suggested a slowly increasing pattern of bycatch selectivity until it reached full selectivity at around 20+ yrs of age. For both, as is the case with the life history parameters, the EPR model is deterministic without allowing for uncertainty in selectivity patterns.
- At the coast-wide scale, the SAS' initial parameterization of the EPR model suggested a median estimate of $Z_{50\%}$ for ages 4-21 of 0.089 (see Table 46). The Review Panel requested limited exploration regarding the impact that different assumptions about age-at-maturity (earlier age-at-maturity) and/or bycatch selectivity (dome-shaped and increased selectivity at younger ages) had on final coast-wide $Z_{50\%}$ estimates for ages 4-21. The investigation suggests there is substantial uncertainty in the $Z_{50\%}$ (i.e., $Z_{50\%}$ estimates ranged from 0.086-0.107 or -3.4% to +20.2% relative to 0.089). Accounting for the full uncertainty in input

parameters to the EPR model would likely suggest an even broader range of plausible $Z_{50\%}$ estimates, making exact specification of a threshold/target $Z_{50\%}$ to use as a biological reference point difficult.

- Justification is needed for the choice of $Z_{50\%}$ as the threshold/target EPR level. Literature suggests that EPR levels ranging from 10-60% may be needed to avoid recruitment overfishing in other species. Exploration of how sensitive the $Z_{xx\%}$ level is to different assumed threshold/target EPR levels is needed. The choice of the most appropriate $Z_{xx\%}$ threshold/target for Atlantic sturgeon will likely require additional research.
- The Review Panel recommends a probabilistic approach to defining EPR % levels, where a range of likely threshold values can be compared to a range of estimated mortality rates from tagging data. While more complex than a point-based management target, expressing the threshold and assessment results in probabilistic terms will better illustrate our understanding of stock status. Then, risk tolerance levels can be established to determine appropriate reference levels. Given the uncertainty in life history characteristics, the Z threshold could be chosen based on a specific quantile of the resulting EPR distribution (e.g., 20%) in relation to the desired EPR level (e.g., 50%).
- The Review Panel was satisfied with the assessment's exploration of sensitivity of EPR to bycatch selectivity, including additional work performed during the review.

c. If appropriate, evaluate model parameterization and specification (e.g., choice of CVs, effective sample sizes, likelihood weighting schemes, calculation/specification of *M*, stock-recruitment relationship, choice of time-varying parameters, plus group treatment)

In this section, only those parameters and specifications not already addressed above will be considered.

The Review Panel would like to re-emphasize that the life history data used in the EPR and sSRA analyses were based on older data from a limited geographic range. The representativeness of life history parameter estimates to the contemporary Atlantic sturgeon population, individual DPSs, or the general life history of the coast-wide population is currently a significant source of uncertainty. A primary recommendation of the Review Panel is to collect contemporary life history information from all segments of the population such that one can better categorize DPS and coast-wide life history parameters related to growth, size/age-at-maturity, annual fecundity, spawning frequency, etc. Until such information is available, it will be nearly impossible to fully characterize the uncertainty in the EPR Z reference point that the SAS posits (and the Review Panel in general supports) to use as the means to compare contemporary total mortality to sustainable rates.

A stock-recruitment relationship was not estimated, nor were reference points calculated from such an estimate. At this time, the current lack of credible juvenile and adult abundance indices for Atlantic sturgeon prohibits reliable estimation of a stock-recruitment curve.

The Review Panel agrees the selected point estimate of natural mortality (M) is reasonable but uncertainty in the value was not carried through in the assessment. Uncertainty in M will affect the results of the EPR and hence our understanding of how current Z compares to the EPR reference point Z. Further, uncertainty in M was not accounted for in the stock reduction analyses.

The coefficient of variation for the removals series used in stock reduction analyses were rough estimates that potentially under represent uncertainty in the data used. Such uncertainty could be more fully incorporated into the stock reduction analyses.

d. Evaluate the diagnostic analyses performed, including but not limited to:
   i. Sensitivity analyses to determine stability of estimates and potential consequences of major model assumptions
   ii. Retrospective analysis

Index Standardization
The SAS performed a fairly exhaustive evaluation of potential candidate models for the GLM standardization of abundance trends. Model selection was based on Akaike's Information Criterion (AIC). Given the nature of the available data, AIC is likely an appropriate method for model selection, though use of AIC as an information criterion for model selection can lead to selection of over-parameterized models with large sample sizes. While an over-parameterized model will provide a better fit to the observed data, it can lead to higher uncertainty in the relative abundance trends. There was no indication in the data of strong spatial or temporal interactions amongst covariates, suggesting that year effects extracted and used as measures of relative abundance were appropriate.

There is concern within the Review Panel that the number of positive tows was limited in a number of the data sets used to develop relative abundance indices. Future work should explore how sensitive the error around the extracted year effects are to the number of positive tows each year. To alleviate this concern partially for the assessment, the Review Panel recommend the use of a binomial error distribution for several of the posited relative abundance indices investigated via Trends Analyses and used for the combined Conn coast-wide index.

The application of a Power Analysis to the final relative abundance trends from each index was extremely informative and should be a regular part of future analyses. The ability to assess the probability of detecting a trend in the population when a given index is utilized provides an objective way to assess the apparent information content contained in each index, given the uncertainty in its predicted year effects.

Effective Population Size
No diagnostic/sensitivity analyses were performed on the results of the N_e analysis. The Review Panel did note the values of N_e reported in the document reinforced the overall portrayal of the US Atlantic sturgeon population as depleted to a concerning extent at both the coast-wide and individual DPS levels. Future diagnostic work should be completed to help infer the robustness of these conclusions.

Bycatch Estimation
The SAS performed a thorough evaluation of potential candidate models for the GLM standardization and estimation of bycatch estimates from the northeast trawl and gill net fisheries and the NC gill net fishery. Model selection was based on AIC, with interactions amongst potential covariates being allowed in the final model. As was the case with the use of AIC for model selection for the relative abundance indices, and given the nature of available data, AIC is likely an appropriate method for model selection, though use of AIC as an information criterion for model selection can lead to selection of over-parameterized models with large sample sizes.

ARIMA Analysis
The retrospective analysis provided for the ARIMA analysis was appropriate and revealed some sensitivity of the results to the length of abundance index used. This was particularly apparent for time series that contained rapid changes at the start and end of the time series.

Acoustic Tagging Model Total Mortality Estimates
Limited information was provided to the Review Panel by the SAS regarding how sensitive estimates of annual mortality from the tagging model are to different model assumptions beyond a sentence stating, “a variety of modeling scenarios were evaluated with different temporal and DPS varying estimates of both survival and detection probability” with the “best model for each size group…selected using DIC.” If the acoustic tagging model is to remain a primary source of information concerning contemporary mortality rates relative to reference mortalities, more diagnostics regarding the candidate models should be provided in future assessments. However, at this time there is not sufficient concern within the Review Panel to invalidate the use of the acoustic tagging model as an estimate of current Atlantic sturgeon total mortality.

Stock Reduction Analyses
The Review Panel felt the sensitivity analyses conducted around the sSRA and DBSRA models were limited and could be improved in future assessments to include uncertainty in parameter inputs. However, these analyses were not used in the final assessment of current stock status.

Egg Per Recruit Calculation
Limited sensitivity analyses were provided in the assessment report for the egg per recruit analysis. Z estimates for only a single EPR reference point ($Z_{50\%}$) are provided, with no indication of how variable the estimate of Z would be if a different percentage relative to an unfished stock was chosen. Further, there was limited to no investigation presented in the report with regards to how robust Z reference points were to input assumptions. The Review Panel recommended that prior to final status determination relative to current mortality rates that the EPR model incorporate uncertainty into input parameters into the model and then develop probabilistic estimates of $Z_{50\%}$ based on the EPR model (see below).

5. **Evaluate the methods used to characterize uncertainty in estimated parameters. Ensure the implications of uncertainty in technical conclusions are clearly stated**

Mortality Status

The acoustic tagging Cormack-Jolly-Seber model estimates of current Z, the preferred method for estimating contemporary Z by both the SAS and Review Panel, appropriately incorporates uncertainty into the recent Z estimates by using a Bayesian framework. The resulting posterior distribution of Z provides the relevant uncertainty information and the Review Panel recommends these be included in the assessment report. However, given the skewed distribution of the posteriors, the Review Panel did recommend using the median of the posterior as the measure of central tendency instead of the mean of the posterior.

Full uncertainty was not incorporated into the current mortality status determinations calculated in the EPR model, as noted above. As presented the EPR model was a deterministic function of input life history parameters and selectivity curves. The Review Panel recommended that uncertainty in the life history and selectivity curves be fully incorporated into the EPR model, such that the reference point calculation ($Z_{50\%}$) could be posited in a probabilistic framework. This, coupled with the posterior Z distributions, would allow for mortality status determinations to be assessed probabilistically (Tables 49 and 50).

Biomass/Abundance Status
ARIMA analysis, as applied in the current Atlantic sturgeon assessment, allows inference of population status relative to an index-based reference point (Helser and Hayes 1995). Specifically, the method uses a two-tiered approach for this evaluation, whereby the analyst specifies the probability of being above or below a reference point and the associated statistical level of confidence (i.e., 80%) in this specification. Therefore, the approach takes into account the uncertainty in both the value of the fitted survey index for a given year and the reference point to which the population level is compared (Helser and Hayes 1995). The result is that one can estimate the probability that a given index value is above a stated reference point. The probabilistic framework lends itself, once a risk tolerance is specified, to monitor population trends relative to an accepted reference point. Given these qualities, the Review Panel agrees the ARIMA approach is satisfactory for trend estimation.

In addition, the application of the Mann-Kendall test to the indices after being fitted using the ARIMA model allows for the probabilistic determination of monotonic trends in the time-series. The Review Panel felt this was useful in the detection of trends in the fitted indices.

6. **Evaluate recommended estimates of stock biomass, abundance (relative or absolute), mortality, and the choice of reference points from the assessment for use in management, if possible, or, if appropriate, recommend changes or specify alternative estimation methods**

Mortality Status
The contemporary Z estimates derived from the acoustic tagging Cormack-Jolly-Seber model are preferred over the $Z_{50\%}$ reference point derived from the EPR model and can be used to determine the current sustainability of Atlantic sturgeon Z. Frequent updates of current Z based on the tagging model could be used to monitor for changes in total mortality at both the coast-wide and individual DPS level. This likely provides a better measure of the impact of anthropogenic mortality

on recovery of the Atlantic sturgeon population than directly monitoring the occurrence of bycatch mortality, ship strike mortality, or other sources of anthropogenic mortality given current data limitations. Without significant investment in collection of basic life history information, expansion of Atlantic sturgeon monitoring efforts, etc., the utility of the more traditional stock assessment methodologies for monitoring mortality rates relative to reference points may not be feasible.

The utility of the tagging model Z estimates is expected to increase as the uncertainty in Z estimates is reduced due to more Atlantic sturgeon being acoustically tagged and fish previously tagged having longer detection histories. However, for these methods to be viable in the long term, there must be a sustained effort to tag additional Atlantic sturgeon coast-wide and maintain/expand current acoustic receiver arrays. This will require continued significant financial resources by funding agencies.

The Review Panel has the following primary concerns regarding the proposed status assessment using tagging estimates of Z with $Z_{50\%}$ as a reference point:

- Choice of $Z_{50\%}$ as an appropriate reference point is not adequately justified
- Current Z, relative to the $Z_{50\%}$ reference point, is not presented in a probabilistic framework
- Uncertainty in the robustness of the EPR analyses exists due to uncertainty in input life history parameters and assumed selectivity curves is not expressed, and
- There is significant heterogeneity in the geographic representation of the acoustic tag data.

Future research addressing these concerns is likely to help inform potential mortality rate recovery targets in the future. The ultimate choice of EPR reference point and mortality status determination would benefit greatly from the specification of risk tolerance by managers.

Biomass/Abundance Status

The Review Panel agrees with the SAS that the best metric of biomass/abundance status currently available for Atlantic sturgeon derives from the results of the ARIMA analysis with respect to defined index based reference points. Uncertainty still exists as to the most appropriate index based reference point to use as a measure of current stock status. The current use of the 25th percentile of the ARIMA fitted index and comparison relative to the index value in 1998 (or index start year) are reasonable starting points, but alternative index reference point values could be chosen. E.g., pooling of 5-year periods at the beginning and end of time series as a more robust approach to measuring overall stock health. The Review Panel suggests the ultimate choice of appropriate index based reference points should be informed by management goals and/or recovery targets.

The Review Panel also finds more emphasis could be placed on the use of effective population size measures as an indication of abundance relative to levels that put the stock at risk for inbreeding depression or loss of genetic diversity. The Review Panel does not advocate using N_e as a reference point, but it could be considered as a recovery target.

The Review Panel agreed with the SAS that at this time one should not use the results of the stock reduction analyses as a measure of biomass/abundance status. Both the DBSRA and sSRA are predicting upward biomass trends in the terminal year that are not matched by the observed trends in any of the relative abundance indices. The Review Panel does not express confidence in this signal, and the mismatch between the increases suggested by the stock reduction analyses and relative abundance trends are suggestive of additional population losses in the recent period that are not captured in the removals series. Given the uncertainty in recent bycatch estimates and the acknowledgement that current bycatch estimates are likely underestimates, the results are not surprising. The main utility of the stock reduction analyses is to inform historical carrying capacity for the system.

Finally, the Review Panel supports the continued evaluation of the MARSS PVA as a means to evaluate percent change in the population over time. At this point, the analysis is not considered to be sufficiently robust owing to the poor quality of the input data. In future assessments, with data improvements, it could be used as a measure of population growth rate and in a recovery plan target reference point. In the future, the combination of census information and N_e could be incorporated into PVAs to evaluate extinction risk.

7. **Evaluate stock status determination from the assessment, or, if appropriate, recommend changes or specify alternative methods/measures**

The Review Panel agrees with the overall assessment that Atlantic sturgeon abundances are likely increasing slowly. The Panel also recognizes the difficulties posed by the paucity of information and lack of DPS-specific recovery targets for status determination. Clearly, Atlantic sturgeon remain depleted relative to historical levels. The Panel recommends additional research to identify appropriate reference points for future status determinations and recovery targets.

The Panel was concerned about the apparent certainty in the coast-wide and DPS status determination table by the use of fixed thresholds, rather than probabilistic outputs. Because status and recovery targets have not been specified, and data uncertainty creates wide distributions of model results, the Panel recommends that the metrics used in status determination be presented as probabilities (Tables 1 and 2).

The Review Panel discourages reliance on traditional stock assessment models for the assessment of Atlantic sturgeon relative to mortality and biomass benchmarks at this time. Data limitations are likely to limit the utility of traditional methods in the near future. Further, until routine age data are collected from encountered Atlantic sturgeon, it will remain impossible to define a recovery target based upon an expansion of the population age structure.

Table 1: (Revised from Assessment Report Table 49) Estimates of Z from tagging relative to $Z_{50\%EPR}$ at the coast-wide and DPS-level. Estimates of Z are for all tagged fish from each region/DPS, and $Z_{50\%EPR}$ values are N-weighted values for ages 4-21.

Region	**Z (95% credible interval)**	**$Z_{50\%EPR}$ (95% CIs)**	**$P(Z)>Z_{50\%EPR}$ 50%**	**$P(Z)>Z_{50\%EPR}$ 80%**	**$P(Z)>Z_{50\%EPR}$ 90%**
Coast	0.04 (0.01 - 0.17)	0.12 (0.10-0.15)	7.2%	6.5%	6.1%
Gulf of Maine	0.30 (0.01 - 1.90)		75.4%	73.5%	72.5%

New York Bight	0.09 (0.01 - 0.34)		34.6%	31.2%	29.4%
Chesapeake Bay	0.13 (0.01 - 0.78)		33.6%	30.0%	28.0%
Carolina	0.25 (0.01 - 0.94)		78.2%	75.4%	73.9%
South Atlantic	0.15 (0.01 - 0.62)		43.9%	40.2%	38.1%

Table 2: (Revised from Assessment Report Table 50) Stock status determination for the coast-wide stock and DPSs based on morality estimates and biomass/abundance status relative to historic levels and the terminal year of indices relative to the start of the moratorium as determined by the ARIMA analysis. Refer to section 7.2 for a more thorough discussion of stock status in each DPS which includes this quantitative evaluation as well as qualitative evidence.

	Mortality Status	**Biomass/Abundance Status**	
Population	**$P(Z)>Z_{50\%EPR}$ 80%**	**Relative to Historical Levels**	**Average probability of terminal year of indices > median 1998 value**
Coast-wide	6.5%	Depleted	0.95
Gulf of Maine	73.5%	Depleted	0.51
New York Bight	31.2%	Depleted	0.75
Chesapeake Bay	30.0%	Depleted	0.36
Carolina	75.4%	Depleted	0.67
South Atlantic	40.2%	Depleted	Unknown (no suitable indices)

8. **Review the research, data collection, and assessment methodology recommendations and make any additional recommendations warranted. Clearly prioritize the activities needed to inform and maintain the current assessment, and provide recommendations to improve the reliability of future assessments**

In general, the Review Panel agrees with the research recommendations and priorities developed by the Atlantic sturgeon Technical Committee (see Assessment Report, Section 8, pp. 107-109). Currently there are severe data limitations restricting the type, scope, and usefulness of assessment methodologies that can be applied to Atlantic sturgeon. Most importantly, there is an incomplete accounting for temporal and spatial variability in life-history parameters, an imperfect understanding of the temporal and spatial organization of reproductively discrete spawning populations, and major uncertainties in the scope for direct harm arising from interaction with ongoing human activities (e.g., bycatch, ship strikes) to the recovery of Atlantic sturgeon. To assist in identifying areas with significant data gaps, the Review Panel created a data gaps table (Table 3) based on the current Atlantic sturgeon assessment report.

The Review Panel provides the following suggested changes to existing research priorities, as well as a set of new research recommendations that are critical to advancing Atlantic sturgeon science, modeling, and future stock assessments.

Future Research
High Priority

- Develop standardized methods that can be used to create reliable indices of abundance for adults and young juveniles (Age 1) to reflect the status of individual DPSs
    - A workshop is recommended to assess the efficacy of existing ‘sturgeon surveys’ (e.g., those presently conducted in NY, SC) and new approaches
- Expand and improve the genetic stock definitions of Atlantic sturgeon, including the continued development of genetic baselines that can be applied coast-wide, within- and among-DPS’s, and at the river-specific level. Consideration of spawning season-specific data collection will be required. Particular emphasis should be placed on collecting additional information from the Gulf of Maine and Carolina DPSs (Table 3).

Moderate Priority
- Determine a permitting process to enable authorizations to sample and collect biological materials from any dead Atlantic sturgeon encountered
    - Pectoral fin spines to support age determination are considered to be of high value
    - Additional materials could include gonad tissues to support development of maturation schedules for males and females and fecundity
- Evaluate potential reference point targets and their efficacy for Atlantic sturgeon. Options include (but are not limited too):
    - number of fish in spawning runs
    - number of rivers with sturgeon presence/absence (by DPS and coast-wide)
    - frequency of catch in indices and/or observer sampling
    - evaluate rivers where you don’t have sturgeon, setting minimum bar
- Determine freshwater, estuarine, and ocean habitat use by life history stage including adult staging, spawning, small and large juvenile residency, and larvae
- Identify spawning units, using appropriate techniques (genetics, tagging, eDNA, collections of eggs or larvae, etc.), along the Atlantic coast that best characterize the meta-population structure of U.S. Atlantic sturgeon
    - Recent search efforts both in previously un-sampled rivers/tributaries and rivers thought to have lost their native populations have revealed evidence of spawning activity that results in the production of young juveniles. Such instances require particular attention to determine whether they are the result of reproduction by self-sustaining populations
- Investigate the influence of warming water temperatures on Atlantic sturgeon, including the effects on movement, spawning, and survival

Low Priority
- Evaluate incidence of and the effects of predation on Atlantic sturgeon

Data Collection
High Priority
- Establish centralized data management and data sharing protocols and policies to promote greater use of all available Atlantic sturgeon data. Priority data sets include (but are not limited to):
    - genetics/tissue samples

  - pectoral fin spines and associated age estimates
  - acoustic tagging and hydrophone metadata
  - external and PIT tag data

  Emphasis should be placed on extracting all available data in underrepresented DPSs. Concurrently, continue to support programs that provide data sharing platforms such as the Atlantic Cooperative Telemetry Network. These initiatives will benefit from the support of federal funding agencies enforcing the requirement to make data collected via federal funds part of the public record within a reasonable period of time. If not a current requirement of funded Atlantic sturgeon research, this should become a requirement.
- Implement directed monitoring of Atlantic sturgeon that is designed to support assessments both coast-wide and at the DPS level and/or expand existing regional surveys to include annual Atlantic sturgeon monitoring. Monitoring two or more reproductively discrete populations within each recognized DPS is suggested. Use of emergent technologies such as validated side scan sonar surveys and acoustic tracking may allow for more cost effective monitoring of river runs.
  - Monitoring protocols that enable data gathering for a number of species (e.g., Shortnose sturgeon) is encouraged
  - Development of adult, YOY (or Age 1), and juvenile indices are a high priority, and considerations should be made for the use of appropriate survey gears
    - Associated length and age composition information is needed so that relative abundance-at-age information can be obtained from the adult and juvenile indices
  - See Table 8 in the assessment report for a list of surveys considered by the SAS during the assessment
  - See Table 3 of this report to see current data gaps identified by the Review Panel
- Continue to collect biological data, PIT tag information, and genetic samples from Atlantic sturgeon encountered on surveys that require it (e.g., NEAMAP). Consider including this level of data collection from surveys that do not require it. Push permitting agencies to allow sampling (to the extent possible) of all encountered Atlantic sturgeon via scientific research activities.
- Maintain and support current networks of acoustic receivers and acoustic tagging programs to improve the estimates of total mortality. Expand these programs in underrepresented DPSs, using a power analysis to define direction and magnitude of expansion, as required to support next assessment.
- Collect sub-population specific (river, tributary, or DPS level) life history information (e.g., age, growth, fecundity, maturity, spawning frequency). Where feasible, emphasis should be on collecting information by sex and for reproductive information by size/age. Particular focus should be on collecting information on Atlantic sturgeon from the South Atlantic DPS given less data and suspected regional life history differences (see Table 3).
- Improve monitoring of bycatch in other fisheries, gears, and locations (notably northern and southern range). When scaling up to unobserved trips, need better data/measures of effective effort that can be reasonably expected to encounter Atlantic sturgeon. This may include collection of more detailed information on type of gear deployed, locations of deployment, etc. To assess the potential for currently missing significant sources of Atlantic

sturgeon bycatch, do a simple query of all observed fisheries to see if Atlantic sturgeon are encountered in other gears beyond gillnet and trawl (e.g., scallop dredges)
- Investigate and account for extra-jurisdictional sources of mortality. Include data on fish size, health condition, and number of fish affected.

Moderate Priority
- Collect more information on regional vessel strike occurrences, including mortality estimates. Identify hot spots for vessel strikes and develop strategies to minimize impacts on Atlantic sturgeon.
- Promote greater Canadian-US Atlantic sturgeon data sharing, cooperative research, and monitoring. Exploring interactions between Canadian and US Atlantic sturgeon may more fully explain mortality trends, particularly with regards to the Gulf of Maine DPS.

Assessment Methodology
High Priority
- Establish recovery goals and risk tolerance for Atlantic sturgeon to measure progress of and improvement in the population since the moratorium and ESA listing
- Expand the acoustic tagging model to incorporate movement
- Conduct a power analysis to determine sufficient acoustic tagging sampling sizes by DPS

Moderate Priority
- Evaluate methods of imputation to extend time series with missing values. ARIMA models were applied only to the contiguous years of surveys due to the sensitivity of model results to missing years observed during exploratory analyses.
- Explore feasibility of combining telemetry tagging and sonar/acoustics monitoring to generate abundance estimates

Table 3: Data gaps for Atlantic sturgeon as compiled by the Review Panel. ✓= data available, --- = no data available or not presented in assessment report.

DPS	Life History				Surveys/Monitoring (# of surveys ≥10 yrs)			Local (DPS-level) bycatch monitoring	# of Acoustic Tags used in Z-estimation	Genetic Samples (N_e estimation, DPS ID)
	Length-Weight	Age-Length*	Maturation	Fecundity/ Spawning Frequency	Small Juveniles	Juvenile/ Adult	Spawning Adults			
Gulf of Maine	✓	2015 (Canada)	---	---	0	1	0	---	153	113
New York Bight	✓	1998, 2000, 2005, 2016	1988	1998	3	1	0	---	657	518
Chesapeake	✓	2012	---	---	2	0	0	---	275	482
Carolinas	✓	2015	---	1982	7	1	0	✓	99	37
South Atlantic	---	2015	---	---	1	0	0	✓	147	508

*sex-specific growth information not presented in report but is available in some studies.

II. Advisory Report

1. Status of Stocks: Current and projected

Given historic removals and estimated effective population sizes, Atlantic sturgeon are currently depleted. The current analysis indicates that anthropogenic mortality (e.g., bycatch and ship strikes) may exceed acceptable levels, reducing recovery rates. There are indications that anthropogenic effects may be higher at the DPS level, though this is confounded with greater uncertainty in tagging model total mortality Z estimates.

The quality and quantity of data available to determine stock status degrades progressing from coast-wide to DPS to river level. The inability to distinguish DPS origin of historical catches and many current anthropogenic sources of mortality (e.g., bycatch in coastal fisheries) precludes the use of conventional stock assessment methods at any spatial resolution other than coast-wide. The only quantitative assessment which could produce conventional metrics of stock status was the stochastic stock reduction analysis. Results for sSRA should not be used to determine stock status given the uncertainty in historical catches, potential changes in productivity and carrying capacity, and concerns as to the suitability of the derived coast-wide index of abundance.

The 1998 assessment determined that populations of Atlantic sturgeon throughout the species range are either extirpated or at historically low abundance. The 2017 assessment, an exhaustive evaluation of available data, provides evidence that at the coast-wide scale there has been some population recovery since the moratorium in 1998. Evidence for the beginning of population recovery at the DPS level is mixed. Significant improvements in the quality of data available to assess sturgeon must be made if stock status is to be credibly determined at any spatial resolution.

Projections were not required in the terms of reference of the assessment as there were no defined reference points.

2. Stock Identification and Distribution

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is one of the largest and longest-lived anadromous fish in North America and can be found along the entire Atlantic coast from Labrador, Canada to the St. Johns River, Florida. In general, each river supports a unique spawning population. Based on the observed levels of genetic differentiation, populations are expected to be demographically independent among natal rivers. Recent work suggests separate genetically discrete spring and fall spawning runs in several systems (e.g., Edisto River in South Carolina and James River in Virginia). There is also increasing evidence of adults visiting multiple spawning tributaries during the same spawning season, suggesting a degree of straying particularly between adjacent rivers which may be indicative of a meta-population structure. Future consideration should be given to the transboundary movement of individuals into Canadian waters in the Gulf of Maine and potentially into the Gulf of St. Lawrence.

3. Management Unit

In 2007, the Status Review Team identified five distinct population segments (DPSs) with different physical, genetic, and physiological characteristics along the Atlantic coast: Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic. Currently Atlantic sturgeon are listed under the Endangered Species Act using the DPS designations. Recent genetic information indicates there is the possibility of a meta-population structure within the range as well as discrete spring and fall spawning sub-populations within some rivers. Given current information it seems reasonable to manage at the DPS level although the current data streams are insufficient to provide information at this resolution.

Additional work is needed to further define the boundary between the Carolina and South Atlantic DPSs. Work would require additional genetic baseline samples to be primarily collected from the Carolina DPS to widen geographic coverage.

4. Landings

Atlantic sturgeon are known to have been taken for food by humans for at least 3,000-4,000 years and have supported fisheries of varying magnitude along the Atlantic coast since colonial times. Records of commercial landings were initiated by the Federal government in 1880 through the US Commission of Fish and Fisheries (also known as the US Fish Commission), which collected landings data from fishers and port agents. The historical dataset represents the best available information on landings from this period though there is uncertainty in species identification and lack of temporal and geographical coverage.

Through the 1900s, data collected on sturgeon landings improved and data in the later part of the century are thought to be reasonably accurate as most states had implemented some form of dealer reporting. Several states closed their sturgeon fisheries in the mid to late 1990s, and a coast-wide moratorium was implemented in 1998, ending the directed sturgeon landings time series. Missing data in the early part of the time series used in the sSRA and DBSRA models were imputed using a loess smoother. The Review Panel felt this was an acceptable approach though there is the potential for more investigative work to be done on improving historical records.

5. Data and Assessment

The quality and quantity of data available to determine stock status degrades progressing from coast-wide to DPS to river level (Table 1). Significant improvements in the quality of data available to assess Atlantic sturgeon must be made if stock status is to be credibly determined at any spatial resolution.

Reliable life history information is required to support the assessment and status determination for Atlantic sturgeon. Basic information on sex-specific growth rates, maturation, and frequency of reproduction is old, limited to a single population, or unrepresentative of DPS units. In particular, there is a need for verification of life history traits of fish from southern DPS units.

ARIMA modeling suggests that, at the coast-wide resolution, there is a moderate probability of sturgeon abundance increase since the moratorium in 1998. The probability increased when binomial GLMs were used in place of negative binomial GLMs. Careful consideration needs to be given to the choice of GLM relative to the availability of data. In a number of instances the amount of data available each year was insufficient to clearly determine the underlying error structure. Results at the DPS level were more variable but in general suggest a positive increase in abundance, with notable exceptions for the Gulf of Maine and Chesapeake Bay. It is unclear if the exceptions are a reflection of underlying data quality for the DPSs, or actual trends in abundance.

An egg-per-recruit (EPR) analysis was used to find the value of Z resulting in an EPR that was 50% of the EPR at the unfished state for ages 4-21. Coast-wide the reference value was determined to range between 0.085 to 0.094 though there is uncertainty in the values due to the paucity of life history information. Further support for the selection of the 50% level is warranted.

Tagging data suggest a coast-wide estimate of total mortality of 0.04 (0.01-0.17). Tagging analyses estimating total mortality (Z) coast wide and at the DPS level suggest Z is lower than the reference Z calculated through the EPR analysis though notable exceptions existed in the north and south of the range. It is not clear if the exceptions are due to increased tagging model uncertainty owing to lower sample sizes and potential emigration, or actually reflect lower survival in these areas. Further work is required to determine sufficient sample sizes and model structure if mortality is to be used as a metric to assess stock status.

The uncertainty in the description of life history characteristics throughout the range of Atlantic sturgeon combined with weakly informative relative abundance indices and indiscernible historic catches makes the application of traditional stock assessment methods unproductive for assessing the current status of Atlantic sturgeon. The DBSRA and sSRA models applied coast wide did provide context for historic population abundance. Changes in carrying capacity coast wide are unknown, though it is assumed freshwater habitat has declined in quality and/or quantity. The DBSRA provided better fits when carrying capacity was allowed to change after 1950. DBSRA estimated historic capacity coast wide at a median estimate of 27,988 mt with a two-stanza (pre- and post-1950) capacity model having a median estimate for the first period of 27,724 mt and 12,777 mt post-1950. The sSRA assessment produced a similar result for capacity as the single stanza DBSRA.

Effective population size (N_e) estimates for 7 of 10 spawning populations distributed among the DPSs are less than the suggested minimum ($N_e = 100$) required to limit the loss in total fitness resulting from in-breeding depression to less than 10%. All N_e estimates lie below the suggested minimum ($N_e > 1000$) required to maintain population evolutionary potential.

6. Biological Reference Points

Suitable biological reference points must be established for Atlantic sturgeon.

7. Fishing Mortality

No fishing mortality, other than bycatch, is assumed to occur since the moratorium. Fishing mortality estimates were produced in the sSRA and DBSRA assessment but are not reliable estimates given the nature of the assessment methods and data utilized. Bycatch and ship strike mortality are included in the Z estimates from acoustic tagging (see below).

8. Recruitment

Limited information is available to determine the abundance and/or trend in young-of-the-year (YOY <500mm) recruitment throughout the range of Atlantic sturgeon. Sampling programs intercepting appreciable numbers of YOY exist in the NY, NC, and SC units (i.e., NYDEC JASAMP, SC Edisto, NC p135). Juveniles (500-1300mm) are encountered in low numbers in non-directed sampling programs throughout the distribution with poor representation in the South Atlantic unit. Currently the data are insufficient to determine abundance and recruitment trend of YOY at the DPS level and provides only weak information of the trend in juveniles.

9. Spawning Stock Biomass

The spawning stock biomass (SSB) is undocumented for all river systems due to the lack of adult abundance indices.

10. Bycatch and incidental mortality

Information on bycatch comes from the Northeast Fisheries Observer Program (NEFOP) and the Northeast Fishery At-sea Monitoring (ASM) Program, North Carolina Gillnet Fisheries, South Carolina American Shad Gillnet Fishery, and nine federal or state-conducted surveys. Generalized Linear Models were used to expand bycatch estimates using the NEFOP/ASM observer coverage on commercial fishing boats from Maine to North Carolina since 1989 (ASM began in 2010) as well as the North Carolina Gillnet Fisheries onboard observers from the fall flounder fishery. The GLMs were used to expand bycatch and bycatch mortalities over the two fisheries. Estimates of bycatch related mortality are likely underestimated as all fishery-dependent sources were not considered, as noted in the assessment report. In addition, the estimates did not account for delayed mortality. There is concern that mortality due to ship strikes may be increasing and is poorly documented.

11. Other Comments

The Review Panel acknowledges the data available to assess Atlantic sturgeon make the determination of status a highly challenging task. The Panel commends the Atlantic sturgeon Stock Assessment Subcommittee for the exemplary work they have done to try to meet the assigned terms of reference. The Panel also appreciates the responsiveness of the committee to exploring additional assessment analyses requested by the Panel.

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Atlantic States Marine Fisheries Commission

Atlantic Sturgeon 2017 Stock Assessment Report

Draft for Management Board Review

Atlantic States Marine Fisheries Commission
Vision: Sustainably Managing Atlantic Coastal Fisheries

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Atlantic Sturgeon Benchmark Stock Assessment

Prepared by the
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EXECUTIVE SUMMARY

The purpose of this assessment was to evaluate the current status of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) along the U.S. Atlantic coast. Data from a variety of fisheries-dependent and -independent sources were reviewed and used to develop bycatch, effective population size, and mortality estimates as well as perform trend analyses, stock reduction analysis, and an egg-per-recruit model.

Stock Identification and Management Unit

The Atlantic States Marine Fisheries Commission (ASMFC) has managed Atlantic sturgeon as a single stock. In 2012, as part of the Endangered Species Act listing, the National Marine Fisheries Service (NMFS) identified five Distinct Population Segments (DPS) based on genetic analysis of Atlantic sturgeon in U.S. waters: Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic. This assessment evaluated Atlantic sturgeon on a coast-wide level as well as a DPS-level when possible. Additionally, a mixed stock analysis of mid-Atlantic shelf aggregations vulnerable to fishery bycatch indicated the presence of multiple populations and DPS units, indicating that bycatch mortality has continued to occur on a coast-wide basis since ASMFC implemented a moratorium on the species.

Landings

Atlantic sturgeon are one of the largest and longest-lived anadromous fish in North America and have supported fisheries of varying magnitude since colonial times. Colonists harvested Atlantic sturgeon for export from New England and the Chesapeake Bay as early as the 1600s. Records of commercial landings were available from 1880 through the mid- to late-1990s. Available data suggest that coast-wide landings peaked in the late 1800s and declined precipitously to low levels in the early 20th Century. Based on concerns of overfishing and bycatch mortality, the ASMFC instituted a coast-wide moratorium in 1998. Landings data were not available for this assessment after the moratorium, therefore the assessment relies upon data from fisheries-independent sources and NMFS observer data.

Indices of Relative Abundance

While there are no surveys designed to directly monitor Atlantic sturgeon abundance, this assessment used nine fishery-independent surveys along the coast to develop indices of relative abundance. Three of the nine surveys were not used in modeling approaches due to their limited time series. Many of the criteria for survey selection had to be relaxed and therefore surveys developed into indices only encountered sturgeon in 1-3% of the tows and had high standard errors associated with the estimates.

Abundance and Biomass

Several trend analysis approaches were explored by the stock assessment subcommittee (SAS) to detect the presence of significant increasing or decreasing trends in the regional and coast-wide abundance indices and the ability to identify DPS-level trends in the available data sets. Approaches included a Mann-Kendall test, Autoregressive Integrated Moving Average (ARIMA) model, and power, cluster, dynamic factor, and population viability analyses. Several of these approaches indicated that there were no significant trends in the various time series with some

exceptions. Both the Mann-Kendall test and population viability analysis detected a significant upward trend in one of the abundance indices developed from North Carolina's Program 135 survey. Cluster and dynamic factor analyses indicated that DPS-level clustering in the data sets could not be detected and that there was only one trend in the abundance indices, suggesting a coast-wide rather than DPS-structured stock based on the indices. The ARIMA model indicated that when using all available years of data for all indices, the terminal year index values were all credibly above the 25th percentile of their respective time series and either had no significant trend or an increasing trend.

Coast-wide abundance or population size estimates were not available, although the SAS did estimate effective population size using genetic data. Additionally, stock reduction analysis was used to explore the population dynamics of Atlantic sturgeon. While the results from the analysis could not be used to evaluate stock status, it did indicate that the population declined rapidly at the beginning of the time series through the early 1900s to a low but stable abundance, with the population beginning to increase again from the late 1990s onwards.

Mortality Estimates

Estimates of total mortality produced from an acoustic tagging model were compared to total mortality thresholds defined as the value of total mortality, Z, that results in an egg-per-recruit (EPR) that is 50% of the EPR of an unfished stock, $Z_{50\%EPR}$, at both the coast-wide and DPS-level. The results of this comparison suggest that coast-wide total mortality ($Z_{coast\text{-}2015}$ = 0.04) is below the coast-wide threshold for total mortality ($Z_{50\%EPR,\ coast}$ = 0.09). The point estimate of Z for the New York Bight DPS ($Z_{NYB\text{-}2015}$ = 0.09) was below the northern region Z threshold ($Z_{50\%EPR,\ north}$ = 0.10). The point estimates of Z for the other DPS areas were above the region-specific Z thresholds; however, the DPS-level estimates of Z from the tagging model had wide credible intervals that included the Z threshold in all cases, so one cannot conclude with statistical certainty whether the DPS-level estimates of Z are above or below its respective thresholds.

Stock Status

Although Atlantic sturgeon received full protection as a federally Endangered Species, there remains no Recovery Plan against which to evaluate Atlantic sturgeon status at the coast-wide or DPS-level. For this assessment, stock status was assessed relative to relative abundance and total mortality on both a coast-wide and DPS basis.

All DPSs were considered depleted relative to historical levels of abundance. For population size, status determination was made qualitatively relative to the historical abundance and relative to 1998, the start of the coast-wide moratorium when more quantitative datasets were available. The 2015 (terminal year) index values of the selected fisheries-independent surveys were compared to the 25th percentile of the time series and to the index value that occurred during 1998 (year of coast-wide implementation of the Atlantic sturgeon moratorium). The terminal year values for all indices were above the 25th percentile of their respective time series. The results of the comparison of terminal year index values to the 1998 value were mixed, with some above and some below the 1998 value.

The coast-wide estimate of total mortality was below the $Z_{50\%EPR}$ threshold, suggesting current levels of mortality for the entire meta-population are sustainable. DPS-level estimates were generally above the *Z* threshold, but those estimates were highly uncertain.

		Biomass/Abundance Status	
Population	Mortality Status	Relative to Historical Levels	Terminal year of indices relative to start of Moratorium (1998)
Coast-wide	Below *Z* threshold*	Depleted	Above
Gulf of Maine DPS	*Above Z threshold (highly uncertain)*	Depleted	Below**
New York Bight DPS	*Below Z threshold (highly uncertain)*	Depleted	Above
Chesapeake Bay DPS	*Above Z threshold (highly uncertain)*	Depleted	Below
Carolina DPS	*Above Z threshold (highly uncertain)*	Depleted	Above
South Atlantic DPS	*Above Z threshold (highly uncertain)*	Depleted	Unknown (no available indices)

*: Credible interval of *Z* includes threshold
**: ME-NH trawl survey index begins in 2000

The SAS concluded that the primary threats to the recovery of Atlantic sturgeon stocks include bycatch mortality, ship strikes, and habitat loss and degradation. Several research recommendations were made to address data and modeling limitations as well as threats and barriers to recovery.

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TERMS OF REFERENCE

For the 2017 ASMFC Atlantic Sturgeon Benchmark Stock Assessment

The following Terms of Reference (TOR) were approved by the ASMFC Sturgeon Management Board in February 2014:

Terms of Reference for the Atlantic Sturgeon Assessment

1. Define population structure based on available genetic and tagging data. If alternative population structures are used in models (e.g., DPS, coast-wide, river system), justify use of each population structure.

2. Characterize the precision and reliability of fishery-dependent and fishery-independent data, including tagging data, that are used in the assessment, including the following but not limited to:
    a. Provide descriptions of each data source (e.g., geographic location, sampling methodology, and potential explanation of anomalous data).
    b. Describe calculation and standardization (if performed) of abundance indices and other statistics including measures of uncertainty.
    c. Discuss trends and associated estimates of uncertainty (e.g., standard errors).
    d. Justify inclusion or elimination of available data sources.
    e. Discuss the effects of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, aging consistency, and sample size) on model inputs and outputs.

3. Develop biological reference points for Atlantic sturgeon populations.

4. Review existing estimates of Atlantic sturgeon bycatch (retained and discarded) and, if possible, develop a time-series of bycatch in monitored fisheries, and discuss the assumptions and applicability of such estimates to reference points.

5. If possible, develop models to estimate population parameters (e.g., *F* or *Z*, biomass, and abundance) and analyze model performance and stability.

6. State assumptions made for models and for calculations of indices and other statistics. Explain the likely effects of assumption violations on synthesis of input data and model outputs.

7. Where possible, assess stock status based on biological characteristics, including but not limited to:
    a. Trends in age and size structure
    b. Trends in temporal indicators of abundance

8. Characterize uncertainty of model estimates and biological or empirical reference points.

9. Recommend stock status as related to reference points (if available). For example:
   a. Is the stock below the biomass threshold?
   b. Is mortality above the threshold?
   c. Is the index above or below a reference index value?

10. Other potential scientific issues:
    a. Compare reference points derived in this assessment with what is known about the general life history of the population unit. Explain any inconsistencies.

11. Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made by next benchmark review.

12. Recommend timing of next benchmark assessment and intermediate updates, if necessary, relative to biology and current management of the species.

Terms of Reference for the Atlantic Sturgeon Peer Review

1. Evaluate appropriateness of population structure(s) defined in the assessment.

2. Evaluate the adequacy, appropriateness, application of the data used, and the justification for inclusion or elimination of available data sources. Evaluate the methods used to calculate indices and other statistics and associated measures of dispersion.

3. Evaluate the estimates of bycatch of Atlantic sturgeon and the methods used to develop them.

4. Evaluate the methods and models used to estimate population parameters (e.g., *F, Z*, biomass, relative abundance) and biological reference points, including but not limited to:

   a. Evaluate the choice and justification of the preferred model(s) or method(s) of calculation (i.e., was the most appropriate model or method chosen given available data and life history of the species?).
   b. If multiple models were considered, evaluate the analysts' explanation of any differences in results.
   c. If appropriate, evaluate model parameterization and specification (e.g., choice of CVs, effective sample sizes, likelihood weighting schemes, calculation/specification of *M*, stock-recruitment relationship, choice of time-varying parameters, plus group treatment).
   d. Evaluate the diagnostic analyses performed, including but not limited to:

    i. Sensitivity analyses to determine stability of estimates and potential consequences of major model assumptions
    ii. Retrospective analysis

5. Evaluate the methods used to characterize uncertainty in estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.

6. Evaluate recommended estimates of stock biomass, abundance (relative or absolute), mortality, and the choice of reference points from the assessment for use in management, if possible, or, if appropriate, recommend changes or specify alternative estimation methods.

7. Evaluate stock status determination from the assessment, or, if appropriate, recommend changes or specify alternative methods/measures.

8. Review the research, data collection, and assessment methodology recommendations and make any additional recommendations warranted. Clearly prioritize the activities needed to inform and maintain the current assessment, and provide recommendations to improve the reliability of future assessments.

TERMS OF REFERENCE REPORT SUMMARY

TOR1. Define population structure based on available genetic and tagging data. If alternative population structures are used in models (e.g., DPS, coastwide, river system), justify use of each population structure.

Historically, ASMFC has managed Atlantic sturgeon as a single stock, although they were evaluated on a river-by-river basis in the most recent assessment (ASMFC 1998). In 2012, as part of the Endangered Species Act listing, NMFS identified five Distinct Population Segments (DPS) of Atlantic sturgeon in US waters: Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic. These DPS designations were based on genetic analysis.

Since the last ASMFC assessment and NMFS status review, there is evidence of new spawning tributaries throughout the species range. Most of these newly discovered populations are likely low in abundance and some show strong connectivity to other spawning tributaries through the movements of adults during putative spawning periods. Additionally dual fall and spring runs have been noted in some tributaries for the Chesapeake, Carolina, and South Atlantic DPSs. Molecular research supports separate lineages for juveniles and adults found in these new spawning tributaries.

An overall pattern of small sub-populations connected through migration is emerging, which contrasts with the previously held view of a small number of discrete populations. Genetic evidence also supports that these sub-populations can be nested within the existing DPS classification. Overall, recent research supports the meta-population construct implemented through NMFS's DPS classification but revisions to spawning tributary membership in particular DPS units are likely in the coming years.

Since many available data sets, including historical landings and indices of abundance, cannot be separated to the DPS or river level, an alternative coast-wide definition of stock was implemented in the ASMFC stock assessment. This stock structure definition is more operational than ecologically based but permitted assessment on overall coast-wide trends in abundance and threats, but curtails full consideration of conservation risks that occur on individual sub-populations.

TOR2: Characterize the precision and reliability of fishery-dependent and fishery-independent data, including tagging data that are used in the assessment, including the following but not limited to:

a. **Provide descriptions of each data source (e.g., geographic location, sampling methodology, and potential explanation of anomalous data).**

Atlantic sturgeon fisheries-dependent and -independent data were evaluated from several sources: historical landings, Northeast Fisheries Observer Program (NEFOP) and the Northeast Fishery At-sea Monitoring (ASM) Program, North Carolina Gill-Net Fisheries, South Carolina American Shad Gill-Net Fishery, and nine federal or state-conducted surveys. Historical landings were available from the commercial harvest along the Atlantic coast beginning in 1880 when the federal government initiated consistent records. While this data set represents the best available data, there are years of missing data likely due to reporting issues, there is missing coverage in some geographic areas, and the dataset ends in 1998 when the moratorium was implemented. NEFOP/ASM had provided observer coverage on commercial fishing boats from Maine to North Carolina since 1989 (ASM began in 2010) and supplied this assessment with biological information and bycatch data for Atlantic sturgeon. The North Carolina Gill-Net Fisheries dataset comes from at-sea onboard observers from the fall flounder fishery as well as other large and small mesh fisheries in the state. Like NEFOP/ASM, this dataset provided bycatch and biological data. South Carolina instituted mandatory catch and effort reporting from licensed fishermen for the American shad gill-net fishery in 1998 and began requiring reporting of Atlantic sturgeon bycatch in 2000. There are reporting issues with this dataset in some river systems, but it does provide meaningful bycatch data for South Carolina. Delaware State University designed a research project to study methods for reducing Atlantic sturgeon bycatch in gill-nets. Atlantic sturgeon lengths from this project were supplied and used in the egg-per-recruit model. See section 4 for a more thorough description of the fishery-dependent data sets.

Fifty fishery-independent and -dependent surveys were considered for this stock assessment for developing indices of abundance and the stock assessment subcommittee (SAS) narrowed it down to nine fishery-independent surveys. Fishery-independent surveys were evaluated and accepted or rejected for use based on criteria developed by the SAS including survey length, geographic range, sampling methodology, and prevalence of Atlantic sturgeon in catches. There were no surveys available that were designed to capture and monitor Atlantic sturgeon, so several of the selected datasets had low detection rates (i.e., 1-3% positive tows). The surveys selected represented all 5 DPSs for Atlantic sturgeon and most were statistically designed random sampling programs. For more information on the fishery-independent surveys used for developing indices of abundance, see section 5.

Coast-wide conventional tagging data for Atlantic sturgeon was available from the US Fish and Wildlife Service database. The decision was made not to analyze these data as a result of concerns about collection methods, completeness, and various errors within the database. Atlantic sturgeon have been implanted with acoustic transmitters by a number of researchers throughout the Atlantic Coast and this data was available from 2006-2015 and used in this assessment for estimating survival rates at the coast-wide and DPS-level (section 6.12.2).

b. Describe calculation and standardization (if performed) of abundance indices and other statistics including measures of uncertainty.

For the NEFOP/ASM data set, a generalized linear model (GLM) framework was developed to estimate Atlantic sturgeon discards from the federal waters. The GLM modeled Atlantic sturgeon takes on each trip as a function of the trip-specific species mix, year, and quarter. Candidate models were fit separately to all observed bottom otter trawl and gill-net (sink and drift) trips for 2000-2015 (section 6.2.1). The North Carolina Gill-Net Fisheries dataset estimated bycatch using a GLM approach (section 6.2.2). South Carolina calculated an average annual catch per unit effort (CPUE) of Atlantic sturgeon per net yard per hour from the American shad gill-net fishery dataset (section 6.2.3).

Fishery-independent survey data were standardized using GLMs incorporating environmental and methodological covariates so as to account for species-specific drivers that may not be captured by the survey's statistical design. Nominal indices of abundance were developed for two of the nine surveys because one provided a longer time-series and the other only had 'year' as a significant cofactor. For a more detailed description of each standardized index and the model used, see section 5.

The acoustic tagging model was designed based on Kéry and Schaub (2012) and Hightower et al. (2015) and a simulation study was used to evaluate model performance. Uncertainty in annual and monthly survival rates for Atlantic sturgeon was characterized using 95% credible intervals.

c. Discuss trends and associated estimates of uncertainty (e.g., standard errors).

The analysis of the NEFOP/ASM bycatch data found that most trips that encountered Atlantic sturgeon were in depths less than 20 meters and water temperatures between 45-60°F. While the annual Atlantic sturgeon take for bottom otter trawls was variable from 2000-2015 and dead discards averaged 4% of the take, there was an overall decreasing trend across the time series. For gillnets, there was more variability and no overall detectable trend and dead discards were higher for this gear at an average of 30%. Standard errors were calculated for the estimates and were higher for gillnets than bottom otter trawls (section 6.2.1). Predicted Atlantic sturgeon bycatch numbers from the North Carolina data set for 2004-2015 ranged from 1,286-13,668 a year, although generally the most recent years were lower than estimates in the earlier years (section 6.2.2). The annual average CPUE for Atlantic sturgeon caught in South Carolina's American shad fishery ranged from 0.000013-0.00035 depending on the river. Shad regulations changed in 2013 and CPUE had decreased significantly since then, with some South Carolina rivers now reporting no Atlantic sturgeon bycatch (section 6.2.3).

For abundance indices developed from fishery-independent surveys, trends in abundance and standard errors fluctuated over various time series. Many surveys had very large standard errors associated with them, likely due to the fact that none of the surveys target Atlantic sturgeon and annual numbers were very low in some cases. Trend analysis did indicate most surveys analyzed had no significant trend in the data with a few exceptions. All abundance surveys were combined using a hierarchical analysis from Conn (2010) to develop a coast-wide index which indicated a relatively stable abundance trend from 1984-2015, with higher errors associated in the early years of the time series than later years.

Uncertainty in the acoustic tagging model's mortality rates was substantially lower for coast wide estimates versus DPS-specific estimates. Coast-wide, annual survival was high for both juvenile and adult Atlantic sturgeon. For individual DPS mean survival estimates, survival was variable and lower than the coast-wide estimates and was sensitive to the amount of data available by region, as expected.

d. Justify inclusion or elimination of available data sources.

Approximately fifty fishery-independent and -dependent surveys were considered by the SAS for inclusion in the analyses. Many were ruled out due to not reliably encountering Atlantic sturgeon and the remaining data sets were further evaluated and several were excluded due to limited or broken time series, limited spatial coverage, or were not designed in a statistical framework (Table 15). Conventional tagging data was not used because of concerns about collection methods, completeness, and various errors within the database and therefore the acoustic tagging data was used.

e. Discuss the effects of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, aging consistency, and sample size) on model inputs and outputs.

Each DPS had at least one survey operating in the region that was developed into an abundance index, although not all surveys could be used in trend analysis due to their short length (<15 years of data). Because these surveys did not target Atlantic sturgeon, most had low detection rates and high standard errors associated with relative abundance estimates. For the bycatch data, overall the three data sets used for estimating bycatch represented areas along the coast. For the acoustic tagging model, coast-wide estimates were robust and similar for juveniles and adults. For some DPSs, estimates had very high 95% credible intervals and estimates for those regions were not deemed as reliable by the SAS.

TOR3: Develop biological reference points for Atlantic sturgeon populations.

The traditional approach for determining stock status is to identify a reference point for a stock characteristic (e.g., stock size, fishing mortality) and compare a recent estimate of that characteristic to the selected reference point. Thresholds are typically used for the definition of stock status (i.e., overfished and overfishing) while targets identify a desirable level of fishing mortality or biomass.

Reference points selected for evaluation were relative abundance and total mortality. Reference points for relative abundance were developed based on ARIMA modeling (see section 6.9). The terminal year from indices of relative abundance were compared to two threshold reference points: (1) the 25th percentile of the fitted time series and (2) the fitted index value that occurred during 1998 (year of coast-wide implementation of the Atlantic sturgeon moratorium).

Total mortality (Z) reference points were developed based on a series of eggs-per-recruit analyses (see section 6.14). Z thresholds were defined as the value of Z that results in an EPR that is 50% of the EPR of an unfished stock, $Z_{50\%EPR}$. These total mortality thresholds were developed at the coast-wide level and for both northern and southern DPS areas. The thresholds represent a numbers-weighted value for ages 4 to 21, the ages represented in the tagging model (see section 6.12). The coast-wide estimate of $Z_{50\%EPR}$ ranged from 0.085 to 0.094 depending on the assumed level of ship strike and bycatch mortalities. The SAS chose a mid-point value of 0.09 for the coast-wide $Z_{50\%EPR}$. For the northern DPS area, the value of $Z_{50\%EPR}$

ranged between 0.10 and 0.11 depending on the assumed level of ship strike and bycatch mortalities. Erring on the conservative side puts the value at 0.10 for the northern DPS area. The value of $Z_{50\%EPR}$ in the southern DPS area ranged between 0.12 and 0.13. A value of 0.12 was selected for $Z_{50\%EPR}$ in the southern DPS area to take a slightly more conservative approach.

Depletion-based stock reduction analysis (DBSRA) was used to estimate unexploited stock size of Atlantic sturgeon. DBSRA uses a time-series of historical landings in conjunction with information on sturgeon life history and expert opinion on current stock size relative to the population's carrying capacity to estimate what unexploited stock size would have to have been to sustain the observed removals without going extinct. Because historical landings cannot be separated to DPS this analysis could only be conducted at the coast-wide level. Atlantic sturgeon unexploited stock size was estimated to be 27,760 mt, with a B_{MSY} of 11,047 mt. Exploration of a multi-stanza carrying capacity model supports the idea that carrying capacity or stock productivity has declined since the beginning of the time-series.

TOR4: Review existing estimates of Atlantic sturgeon bycatch (retained and discarded) and, if possible, develop a time-series of bycatch in monitored fisheries, and discuss the assumptions and applicability of such estimates to reference points.

Estimates of Atlantic sturgeon bycatch were developed from two observer programs: the NEFSC Northeast Fisheries Observer Program, which observes trips in primarily federal waters from Maine to North Carolina, and the North Carolina Division of Marine Fisheries' (NCDMF) Sea Turtle Bycatch Monitoring Program (Program 466) and Alternative Platform Observation Program (Program 467), which observe trips in North Carolina's estuarine gillnet fisheries.

A generalized linear model (GLM) framework was developed to estimate Atlantic sturgeon discards in federal waters from the NEFOP/ASM data (Miller and Shepherd 2011). For this assessment, a quasi-Poisson assumption was used for modeling Atlantic sturgeon takes as a function of species landed, year, and quarter. Models were fit to a subset of observer trips between 2000 and 2015 that included all coastal statistical areas and those observer programs that encountered Atlantic sturgeon and had a representative geographic range. Gillnet trips and trawl trips were modeled separately. To predict Atlantic sturgeon catch for all commercial landings, landings for each trip between 2000 and 2015 in the VTR database were determined for each species covariate. Using the estimated coefficients from the best performing model for each gear, the expected Atlantic sturgeon take was predicted for each VTR trip where information was available on whether the species was landed, and, if necessary, year and quarter. Dead discards were estimated by calculating the proportion of observed Atlantic sturgeon recorded as dead and applying this proportion to the total catch estimate.

The best performing model for each gear type was applied to vessel trip reports to predict Atlantic sturgeon take for all trips. The total bycatch of Atlantic sturgeon from bottom otter trawls ranged between 624–1,518 fish over the time series. The proportion of the encountered Atlantic sturgeon recorded as dead ranged between 0–18% and averaged 4%. This resulted in annual dead discards ranging from 0–209 fish. Likewise, the total bycatch of Atlantic sturgeon from sink and drift gill nets ranged from 253–2,715 fish. The proportion of Atlantic sturgeon recorded as dead ranged between 12–51% and averaged 30%, resulting in annual dead discards ranging from 110–690 fish. Since 2000, there has been little overall change in annual dead discard numbers.

A generalized linear model (GLM) framework was used to predict Atlantic sturgeon interactions in North Carolina’s estuarine gill-net fishery based on data collected during 2004 through 2015. The numbers of Atlantic sturgeon occurring as bycatch was modeled by a set of explanatory variables and an offset term for effort using a standard Poisson model. The variables best fitting model included year, mesh size, season, and management unit, all of which were treated as categorical variables. Predicted numbers of Atlantic sturgeon bycatch were computed using the best-fitting GLM and assuming effort levels equivalent to those observed in 2004 through 2015. The GLM coefficients were applied to the corresponding predictor variables in the trip-level effort data to predict bycatch numbers.

Predicted total bycatch numbers for 2004 to 2015 ranged from a low of 1,286 Atlantic sturgeon in 2011 to a high of 13,668 Atlantic sturgeon in 2008. The proportion of fish observed dead was applied to the estimates of total bycatch to obtain estimates of dead discards. The percent of observed Atlantic sturgeon recorded as dead ranged from 0 - 20%, with an overall mean of 6%. Estimates of dead discards ranged from 0 – 424 fish. Estimates of total bycatch in the most recent years (2010-2015) were generally lower than estimates for the earlier years (2004-2009).

The estimates of total bycatch from the North Carolina estuarine gillnets were higher than the estimates of bycatch from the coastal gillnets, but the observed proportion dead in the North Carolina data was lower than in the NEFOP/ASM data, resulting in similar estimates of dead discards. The biological data collected by these two programs indicated the North Carolina estuarine fisheries were operating on a different component of the population than the coastal fisheries. The mean size of Atlantic sturgeon caught in the North Carolina estuarine gillnet fisheries was 65 cm TL and 2.12 kg, while the mean size of Atlantic sturgeon caught in the coastal gillnet fisheries was 132 cm TL and 20.1 kg. Atlantic sturgeon caught in the coastal trawl fisheries were a similar size, with a mean length of 143 cm TL and a mean weight of 24.7 kg.

Bycatch numbers could not be allocated to populations or DPS units for either analysis, but coastal aggregations which are intercepted by trawl and gillnet fisheries are known to comprise mixed populations from all DPS units.

TOR5: If possible, develop models to estimate population parameters (e.g., F or Z, biomass, and abundance) and analyze model performance and stability.

A Cormack–Jolly–Seber (CJS) model was applied to acoustic tagging data to estimate survival at the coast-wide and DPS level. Data for this analysis were provided by 12 different researchers and state agencies from all five DPSs. A total of 1,331 tagged Atlantic sturgeon detection records (Table 35) were available from a period of January 2006–December 2015. The size of Atlantic sturgeon at tagging ranged from 29.8–268.0 cm TL. Atlantic sturgeon were assigned to a DPS based on genetic information (collected at tagging and analyzed in conjunction with this assessment), if available, or their tagging location. The model was implemented in R and WinBUGS.

The coast-wide mean survival estimate was high for all Atlantic sturgeon, at 0.96 (0.84–0.99, 95% credible interval). Adult survival (0.94, 0.71–1.00) was slightly higher than juvenile survival (0.91, 0.63–1.00). Estimates from the best supported model used a single survival estimate, but had varying monthly detection. All models produced similar estimates of survival, suggesting robust results.

Individual DPS mean survival estimates were variable and lower than the coast-wide pooled estimates. Estimates from the best supported model used a single survival estimate, but had varying monthly detection. The credible intervals for the DPS-level estimates of survival were wider than the coast-wide estimates. These results may be due to low sample size in these size groups and not necessarily low survival. Further tagging studies may be required to improve estimates in these areas.

TOR6: State assumptions made for models and for calculations of indices and other statistics. Explain the likely effects of assumption violations on synthesis of input data and model outputs.

Indices are calculated using specific distributional assumptions to standardize for effects of factors like environmental conditions that are not considered in the survey design. These assumptions are tested through the standardization process to identify the statistically most appropriate distribution, but natural data do not follow a theoretical distribution perfectly. Misspecifying the distribution underlying the GLM standardization approach will result in incorrect estimates of variance and potentially biased indices. In addition, although some indices track abundance of juveniles and can be assigned to an individual DPS, many trawl-based indices are likely sampling fish from other DPS units than the waters in which they operate.

The tagging model explored a number of assumptions about model structure, including time- and DPS-varying survival and detection probabilities. The final model was chosen based on the DIC, so the quality of information in the available data influences the model structure selected. Better quality data, including more tagged fish at the DPS and size class category, might change the structure of the model selected. In addition, the model assumes that all tagged fish disappear from the model due to mortality, not tag loss or failure. If tag failure is a more common event than assumed, estimates of survival will increase.

The EPR analysis uses the traditional equilibrium assumptions about natural mortality, size and fecundity at age, maturity, and selectivity. Current estimates of M, growth, and fecundity need more research, especially at the DPS level, but violating the assumption of time-constant parameters would have a bigger effect on the EPR results. Similarly, the selectivity of bycatch and shipstrike sources of mortality is poorly known and needs more research. Total mortality will be sensitive if selectivity changes on immature individuals.

The DBSRA model was most sensitive to assumptions about the state of the population relative to the unfished state. Estimates of allowable removals were sensitive to a number of assumptions about the shape of the underlying production curve, the status of the population at the end of the time-series, and other parameters, but the estimates of unexploited stock size were robust to these assumptions.

TOR7: Where possible, assess stock status based on biological characteristics, including but not limited to:

a. Trends in age and size structure

Available data on age and size structure were limited temporally or by small sample sizes. For this reason, it was not possible to assess stock status relative to trends in age and size structure on a coast-wide, DPS, or population level.

b. Trends in temporal indicators of abundance

Indices of relative abundance, grouped by DPS, were compared to the threshold reference points defined in TOR #3 based on ARIMA modeling (see section 6.9). No statistically significant monotonic trends were identified in the adult or subadult and adult surveys. The Gulf of Maine, New York Bight, Chesapeake Bay, and Carolina DPS areas are above the 25th percentile of their respective time-series. The South Atlantic DPS was unknown because there was no abundance index from that DPS with a long enough time series to use in ARIMA.

TOR8: Characterize uncertainty of model estimates and biological or empirical reference points.

Estimates of bycatch had fairly wide confidence intervals due to the low sample sizes of Atlantic sturgeon in the observer datasets.

The trend analysis and ARIMA model results are influenced by the uncertainty in the indices of abundance. The indices generally had low encounter rates with Atlantic sturgeon and wide confidence intervals around the estimates of CPUE, which reduced the models abilities to detect significant trends.

Estimates of survivorship from the tagging model were more robust for the coast-wide model, with the annual estimate of survival having a lower standard deviation and tighter credible intervals than the DPS-level estimates. Similarly, estimates of survival for adults and for juveniles were more uncertain than estimates for the pooled size classes. Sample size is most likely driving these differences, with the most precise estimates coming from the pooled samples.

The uncertainty of the $Z_{50\%EPR}$ estimates was explored by calculating the value over a range of ship strike and bycatch mortalities (see section 6.14). In general, there was little difference among the $Z_{50\%EPR}$ values over the ranges explored for both the coast-wide analysis and the northern and southern DPS area analyses (see response to TOR #3).

Estimates of unexploited population size from the DBSRA analysis had reasonable confidence intervals. Uncertainty in this model is driven in part by the uncertainty assumed in the input parameters, so widening the range of parameter values that model draws from will increase uncertainty, but it also is affected by the ability of the model to fit a range of K that results in a trajectory of biomass that did not cause the population to go extinct or recover beyond the assumed terminal year status.

TOR9: Recommend stock status as related to reference points (if available). For example:

a. Is the stock below the biomass threshold?

The SAS was unable to develop estimates of current biomass or abundance at the coast-wide or DPS level.

b. Is mortality above the threshold?

At the coast-wide level, the estimates of total mortality from the tagging model for all fish age 4 to 21 ($Z_{coast\text{-}2015}$ = 0.04) was below the *Z* threshold ($Z_{50\%EPR\ coast}$ = 0.09).

The point estimate of *Z* for the New York Bight DPS ($Z_{NYB\text{-}2015}$ = 0.09) was below the northern region *Z* threshold ($Z_{50\%EPR\ north}$ = 0.10). The point estimates of *Z* for the other DPSs were above the region-specific *Z* thresholds. However, the DPS-level estimates of *Z* from the tagging model had wide credible intervals which included the *Z* threshold in all cases, so we cannot say with statistical certainty whether the DPS-level estimates of *Z* are above or below the thresholds.

c. Is the index above or below a reference index value?

The terminal year values for all indices were all credibly above the 25th percentile of their respective time series.

The situation relative to index values in 1998, the year the coast-wide moratorium was implemented, was mixed. The 2015 index from the Gulf of Maine DPS (ME-NH Trawl survey) was not credibly above the index value in 2000 (survey started in 2000). All terminal year indices from surveys in the New York Bight DPS were credibly above their respective 1998 index values. Terminal year index values from surveys in the Chesapeake Bay DPS were not credibly above their respective 1998 index values. Finally, terminal year index values for all fitted indices in the Carolina DPS, save one, were above their respective 1998 index values. The South Atlantic DPS status relative to 1998 is unknown because the one survey developed for that region was not long enough to test.

TOR10: Other potential scientific issues:

a. Compare reference points derived in this assessment with what is known about the general life history of the population unit. Explain any inconsistencies.

The $Z_{50\%EPR}$ estimates developed in this assessment are very low, but that is consistent with what we know about the life history of Atlantic sturgeon. They are long-lived, slow-growing, and slow to mature. In addition, they are vulnerable to incidental mortality before they mature, which lowers the amount of anthropogenic mortality they can sustain.

The DBSRA estimate of unexploited stock size is 27,760 mt. Recorded landings of approximately 2,000 - 3,000 mt at the beginning of the historical record (which are most likely an underestimate) would therefore be an exploitation rate of 10%, higher than the total mortality benchmark and consistent with overexploitation that allowed high catches but quickly drove the stock to depleted levels.

TOR11: Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made by next benchmark review.

The Atlantic Sturgeon SAS and Technical Committee (TC) identified a number of research recommendations to improve future stock assessments. High priority research needs include monitoring bycatch and bycatch mortality, establishing regional and coast-wide fishery-independent surveys to monitor annual abundance, continuing genetic sampling and refining the baseline, increasing the sample size of acoustically tagged fish, collecting data on regional vessel strike occurrences, and collecting DPS-specific age, growth, fecundity, and maturity information.

TOR12: Recommend timing of next benchmark assessment and intermediate updates, if necessary, relative to biology and current management of the species.

The Atlantic sturgeon SAS and TC recommend that an assessment update be considered in five years, although recognizing the life history and data needs it is unlikely that a significant increase in information will be available by that time. The SAS and TC recommend that a benchmark stock assessment be conducted in ten years if improvements in data have been made. The SAS and the TC also recommend that members stay proactive about monitoring research programs and maintaining current sampling programs.

1 INTRODUCTION

1.1 Brief Overview and History of the Fisheries

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are one of the largest and longest-lived anadromous fish in North America and can be found along the entire Atlantic coast from Labrador, Canada to St. Johns River, Florida (refer to Appendix B for more information on the types of water bodies and systems where Atlantic sturgeon are known (or expected) to occur within each distinct population segment). These taxonomically primitive fish have been taken for food by humans for at least 3,000-4,000 years (Warner 1972) supporting fisheries of varying magnitude since colonial times—there are reports from Maine and Massachusetts from as early as the 1600s that cite Atlantic sturgeon as an important fishery in those states (Wheeler and Wheeler 1878; Jerome et al. 1965). However, larger scale commercial fisheries for this species did not exist until the mid-1800s (Goode 1887). Sturgeon were primarily harvested for their flesh and eggs (caviar from sturgeon eggs was considered a delicacy in Europe), although other parts had commercial value as well. Sturgeon skin was made into leather for clothes and bookbinding, and a component of the swim bladder was used to make adhesives and a gelatin that served as a clarifying agent in jellies, wine and beer. Swim bladders were also fashioned into windows for carriages (Goode 1887).

Records of Atlantic sturgeon commercial harvest have been kept since 1880 (Figure 1). At that time, Atlantic sturgeon were among the top three species in weight of fish harvested commercially along the Atlantic coast, and considered second in value only to lobster (US Bureau of Fisheries 1907; US Commission of Fish and Fisheries 1884-1905). Although landings data prior to 1967 do include shortnose sturgeon (shortnose sturgeon were listed under the Endangered Species Act in 1967, formerly the Endangered Species Preservation Act) it is likely that the bulk of those landings can be attributed to the much larger Atlantic sturgeon (Secor and Waldman 1999). Atlantic sturgeon landings peaked in 1890 at 3,348 metric tons (mt) and were dominated by the Mid-Atlantic jurisdictions (e.g., the Hudson and Delaware Rivers and the Chesapeake Bay systems), although landings also came from southeastern states of North Carolina, South Carolina and Georgia. By 1901, the fishery collapsed to less than 10% of its peak landings recorded roughly a decade earlier (Secor 2002). Landings continued to decline and remained between 1-4% of its peak from 1910 to 1995. After the collapse of Atlantic sturgeon stocks in the Mid-Atlantic region, landings for North Carolina, South Carolina, and Georgia dominated the coastal harvest. Landings for these states declined by the 1980s and coast-wide harvest shifted back to New York and New Jersey. There are no records of a significant recreational fishery for Atlantic sturgeon. Refer to Appendix B for more detail on the history of Atlantic sturgeon fisheries within each Distinct Population Segment (DPS).

1.2 Management History

By the late 1980s, commercial fishing operations (directed and incidental) were still conducted on remnant populations throughout much of the species range. Acknowledging that restoration of the stock would not be realized without immediate management action, the Atlantic States Marine Fisheries Commission (ASMFC or Commission) began development of a Fishery

Management Plan (FMP) for the species which was implemented in 1990. The goal of the FMP is to provide a framework for the restoration of Atlantic sturgeon to fishable abundance throughout its range. For the FMP, fishable abundance was defined as 700,000 pounds, or 10% of 1890 landings of 7 million pounds. Among the management recommendations of that plan was the statement that states should adopt a: 1) minimum size limit of 2.13 m total length (TL) and institute a monitoring program; 2) a moratorium on all harvest; or 3) for states and jurisdictions to submit an alternative management program to the Plan Review Team for determination of conservation equivalency.

The FMP suggested that the dramatic decline in landings was primarily caused by overfishing, although habitat loss and degradation, and impediments to spawning areas (i.e., dams) likely also contributed to the decline. By 1996 (and as early as 1984 in some states), Atlantic sturgeon fishery closures were instituted in ten states and jurisdictions along the Atlantic Coast. Since 1997, all states have enacted bans on harvest and possession of Atlantic sturgeon and sturgeon parts. Despite these closures stocks continued to decline. In response, the Commission's member states and jurisdictions determined that the FMP was insufficient for conservation and restoration of Atlantic sturgeon stocks and initiated development of Amendment 1 which was approved in June 1998. The goal of the Amendment "is to restore Atlantic sturgeon spawning stocks to population levels which will provide for sustainable fisheries, and ensure viable spawning populations." The Amendment strengthens conservation efforts by formalizing the closure of the directed fishery and by banning possession of bycatch and eliminating any incentive to retain Atlantic sturgeon. Under Amendment 1, states must maintain complete closure of any directed fishery for Atlantic sturgeon and prohibit landings from any fishery until stocks exhibit a minimum of 20 protected year classes of spawning females and the FMP is modified to permit harvest and possession.

The Amendment also requires states to monitor, assess, and annually report Atlantic sturgeon bycatch and mortality in other fisheries, although bycatch reporting is widely accepted as being underreported or not reported at all. The Amendment also requires that states annually report habitat protection and enhancement efforts. Finally, each jurisdiction with a reproducing subpopulation should conduct juvenile assessment surveys (including CPUE estimates, tag and release programs, and age analysis). States with rivers that lack a reproducing Atlantic sturgeon subpopulation(s) but support nursery habitat for migrating juveniles should also conduct sampling.

Applicants for exemption to the ban on possession for aquaculture and importation of non-indigenous Atlantic sturgeon (i.e., originating from outside U.S. jurisdiction) must adhere to the terms, limitations, enforcement, and reporting requirements which were approved by the Commission in January 2001 and receive approval from the Board through the adaptive management process. For example, Addendum I (2001) to the Atlantic sturgeon FMP exempts Florida from the possession moratorium for the purposes of developing private aquaculture facilities for cultivation and propagation of the species. Addendum II (2005) exempts a private company in North Carolina from the moratorium on possession, propagation, and sale of Atlantic sturgeon meat and eggs and allows a Canada-based exporter to export Atlantic sturgeon fry and fingerlings into North Carolina. Addendum III (2006) similarly allows a private company in North Carolina to import Atlantic sturgeon from a Canada-based exporter.

Addendum IV to Amendment 1, approved in 2012, updates habitat information for Atlantic sturgeon and identifies areas of concern and research needs.

1.3 Stock Assessment History

Per the 1998 Atlantic sturgeon stock assessment report, Atlantic sturgeon populations throughout the species' range were either extirpated or considered to be at historically low abundances (ASMFC 1998). The report defined the target fishing mortality (F) rate as that level of F that generated an eggs-per-recruit (EPR) equal to 50% of the EPR at F = 0.0 (i.e., a "virgin stock," or a stock that is yet to experience mortality due to fishing). This target rate (F_{50}) equals 0.03 (annual harvest rate of 3%) for a restored population. This target is far below estimates of F prior to enactment of the fishery moratoria, which ranged from 0.01–0.12 for females and 0.15–0.24 for males. It is important to note that while these estimates were determined for the Hudson River stock and may not apply to other specific stocks along the Atlantic coast, they are suggestive of the coast-wide population.

Although populations of Atlantic sturgeon have persisted, adult population abundance in some systems may be so low as to significantly impede reproduction success and timely recovery. Recruitment levels have been estimated in only the Hudson and Altamaha Rivers in single year studies. In many systems age-0 and age-1 juveniles remain undetected despite directed efforts to do so. Impediments to recovery largely include historical overfishing, incidental bycatch, ship strikes, and the degradation and loss of essential fish habitat (e.g., spawning and nursery grounds). The 1998 report also suggested that aside from major threats to existing habitat, including climate change, reducing bycatch mortality is of greatest importance to restoring Atlantic sturgeon.

1.3.1 Endangered Species Act

Undertaken concurrently with the Commission's stock assessment in 1998, NOAA Fisheries evaluated the status of the species with regard to listing under the Endangered Species Act (ESA). That Status Review Report concluded that listing was not warranted at the time (NOAA 1998).

In February 2007, a Status Review Team (SRT) finalized its report on the status of U.S. Atlantic sturgeon (ASSRT 2007). The SRT identified five DPSs—discrete population units with distinct physical, genetic, and physiological characteristics—along the Atlantic coast: Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic (Figure 2). The SRT concluded that there was a greater than 50% chance that the Carolina, Chesapeake Bay, and New York Bight DPSs would become endangered within the next 20 years. The biggest threats to the recovery of the DPSs included bycatch mortality, water quality, lack of adequate state or federal regulatory mechanisms, and dredging activities. The SRT did not have enough information to decide on the status of the Gulf of Maine and South Atlantic DPSs at that time.

In 2009, the National Resources Defense Council petitioned NOAA Fisheries to list Atlantic sturgeon under the provisions of the ESA based on the recommendations from the 2007 Status Review. In January 2010, NOAA Fisheries reported that the petition may be warranted, and after further review, NOAA Fisheries published two proposed rules (75 FR 61872 and 75 FR 61904) in October 2010 to list the Gulf of Maine DPS as threatened and the remaining DPSs as endangered. Over 400 public comments were submitted to NOAA Fisheries on the proposed rule.

NOAA Fisheries published two final rules (77 FR 5880 and 77 FR 5914) in February 2012, declaring the Gulf of Maine DPS as threatened and the remaining four DPSs as endangered (effective April 2012). Additionally, pursuant to section 7 of the ESA, NOAA Fisheries released a draft biological opinion in May 2013 stating that seven Northeast fisheries will likely not jeopardize the continued existence of the five Atlantic sturgeon population segments (NOAA Fisheries Consultation No. F/NER/2012/01956). NOAA Fisheries published an Interim Final 4(d) Rule for the threatened Gulf of Maine DPS in December 2013 which essentially provides the same protection as an endangered listing.

In 2013, in response to the ESA listing, the Board initiated the development of a coast-wide benchmark stock assessment to evaluate stock status, stock delineation, and bycatch. Data (including bycatch, survey, tagging, and genetic data) have been collected from dozens of state and federal agencies and academic programs throughout the coast. In 2014, the Board evaluated progress on the benchmark assessment and decided to change the completion date to 2017 to allow for the most comprehensive assessment possible.

1.4 Management Unit Definition

The management unit is defined as “Atlantic sturgeon stocks of the east coast of the U.S., from the Canadian border to Cape Canaveral in Florida” (ASMFC 1998). Accordingly, all ASMFC member states and jurisdictions, including the District of Columbia and the Potomac River Fisheries Commission, have a declared interest in the Interstate FMP for Atlantic sturgeon.

2 LIFE HISTORY

Section 2 is intended to be representative of the coast-wide metapopulation. See “Appendix B” for additional DPS-specific life history information.

2.1 Stock Definitions

The Atlantic sturgeon is broadly distributed along the Atlantic coast from Florida to the Canadian Maritimes and historically ranged into Europe before its extirpation there (Ludwig et al. 2002). Adults and subadults can range extensively along the coast, and commonly comprise mixed stocks in both estuarine and coastal regions (Dunton et al. 2012; Wirgin et al. 2012). Although the coastal movements of subadults and adults are not well understood, it is generally believed that adults preparing to spawn progress northward from southern winter foraging areas towards their natal rivers (see Hilton et al. 2016 for a thorough review of Atlantic sturgeon life history). These spawning adults are followed by subadults that move into estuaries as well as adults that generally reside at the mouth of bays and nearshore coastal waters over the summer before departing southward in the fall (Welsh et al. 2002; Erickson et al. 2011; Dunton et al. 2012). Spawning takes place over coarse grained materials or bedrock. After hatching, juvenile Atlantic sturgeon reside in the freshwater portion of their natal river for their first year or two before they begin to transition into the estuary (McCord et al. 2007). Ultimately, between ages 3-5 these individuals will enter the coastal migratory stock as outlined above.

Generally speaking, each river supports a unique spawning population. Based on the observed levels of genetic differentiation, populations are expected to be demographically independent among natal rivers. In some rivers (e.g. Edisto and James in Virginia), recent work supports separate spring and fall spawning runs in several systems (Post et al. 2014; Smith et al. 2015; Balazik et al. 2017; Farrae et al. 2017). There is also increasing evidence of adults visiting multiple spawning tributaries during the same spawning season, suggesting a degree of straying particularly between adjacent rivers (C. Stence, MD DNR, pers. comm.).

For the purpose of management, Atlantic sturgeon populations within the United States are divided into DPSs under the Endangered Species Act, reflecting the significance and discreteness of these units (ASSRT 2007). There is minimal contemporary gene flow among the DPS units, and the units represent broad patterns in genetic structure (ASSRT 2007; Fritts et al. 2016; Savoy et al. 2017). Juveniles (<550 mm total length) and adults (≥1,300 mm total length) observed near spawning areas are generally thought to represent the population endemic to the river where they are observed. However, subadults and adults mix extensively and can only be distinguished using molecular approaches.

Contemporary spawning populations within each DPS

The stock assessment subcommittee (SAS) evaluated the spawning populations of Atlantic sturgeon along the U.S. Atlantic coast. The SAS compiled a list of rivers and tributaries by DPS and assigned a level of spawning certainty to each of them (Table 1). This list is based on the 2007 status review with updates from researchers and scientific literature for this stock assessment and likely is not a comprehensive list. In the Gulf of Maine DPS, the Kennebec is the only river with confirmed spawning and other rivers remain unknown or historical sites of spawning that have not been documented as having spawning Atlantic sturgeon in recent decades. The Connecticut, Hudson, and Delaware Rivers have confirmed spawning for the New York Bight DPS and the Tauton River remains unknown although it did have spawning Atlantic sturgeon historically. For the Chesapeake Bay DPS, the James River is the only site of confirmed spawning while four other rivers in that region are highly likely to have a spawning population. The Roanoke River in the Carolina DPS is the only river with confirmed spawning, although several more are categorized as highly likely, suspected, or unknown. The Edisto, Savannah, and Altamaha Rivers in the South Atlantic DPS are all sites of confirmed spawning, while several more rivers in the region are suspected or unknown.

2.2 Migration Patterns

The 1998 Atlantic sturgeon stock assessment relied primarily on conventional tagging data to develop information on Atlantic sturgeon migration patterns (ASMFC 1998). This method, the best at the time, depended solely on adequate tag retention and subsequent capture and reporting of the animal either by commercial fishers or by other sturgeon researchers. With the introduction of a coast-wide fishing moratorium for Atlantic sturgeon and closure of fisheries in 1998, commercial fisher interaction was no longer a viable method of collecting recapture information. However, since that assessment, biotelemetry including acoustic tagging has, for the most part, replaced conventional tagging efforts because of its reliability, long lived transmitters, and cooperation among researchers. For the last 10+ years, this method of tracking animals has provided multi-year accounts of individuals and, in some cases, changed institutional knowledge and beliefs.

In northern rivers, Atlantic sturgeon most often spawn in tidal freshwater regions of large estuaries (Hildebrand and Schroeder 1928; Moser and Ross 1995; Bain 1997; Colette and Klein-MacPhee 2002). This pattern is most prevalent in New England and U.S. Mid-Atlantic estuaries where obstructions to migration at the fall line preclude upriver migration. In the south where many rivers remain unblocked, Post et al. 2014 shows that Atlantic Sturgeon used approximately 74% of the river habitats available to them within the Altamaha System below the Fall Line, including the Ocmulgee and Oconee tributaries; one individual fish migrated to RKM 408 in the Ocmulgee River, the longest documented migration of an Atlantic sturgeon within a U.S. spawning river. By comparison, spawning runs in the Roanoke River reached RKM 204, adult spawning runs in the Hudson River only reach RKM 182 and spawning runs in the James River have been documented to reach RKM 155 (Van Eenennaam 1996; Balazik et al. 2012a).

Spawning migrations are cued by temperature, which causes fish in U.S. South Atlantic estuaries to migrate earlier than those in Mid-Atlantic and New England portions of their range (Smith 1985). In Florida, Georgia, and South Carolina, spawning migrations begin in February. Collins et al. (2000) found that in the Edisto River, South Carolina, ripe males were captured as early as March 2nd, and a single ripe female was captured on March 7th. Additionally, the researchers captured spent males as early as late March and spent females as late as mid-May. In contrast, researchers in the Mid-Atlantic region report that spawning migrations for Atlantic sturgeon begin between April and May (Hildebrand and Schroeder 1928; Dovel and Berggren 1983; Secor and Waldman 1999; Bain et al. 2000). In New England and Canada, spawning migrations occur from May through July (Collette and Klein-MacPhee 2002). Furthermore, Hatin et al. (2002) reported that spawning occurred from early June to approximately July 20th in the St. Lawrence River, Québec.

In addition to a spring migration, many studies document the occurrence of a fall migration (Smith et al. 1984; Collins et al. 2000; Laney et al. 2007; Balazik and Musick 2015; Smith et al. 2015). Most fall migrations are movements out of the estuaries into marine habitats. Fall migrations occur from September through December, again, depending on the latitude (Smith 1985). In addition, some researchers have proposed that an alternate fall migration into estuaries may be related to spawning (Smith et al. 1984; Rogers and Weber 1995; Weber and

Jennings 1996; Moser et al. 1998; Collins et al. 2000; Laney et al. 2007), which has recently been confirmed for the James River, Roanoke River, and Altamaha (Balazik and Musick 2015; Hilton et al. 2016).

2.2.1 Spawning

2.2.1.1 Northeast

In the northeast, hereby defined as large coastal river systems north of the Chesapeake Bay, spawning of Atlantic sturgeon is believed to be restricted to a single spawning season in the late spring-early summer months, although recent telemetry evidence and anecdotal reports suggest a second spawning event may take place in the Delaware River (Dewayne Fox, Delaware State University, personal communication). Adults begin entering the Delaware in late April with spawning believed to take place in May and June (Borodin 1925; Simpson and Fox 2007). The timing of river entry and spawning is delayed as one moves north into the Hudson River (late May into July; Van Eenennaam et al. 1996) and further north, begins in late May and into early July while in the Kennebec River spawning is believed to occur in June and July (Wippelhauser et al. 2017). Although the timing of spawning is unknown for the Connecticut River, the length frequency distribution of river-resident juveniles supports a single spawning season (Savoy et al. 2017). Quantitative estimates of inter-basin exchange by spawning adults are not well documented, but genetic evidence suggests that recolonization may occur from distant populations (Savoy et al. 2017) or inadvertent introductions (T. Savoy, CTDEP, personal communication).

2.2.1.2 Southeast

Historically, Atlantic sturgeon in Chesapeake Bay and south were thought to spawn only during spring months however, Smith et al. 2015 identified a fall spawn within the Roanoke River, NC through the collection of eggs utilizing artificial substrates. They were successful in collecting 38 eggs over 21 days of sampling immediately below the first shoals at Weldon (RKM 220). Estimated spawning dates were 17-18 and 18-19 of September when water temperatures were 25 to 24°C and river discharge was 55 to 297 m3/s. Spring spawning fish usually enter the rivers during winter months and initiate spawning migrations in March and April or when water temperatures are between 13 and 19^{o}C (Smith 1985; Collins et al. 2000). Spawning habitat for the spring spawn occurs between RKM 80 and 150 and consists of rocky coble or limestone outcrops (Collins et al. 2000; Post et al. 2014; Balazik and Musick 2015). Collected telemetry data indicates that fall spawns are now evident in all historic Atlantic sturgeon rivers in Virginia, North Carolina, South Carolina, and Georgia (Hager et al. 2014; Post et al. 2014; Smith et al. 2015; Balazik and Musick 2015; Ingram and Peterson 2016). Spawning fish enter the rivers in late summer and begin migrations upriver when water temperatures are between 25 and 28^{o}C. Generally, spawning habitat for fall spawners is higher in estuaries and rivers than spring spawning, occurring between RKM 180-350. Sturgeon remain present on spawning grounds while water temperatures decrease, then they quickly emigrate during late fall. Based on telemetry and genetic data, spawning events (spring and fall) occur in some rivers in South Carolina, but single fall spawns are believed to occur in Georgia rivers and spring spawning remains unknown in the Roanoke River, North Carolina (Post et al. 2014; Smith et al 2015; Farrae et al. 2017).

2.2.2 Coastal Migration

Atlantic sturgeon are believed to reside in their natal rivers for the first couple of years before joining the coastal mixed stock (Dovel and Berggren 1983; Bain 1997; Hatin et al. 2007; McCord et al. 2007). As subadults, Atlantic sturgeon exhibit fidelity to their natal system where they return in the late spring and summer months for foraging, or they remain offshore. Upon reaching maturity they exhibit increased natal site fidelity and are believed to return to their rivers only for spawning with foraging taking place at the mouth of large estuaries and nearshore marine waters (Dunton et al. 2012; Breece et al. 2016). As such, Atlantic sturgeon will spend most of their lives in marine or estuarine waters where the risk of bycatch in fixed and mobile fisheries is enhanced (Collins et al. 1996; Dunton et al. 2015). In coastal Atlantic waters, survey, bycatch, and conventional tagging data support seasonal migrations to the south during winter months and to the north during spring months (Hilton et al. 2016). Perspectives on coastal migrations has been enhanced greatly through telemetry studies. Telemetered adult Atlantic sturgeon tagged off the coast of Delaware have been acoustically detected from Cape Canaveral, Florida, to the Gulf of St. Lawrence, Canada, providing evidence of their dispersal mechanism for their historical European colonization (Ludwig et al. 2002; Wirgin et al 2015). Continuous sampling efforts to tag large adult Atlantic sturgeon (>150 cm fork length (FL)) by researchers coupled with increased hydroacoustic telemetry arrays available to detect and provide information at much greater resolution than historically possible allowing for near continuous detection records for adults. Results from this data indicate, during peak summer temperatures, non-spawning adult Atlantic sturgeon from southeastern rivers begin nearshore (1-12 miles from shore) northerly migrations and are frequently captured or detected during spring and summer months in Delaware and New York (Oliver et al. 2013; Post el al. 2014). Additionally, multi-year tracking of these same fishes in subsequent years show spawning behavior in southeastern rivers.

2.3 Age

2.3.1 Ageing error

Age determination depends on careful and consistent interpretation of optical zonation patterns associated with annuli, which are presumed to form at an annual rate. Validation of annual periodicity of annuli in fin spines has been tested through (1) measurement of seasonal growth of the marginal increment, (2) comparison of estimated age to known age in reared sturgeons up to age 4 years, and (3) through correspondence between optical chemical zonation patterns across annuli (Stevenson and Secor 1999). These approaches provide limited evidence that optical patterns correspond to ages in juveniles and subadults. Despite an attempt to conduct radiometric dating of fin spines (Burton et al. 1999), longevity estimates in adult Atlantic sturgeon remain unverified. Precision in age interpretations have been evaluated through paired comparisons of estimates between two readers. Coefficient of variation (CV) between readers ranged from 1.8-5.6% (1.8% (Balazik et al. 2012), 3.8% (Dunton et al. 2015), 4.8% (Stevenson and Secor 2000), and 5.6% (Stewart et al. 2015)). Minimal bias was detected between different readers, except for Balazik et al. (2012), who reported a strong subjective effect between readers. Age calibrations were exercised between two past studies' first authors: Van Eenennaam and Doroshov (1998) vs. Stevenson and Secor (2000). Still, no reader set exists for training and assessing precision among studies or laboratories. In general CVs of 5-10% are expected for longer lived species such as Atlantic sturgeon (Stevenson and Secor 2000; Campana 2001). On the other hand, an error of one year can convey substantial bias to growth models when assigning ages less than 10 years.

2.3.2 Maximum Size and Age

Longevity is a useful parameter in estimating natural mortality, age at maturity, and life-time reproductive rates, which in turn are used in developing biological reference points. Parameterization of L_∞ is very sensitive to the size distribution of the fitted sample and selective fishing and other sources of mortality, whereby past exploitation and ecosystem changes can shape the demographics and yield of extant populations. For instance, Balazik et al. (2010) analyzed 400-year-old Atlantic sturgeon spines from a Jamestown, Virginia, colonial midden and observed older individuals and slower growth than in the extant population of James River Atlantic sturgeon.

Vladykov and Greely (1963) reference a female taken in the Saint Johns River, New Brunswick, during July 1924 which was 427 cm (14 feet) in length and weighed 369 kg. Bigelow and Shroeder (1953) discounted an observation of an 18-foot long Atlantic sturgeon, but thought 12 feet (366 cm) was "perhaps the greatest length to expect today." Maximum size from the growth study data sets was 277 cm (Van Eenannaam and Doroshov 1998; Stevenson and Secor 2000), or approximately 9 feet. Based on observations of Atlantic sturgeon carcasses during the past two decades, U.S. Fish and Wildlife Service (USFWS) scientist Albert Spells suggested 10 feet (305 cm) might be a reasonable estimate of maximum length during the recent period.

Maximum age was reported in an obscure way in Magnin (1964) as 60 years—"thus we examined an *A. oxyrhynchus* that was 60 years old" (Google translation from French)—without reference to the fish's size or origin. Among the reviewed growth studies, a maximum age of 43 was observed by Van Eenannaam and Doroshov (1998) for the Hudson River. A 250 cm TL Atlantic sturgeon stranded on the western shore of Delaware Bay was estimated to be 47 years old (Secor 1995). Stewart et al. (2015) observed a maximum age of 51 years in their St. John's River sample. Smith (1985) observed a maximum age from commercial samples of 30 years in South Carolina. Given these records, longevity of 60 years seems reasonable for populations in the northern extent of its range. The SAS agreed that longevity of 40 years was reasonable for more southern populations.

2.4 Growth

2.4.1 Methods

Biological data for Atlantic sturgeon were compiled from several past and on-going research programs along the Atlantic Coast. The available biological data were used to model the length-weight and age-length relationships for Atlantic sturgeon at the coast-wide and DPS levels.

Note that data were not available for all DPS areas. All modeling was done in R (R Core Team 2017).

The traditional length-weight function was used to model the relationship between TL in centimeters and weight in grams:

$$W = aL^b$$

where *W* is weight in grams, *L* is TL in centimeters, and *a* and *b* are parameters of the length-weight function.

After some preliminary exploration of alternative models, the working group decided to model the age-length relationship using the traditional von Bertalanffy model:

$$L_t = L_\infty\left[1 - e^{-K(t-t_0)}\right]$$

where L_t is length at age t, L_∞ is the asymptotic average length, K is the Brody growth coefficient, and t_0 is the age when average length is zero. In the fitting procedure, the observations were weighted by the inverse of the sample size at age. Exploratory modeling found that this was necessary to obtain realistic estimates of L_∞. Confidence intervals for the age-length model parameters were constructed based on 1,000 bootstrap samples and was implemented using the nlsBoot() function within the nlstools package in R (Baty 2015).

The assumptions associated with the fit of the von Bertalanffy model were evaluated for the fit to all available data. A plot of the observed data was inspected to identify potential outliers. A plot of the residuals versus fitted values was created to evaluate whether the variability about the model is constant. A histogram of the model residuals and a Q-Q plot were constructed to assess the normality of the errors.

2.4.2 Results

The parameter estimates of the length-weight relationship fit to the Atlantic sturgeon data are summarized in Table 2. Comparison of the predicted length-weight relationships among DPS areas suggests differences (Figure 4 - 7). These differences stem, in part, from differences in the range of lengths and weights observed and available sample sizes.

The von Bertalanffy age-length model appears to provide an adequate fit to the available data, in general (Figure 9). No obvious outliers are apparent. A plot of the residuals versus fitted values suggests that there may be an additional inflection in early growth not accounted for in the von Bertalanffy growth model (Figure 10). Attempts to fit a double von Bertanffy growth model (after Balazik et al. 2012b) did not improve the residual pattern. The histogram of the residuals (Figure 10) and the Q-Q plot (Figure 11) indicate that the residuals are normally distributed.

A summary of the age-length parameter estimates suggests variation in growth among the DPS areas (Table 3). The plots of the observed data and the predicted age-length relationships suggest that Atlantic sturgeon may live longer and grow slower in the north compared to the south (Figure 12 - 12). Note that the very high L_∞ estimate for the Chesapeake DPS was supported by very few adult samples for that analysis and that Balazik et al. (2012b) chose to fit a double von Bertlanffy to that data set. Still, for the combined model (Figure 8), parameter values estimated here are generally within the range of published estimates (Van Eenennaam and Doroshov 1998; Dunton et al. 2015; Stewart et al. 2015).

2.5 Maturity

Reproductive schedules are not well studies for Atlantic sturgeon, with only a single detailed detailed study (Van Eenennaam and Doroshov 1998). In a review article Smith (1985) suggested that maturity at age for coastal Atlantic sturgeon stocks varied by latitude where maturation is reached at an earlier age in southern regions, althought this has not been confirmed. Sex differentiation may begin as early as age 1 but is completed by age 4 (Van Eenennaam and Doroshov 1998). Coast-wide estimates for maturity range from five years to 32 years, although maturity is reached earlier on average in males than in females (Smith and Clugston 1997). Fecundity increases with body size and age, although this was dampened in older females (Van Eenennaam and Doroshov 1998). The total length and weight of mature female Atlantic sturgeon is 2-3 m and 100-200 kg, respectively, while mature males range from 1.4-2.1 m and 50-100 kg (Smith 1985; Collins et al. 2000; Dadswell 2006).

2.6 Mortality

2.6.1 Natural Mortality

Atlantic sturgeon are a long-lived species, with a maximum recorded age of 60 years in the northern extent of its range and 40 years in the southern extent, suggesting natural mortality (M) on subadults and adults is low.

Some work has been done to empirically estimate total mortality. For samples collected in the mid-1990s, Kahnle et al. (1998) estimated total mortality (Z) to be the summation of F and M for the harvested stock of Hudson River females ($Z = 0.15$ to $0.20\ yr^{-1}$), and males ($Z = 0.22$ to $0.31\ yr^{-1}$). Stevenson (1997) also estimated Z based on catch curve analysis for the Hudson River during the 1990s. Female and male Z was estimated at 0.04 and 0.18. Fishery samples from coastal New Jersey supported an estimate of $Z = 0.26$.

Hightower et al. (2015) developed estimates of Z from acoustic tagging data for fish tagged in North Carolina, South Carolina, and Georgia. Their estimates ranged from 0.14–0.18, with the estimate for the pooled adults (150–231 cm) equal to 0.15. Petersen et al. (2008) estimated Z from catch curves of adult fish (ages 9–14) in the Altamaha River in 2004 and 2005. They estimated Z at 0.19 for 2004 and 0.24 for 2005.

Schueller and Petersen (2010) developed estimates for age 1–3 fish (30–75+ cm) in the Altamaha River from acoustic tagging data and found much lower estimates of survival, with Z ranging from 1.08–3.51 over three years. However, mortality and emigration are confounded in their study, so their estimates of Z are likely biased high. Their results still suggest that mortality may be higher in the youngest fish.

Although these estimates are post-moratorium, they still include anthropogenic sources of mortality such as bycatch and ship strikes, and therefore are not true estimates of M.

Several age-constant and age-varying ways to estimate natural mortality based on maximum age and life-history parameters were explored (Figure 15). Then et al. (2014) suggested that maximum age-based estimators are more reliable than life-history-based estimators, at least for age-constant estimates. Age-constant estimates of M for a maximum age of 60 years ranged from 0.05–0.115 (Table 6; Figure 15).

Lorenzen's (1996) equation relating M to body weight to estimate natural mortality at age was used (Table 7; Figure 15). These estimates were scaled to a maximum age of 60, meaning that the estimates of natural mortality at age were scaled to ensure the proportion of the population left alive at age 60 would be equivalent to an age-constant estimate of M derived from a maximum age of 60 years. This resulted in estimates of M-at-age that ranged from 0.3 for age 1 down to 0.040–0.034 for ages 25-60+.

Then et al.'s (2014) recommended age-constant estimator produced the highest estimate of M, at M = 0.115, which was higher than the estimates of Z from the tagging models we examined (see section 6.12). Therefore, for age-constant M approaches, Hewitt and Hoenig's (2005) regression method was used which produced an estimate of M=0.07, consistent with what had been used in the last benchmark assessment. For age-varying M approaches, the Lorenzen method scaled to a maximum age of 60 years was used for the coast-wide and northern EPR analysis and 40 years was used for the southern EPR analysis.

2.6.2 Bycatch Mortality

While there is no longer a directed fishery, mortality still occurs when Atlantic sturgeon are caught as bycatch in a variety of fisheries throughout the species range. Atlantic sturgeon are caught predominantly in sink gill net gear (Stein et al. 2004; ASMFC 2007), but also pound nets, trawls, and drift and anchored gill nets. During the NMFS review to list Atlantic sturgeon under the ESA in 2012, it was determined that bycatch mortality was one of the primary threats to the species. The need to reduce or eliminate bycatch mortality for Atlantic sturgeon was identified in Amendment 1 to the FMP in 1998. There is limited data on Atlantic sturgeon bycatch, although there are several observer programs in place that provided data and are described in section 4. In 2003, an Atlantic Sturgeon Technical Committee Workshop on the status of Atlantic sturgeon identified several issues regarding bycatch of sturgeon in other fisheries. In 2007, the Sturgeon Technical Committee requested Board support to undertake a focused assessment of the Northeast Fisheries Science Center (NEFSC) Observer database. Findings (ASMFC 2007) indicated similar bycatch levels as a previous analysis (Stein et al. 2004) and indicated bycatch deaths resulting from sink gill nets could be curtailing recovery of some populations. In 2013, ASMFC and NMFS co-hosted a workshop to discuss solutions to reduce Atlantic sturgeon bycatch in southern New England and Mid-Atlantic gillnet fisheries which included some modifications in gear in this fishery as well as reduced soak times (NMFS and ASMFC 2013).

2.6.3 Ship Strike Mortality

Historical accounts of Atlantic sturgeon vessel interactions date back 150 years (Lossing 1866; Ryder 1890) and involved sturgeon jumping out of the water and primarily impacting sailing vessels or slow moving steam ships. In recent years there has been increased attention focused on the mortality of marine megafauna resulting from vessel strikes. Ship related deaths have been linked as a significant source of mortality for a number of taxa including large whales (Knowlton and Kraus 2001; Laist et al. 2001), sea turtles (Hazel et al. 2007), and fishes (Rowate et al. 2007; Simpson and Fox 2009; Brown and Murphy 2010; Balazik et al. 2012c), and was listed as a contributing factor in the 2012 ESA listing decision for Atlantic sturgeon in the New York Bight DPS (NOAA 2012).

In an analysis of vessel interactions with acoustically tagged Atlantic sturgeon, Balazik et al. (2012c) showed that ship strike deaths were due to deep ocean cargo vessels in narrow up-estuary sections of the James River (RKM 102-126), and particularly in an area with an engineered shipping lane, which large sturgeon used as movement corridor. However, the role vessel characteristics (e.g. draft/bottom clearance, speed, and propeller size) play in ship strike events is limited. Atlantic sturgeon appear capable of detecting some vessels and may exhibit avoidance behavior (Barber 2017) although their ability to escape the flows associated with the suction of propellers is likely limited given the levels of ship strikes noted in some systems.

At present we understand that ship strike mortality is a problem in some systems (e.g., important spawning rivers such as the Savannah, James, York, Delaware, and Hudson Rivers), however understanding of the true population level impacts (e.g., the extent and magnitude) remains limited due to our reliance on carcass reports in most system. Reported ship strike deaths in the James River have numbered more than 10 in some years which could represent a significant fraction of the adult population. The rate of carcass reports have increased recently (Figure 16), however it is not known if this is due to increased mortality events or improved carcass reporting. A study of deliberately released sturgeon carcasses estimated 33% reporting of ship-strike carcasses owing to carcasses becoming obscured by vegetation, lack of access, or large drift distances (Balazik, personal communication).

2.7 Feeding Behavior, Competition, and Predation

2.7.1 Egg and larval stage

There are no studies to indicate what larval Atlantic sturgeon prey upon in the wild. However, it is assumed that after they absorb the yolk sac, they feed on small bottom dwelling organisms (Gilbert 1989). Studies of other sturgeon species indicate that larvae in rivers feed on small mobile invertebrates, including cladocerans and copepods (Baranova and Miroshnichenko 1969; Miller et al. 1991). Miller et al. (1991) found that white sturgeon larvae primarily fed on amphipods.

During their lab test, Kynard and Horgan (2002) found that Atlantic sturgeon larvae (30 to 50 days old) preferred illumination and a white substrate. They hypothesize that an illuminated bright substrate may make it easier for young Atlantic sturgeon to locate moving prey. Laboratory rearing of larvae depends principally on *Artemia* sp. as prey, which the Atlantic sturgeon can readily consume (Kynard and Horgan 2002).

Kynard and Horgan (2002) hypothesize that larval and juvenile Atlantic sturgeon have a low predation risk. This hypothesis is based on the theory that migration upon hatching is stimulated by predation risk to embryos. Species that undergo high predation tend to migrate from the area immediately after hatching (Kynard and Horgan 2002). While this hypothesis has not been fully tested, Kynard and Horgan (2002) have determined that shortnose sturgeon embryos have few predators. After sampling predators in a spawning area, they found that only one fish, the fallfish (*Semotilus corporalis*), had sturgeon eggs in its stomach (Kynard and Horgan 2002).

2.7.2 Juvenile stage

Pottle and Dadswell (1979) examined the gut contents of juvenile Atlantic sturgeon in the St. Johns River, Florida. They found that juvenile Atlantic sturgeon fed on diptera and trichoptera, in addition to amphipods. Secor et al. (2000) found that juvenile Atlantic sturgeon in the Chesapeake Bay preyed upon annelid worms, isopods, amphipods, chironomid larvae, and mysids. Moser and Ross (1995) found polycheate worms, isopods, and mollusk shell fragments in the stomachs of juvenile sturgeon in North Carolina. An examination of 12 juvenile Atlantic sturgeon in the Connecticut and Merrimack Rivers showed a mix of amphipods and polychaetes (Kynard et al. 2000). In freshwater, juvenile Atlantic sturgeon ate plant and animal matter, sludgeworms, chironomid larvae, mayfly larvae, isopods, amphipods, and small bivalve mollusks (Scott and Crossman 1973). Scott and Crossman (1973) also noted that sturgeon consumed mud while foraging on the bottom.

Secor et al. (2000) analyzed the gut content of 12 juvenile Atlantic sturgeon in the Chesapeake Bay and found that sand, silt, and detritus accounted for 34% of the gut contents. Annelid worms made up 61% of the prey items, followed by isopods (*Cyathura polita* and *Cyathura* sp.; 23%), amphipods (*Leptocheirus plumulosus* and *Gammarus* sp.; 10%), chironomid larvae (1.6%), and mysids (*Neomysis americana*; 1.5%). One-third of the Atlantic sturgeon had empty guts (Secor et al. 2000). In this small study, Secor et al. (2000) did not find that juvenile Atlantic sturgeon preyed upon mollusks, despite their high biomass in the Chesapeake Bay.

Both juvenile Atlantic sturgeon and shortnose sturgeon occupy the same freshwater/saltwater interface nursery habitat, although shortnose sturgeon tend to be located in freshwater, while Atlantic sturgeon use more saline areas (Dadswell 1979; Dovel and Berggren 1983; Dovel et al. 1992; Kieffer and Kynard 1993; Haley et al. 1996; Bain 1997). Haley et al. (1996) collected the majority of juvenile Atlantic sturgeon in the Hudson River in deeper, mesohaline (3.0 ppt to 16.0 ppt) regions, while juvenile shortnose sturgeon were found most often in the shallower, freshwater (<0.5 ppt) zones of the estuary. Furthermore, bioenergetic comparisons showed that age-1 Atlantic sturgeon demonstrated better growth in brackish water (1 ppt to 10 ppt), than sympatric shortnose sturgeon juveniles (Niklitschek 2001). In contrast, Bain (1997) found that early juvenile Atlantic sturgeon had the same distribution as juvenile shortnose sturgeon in the Hudson River estuary during all seasons. Both species were similar in size, grew at about the same rate, had similar diets, and shared deep channel habitats early in life (Bain 1997). Additionally, Bain (1997) found that the distribution of adult shortnose sturgeon overlapped with the distribution of juvenile Atlantic sturgeon.

Haley et al. (1996) hypothesized that the freshwater/saltwater interface where both sturgeon species concentrate, may serve as a foraging ground, and that Atlantic and shortnose sturgeon may compete for food in this area. However, Pottle and Dadswell (1979) found that juvenile Atlantic and shortnose sturgeon in the St. Johns River preyed on different species. They found that Atlantic sturgeon preyed upon diptera, trichoptera, and some amphipods, while shortnose sturgeon preyed mostly upon cladocerans, amphipods, mollusks, and insect larvae (Pottle and Dadswell 1982). When reared in large outdoor tanks and fed an artificial diet, shortnose sturgeon juveniles fed at higher rates and grew more rapidly than similar sized Atlantic sturgeon (Niklitschek 2001).

In more southern rivers, juvenile Atlantic sturgeon and adult shortnose sturgeon may share parts of the river with similar salinity levels. This has been documented in the Savannah River during the fall and winter, and in the Altamaha River during warm summers (Kieffer and Kynard 1993).

Atlantic sturgeon juveniles would be expected to compete with other demersal feeding fishes in estuaries. In Mid-Atlantic estuaries these demersal feeders include catfishes, white perch, carp, spot, croaker, and hogchoker (Murdy et al. 1997).

2.7.3 Adult stage

It has been hypothesized that Atlantic sturgeon do not feed during spawning migrations. Research is currently being conducted in South Carolina to test this hypothesis (M. Collins, South Carolina Department of Natural Resources, personal communication). Post-spawning adults that remain in freshwater systems have been documented feeding on gastropods and other benthic organisms (Scott and Crossman 1973). In general, adult Atlantic sturgeon feed indiscriminately throughout their lives and are considered to be opportunistic feeders (Vladykov and Greeley 1963; Murawski and Pacheco 1977; Van den Avyle 1983; Bain 1997; Colette and Klein-MacPhee 2002). They feed on mollusks, polychaetes, gastropods, shrimps, isopods, and benthic fish in estuarine areas (Dadswell et al. 1984; Secor et al. 2000b; Colette and Klein-MacPhee 2002). In freshwater, their prey includes aquatic insects, nematodes, amphipods, and oligochaetes (Colette and Klein-MacPhee 2002).

Adult Atlantic sturgeon appear to have few ecological competitors. They spawn later in the season and in different areas than shortnose sturgeon, thus avoiding competition for egg deposition space in areas where their habitat overlaps (Bath et al. 1981; Gilbert 1989; Kynard and Horgan 2002). Other species that might use the same spawning habitat include anadromous species, such as white perch, striped bass, and American shad.

The ASSRT (2007) notes the following information on competition and predation in Atlantic and shortnose sturgeon:

> Atlantic sturgeon are benthic predators and may compete for food with other bottom-feeding fishes and invertebrates including suckers (*Moxotoma* sp.), winter flounder (*Pleuronectes americanus*), tautog (*Tautoga onitis*), cunner (*Tautagolabrus adspersus*), porgies (Sparidae), croakers (Sciaenidae), and stingrays (*Dasyatis* sp.) (Gilbert 1989). Specific information concerning competition between Atlantic sturgeon and other species over habitat and food resources is scarce. There are no known exotic or non-native species that compete directly with Atlantic sturgeon. There is a chance that species such as suckers or other bottom forage fish would compete with Atlantic sturgeon, but these interactions have not been elucidated (from ASSRT 2007).

The relationship between the federally endangered shortnose sturgeon and the Atlantic sturgeon has recently been explored. Shortnose sturgeon are sympatric with Atlantic sturgeon throughout most of their range. Larger, adult shortnose are suspected to compete for food and space with juvenile Atlantic sturgeon in rivers of co-occurrence (Pottle and Dadswell 1979; Bain 1997). Bain (1997) found that while shortnose and Atlantic sturgeon overlap in their use of the lower estuary, the overall distribution of the two species differed by river kilometers, providing evidence that Atlantic and shortnose sturgeon partition space within the Hudson River despite co-occurrence in channel habitats. This finding is consistent with Kieffer and Kynard (1993) who found that subadult Atlantic and adult shortnose sturgeon in the Merrimack River, Massachusetts were spatially separate except for brief use of the same saline reach in the spring. Kahnle and Hattala (1988) conducted late summer-fall bottom trawl collections in the lower Hudson River Estuary from 1981-1986 and found that most shortnose sturgeon occupied RKM 55-60 in water depths of greater than six meters. Even though there was overlap in river miles, there was separation by water depth. In Georgia, the distributions of adult shortnose and juvenile Atlantic sturgeons overlap somewhat, but Atlantic sturgeon tend to use more saline habitats than shortnose sturgeon (G. Roger, formerly Georgia Department of Natural Resources, personal communication; from ASSRT 2007).

Juvenile shortnose sturgeon apparently avoid competition for food with Atlantic sturgeon in the Saint John River, Canada by spatial separation, but adult shortnose may compete for space with similar-sized juvenile Atlantic sturgeon (Dadswell et al. 1984). Bain (1997) analyzed stomach contents of Atlantic and shortnose sturgeon in the Hudson River using gastric lavage and found clear differences in their diets. Polychaetes and isopods were primary foods retrieved from Atlantic sturgeon while amphipods were the dominant prey obtained from shortnose sturgeon (Bain 1997; from ASSRT 2007).

2.7.4 Predation

Very little is known about natural predators of Atlantic sturgeon. The presence of bony scutes are likely effective adaptations for minimizing predation of sturgeon greater than 25 mm TL (Gadomski and Parsley 2005). Documented predators of sturgeon (*Acipenser* sp.) include sea lampreys (*Petromyzon marinus*), gar (*Lepisosteus* sp.), striped bass, common carp (*Cyprinus* *carpio*), northern pikeminnow (*Ptychocheilus oregonensis*), channel catfish (*Ictalurus punctatus*), smallmouth bass (*Micropterus dolomieu*), walleye (*Sander vitreus*), grey seal (*Halichoerus grypus*), fallfish (*Semotilus corporalis*), and sea lion (*Zalophus californianus*) (Scott and Crossman 1973; Dadswell et al. 1984; Miller and Beckman 1996; Kynard and Horgan 2002; Gadomski and Parsley 2005; Fernandes 2008; Wurfel and Norman 2006).

Concerns have been raised that invasive species like flathead catfish (*Pylodictus olivaris*) and blue catfish (*Ictalurus furcatus*) are harming the recovery of anadromous species on the Atlantic coast (e.g., Brown et al. 2005, Schmitt et al. 2017). However, the evidence that these species are feeding on young-of-year or juvenile Atlantic sturgeon is inconclusive, and more work needs to be done to determine the extent of these interactions (see also Section 7.3).

There is little information regarding the marine diet of Atlantic sturgeon. Johnson et al. (1997) suggest that this is because of the low population density of Atlantic sturgeon offshore and the fact that most studies have focused on rivers and estuaries. A stomach content study by Johnson et al. (1997) found that Atlantic sturgeon off the coast of New Jersey preyed upon polychaetes, isopods, decapods, and amphipods. They also found that mollusks and fish contributed little to the diet, and that sand and organic debris were major components (Johnson et al. 1997). Scott and Crossman (1973) stated that in marine waters, Atlantic sturgeon fed on mollusks, polychaete worms, gastropods, shrimps, amphipods, isopods, and small fish (particularly sand lances).

Atlantic sturgeon compete with other bottom feeding fish and invertebrates. Gilbert (1989) lists winter flounder (*Pleuronectes americanus*), tautog (*Tautoa onitis*), cunner (*Tautogolabrus adspersus*), porgies (Sparidae), croakers (Sciaenidae), and stingrays (*Dasyatis* sp.) as possible competitors. Scott and Crossman (1973) report that Atlantic sturgeon are killed by sea lampreys, *Petromyzon marinus*; in South Carolina, long nose gar have been reported attacking sturgeon (Smith 1985).

3 HABITAT DESCRIPTION

See "Appendix A – Habitat" for more detail.

Atlantic sturgeon are motile, long lived, and use a wide variety of habitats found in Atlantic coastal waters of the United States, and major river basins from Labrador (Churchill River, George River, and Ungava Bay), to Port Canaveral and Hutchinson Island, Florida (Van den Avyle 1984). Atlantic sturgeon require freshwater habitats for reproduction and early life stages, in addition to hard bottom substrate for spawning (Vladykov and Greeley 1963; Huff 1975; Smith 1985). Coastal migrations and frequent movements between the estuarine and upstream riverine habitats are characteristic of this species (ASMFC 1998). In some systems, Atlantic sturgeon may prefer extensive reaches of silt-free higher gradient boulder, bedrock, cobble-gravel, and coarse sand substrates for spawning habitat (Brownell et al. 2001). Juvenile and adult Atlantic sturgeon frequently congregate in upper estuary habitats around the saltwater interface, and may travel upstream and downstream throughout the summer and fall, and during late winter and spring spawning periods. Adult Atlantic sturgeon may spend many years between spawning periods in marine waters (Brundage and Meadows 1982; Bain 1997; ASMFC 1998; NMFS 1998; Savoy and Pacileo 2003; ASSRT 2007).

3.1 Geographical and temporal patterns of spawning and migration

Atlantic sturgeon most often spawn in tidal freshwater regions of large estuaries (Hildebrand and Schroeder 1928; Moser and Ross 1995; Bain 1997; Colette and Klein-MacPhee 2002). This pattern is prevalent in New England and U.S. mid-Atlantic estuaries, where obstructions to migration at the fall line preclude upriver migration. In the south where some rivers remain unblocked as far as the fall line, Atlantic sturgeon may ascend hundreds of miles upstream into non-tidal rivers to spawn. Spring spawning migrations are cued by temperature, which causes fish in U.S. South Atlantic estuaries to migrate earlier than those in Mid-Atlantic and New England portions of their range (Smith 1985). In Florida, Georgia, and South Carolina, spawning migrations commence in February. In the Mid-Atlantic region spawning migrations commence between April and May (Hildebrand and Schroeder 1928; Dovel and Berggren 1983; Secor and Waldman 1999; Bain et al. 2000). In New England and Canada, spawning migrations occur from May through July (Collette and Klein-MacPhee 2002). In addition to a spring migration, there is recent discovery of a fall spawning migration (Smith et al. 2015; Balazik and Musik 2015). Later fall and winter migrations are movements out of the estuaries into marine habitats, and they generally occur from September through December depending on the latitude (Smith 1985).

3.2 Spawning Habitat Characteristics

Atlantic sturgeon generally spawn in tidal freshwater regions of estuaries, but spawn in inland, nontidal reaches of freshwater rivers in the southeastern part of their range. Most studies report that Atlantic sturgeon spawn in freshwater above the salt wedge in estuaries (Dovel 1979; Smith 1985; Van Eenennaam et al. 1996; Bain et al. 2000). For instance, Dovel (1978, 1979) reported that Atlantic sturgeon in the Hudson River, New York, spawn in freshwater above the salt wedge. Substrate is a key habitat parameter for Atlantic sturgeon, because a hard bottom substrate is required for successful egg attachment and incubation (Vladykov and Greeley 1963; Huff 1975; Smith 1985; Gilbert 1989; Smith and Clugston 1997; Secor et al. 2002; Bushnoe et al. 2005). Within rivers, the areas of cobble-gravel, coarse sand, and bedrock outcrops, which occur in the rapids complex, may be considered prime habitat. In northern rivers, these areas are nearer to the salt-wedge than in southern rivers. Atlantic sturgeon have been documented spawning in water from 3 m to 27 m in depth (Borodin 1925; Dees 1961; Scott and Crossman 1973; Shirey et al. 1999; Bain et al. 2000; Collins et al. 2000; Caron et al. 2002; Hatin et al. 2002); however, spawning depth seems to vary greatly depending upon the available depth range.

3.3 Egg and Larval Habitat

Eggs are deposited into flowing water and disperse following fertilization. After approximately 20 minutes, the demersal eggs become strongly adhesive and attach to hard substrates (Murawski and Pacheco 1977; Van den Avyle 1983). The eggs hatch after 94 to 140 hours. Late-stage larvae settle to demersal habitat following a pelagic yolksac larval period of about 10 days. This will be the principal type of habitat for the remainder of the sturgeon's life (NMFS 1998).

Larval Atlantic sturgeon (<4 weeks old) are < 30 mm (TL) (Van Eenennaam et al. 1996), and are assumed to inhabit the same riverine or estuarine areas where they were spawned (Bain et al. 2000; Kynard and Horgan 2002). Newly hatched larvae are active swimmers and leave the bottom to swim in the water column. Larvae exhibit benthic behavior once the yolk sac is absorbed (Smith et al. 1980, 1981). Bath et al. (1981) caught free embryos by actively netting the bottom near the spawning area, thus demonstrating that early life stages are benthic.

3.4 Juvenile Estuarine Habitat

Juvenile Atlantic sturgeon are thought to remain close to their natal habitats within the freshwater portion of the estuary for at least one year before migrating out to sea (Secor et al. 2000). Migrations to coastal areas occur between two and six years of age (Smith 1985), and are seasonal, with movement occurring north in the late winter, and south in fall and early winter (Dovel 1979; Smith 1985; NMFS 1998). Seasonal migrations of juveniles are regulated by changes in temperature gradients between fresh and brackish waters (Van Den Avyle 1984). Later-stage juveniles often enter and reside in non-natal rivers that lack active spawning sites (Bain 1997). Inter-estuarine migrations have been documented extensively in the literature (Dovel and Berggren 1983; Smith 1985; Welsh et al. 2002; Savoy and Pacileo 2003). These non-natal estuarine habitats serve as nursery areas, providing abundant foraging opportunities and thermal and salinity refuges. Therefore, these areas are very important to the Atlantic sturgeon's survival (Moser and Ross 1995).

3.5 Late Stage Juvenile and Adult Marine Habitat

Juvenile Atlantic sturgeon are known to emigrate out of their natal estuarine habitats and migrate long distances in the marine environment. Little is known about the habitat use of adult Atlantic sturgeon during the non-spawning season, particularly when the sturgeon return to marine waters (Bain 1997; Collins et al. 2000, Erickson et al. 2011). While at sea, adult Atlantic sturgeon have been documented using relatively shallow nearshore habitats (10 to 50 m in depth) (Laney et al. 2007; Stein et al. 2004); however, adult sturgeon have been captured at depths up to 75 m (Colette and Klein-MacPhee 2002). It is possible that individual fish select habitats in the same areas, or even possibly school to some extent (Bain et al. 2000; Stein et al. 2004; Laney et al. 2007). Stein et al. (2004) reported that Atlantic sturgeon were found mostly over sand and gravel substrate, and that they were associated with specific coastal features, such as the mouths of the Chesapeake Bay and Narragansett Bay, and inlets in the North Carolina Outer Banks. Laney et al. (2007) found similar results off the coasts of Virginia and North Carolina.

4 FISHERY-DEPENDENT DATA SOURCES

Historical landings are available for Atlantic sturgeon as well as landings up until the time of the moratorium. Since the moratorium, bycatch of Atlantic sturgeon remains a leading source of mortality. The data sources used in this assessment are described below. The SAS evaluated several sources of fisheries-dependent data for inclusion in the landings and bycatch estimates. Eliminated data sets included Maine's sampling of the commercial gill net fishery and Delaware Ship Strike Mortality Monitoring because of a short time series. Also excluded from analyses were Massachusetts Division of Marine Fisheries bycatch monitoring, USFWS Reward Program, and Delaware Division of Fish and Wildlife Voluntary bycatch logbook program due to low catch rates or reporting or limited access to the fishery after the listing.

4.1 Historical Landings

At the beginning of the 20th century, Atlantic sturgeon were among the top three species in weight of fish harvested commercially along the Atlantic coast (US Bureau of Fisheries 1907; US Commission of Fish and Fisheries 1884-1905). Records of commercial landings were initiated by the Federal government in 1880 through the US Commission of Fish and Fisheries (also known as the US Fish Commission), which collected landings data from fishers and port agents. This dataset represents the best available information on landings from this period, which was the peak of harvest for this species, but there are caveats about the accuracy of the data, including potential issues with species identification and lack of geographical coverage. The time series includes many years with no reported landings interspersed among years of high landings (Figure 1), because the newly formed US Fish Commission did not survey regional fisheries every year (Secor 2002). Further, New England fisheries were first surveyed after the Atlantic sturgeon fishery peaked. Reported landings peaked in 1890 at 3,348 mt. Landings declined precipitously soon after and have remained relatively low through the present.

In the beginning of the 20th century, the Atlantic sturgeon fishery was concentrated in the Delaware River and the Chesapeake systems, although this may also be indicative of concentrated sampling in those regions. Substantive landings also came from the southeastern states of North Carolina, South Carolina, and Georgia (Smith 1985). After the collapse of sturgeon stocks in the Mid-Atlantic States, landings for North Carolina, South Carolina and Georgia dominated the coastal landings. Landings for these states declined by the 1980s and coast-wide landings shifted to New York and New Jersey. By this time, most states had implemented some form of dealer reporting, making the landings from the end of the directed time series the most accurate.

Several states closed their sturgeon fisheries in the mid to late 1990s, and a coast-wide moratorium was implemented in 1998, ending the directed sturgeon landings time series.

4.2 Northeast Fisheries Observer Program and the At-sea Monitoring Program

The NMFS NEFSC's Fisheries Sampling Branch manages the Northeast Fisheries Observer Program (NEFOP) and the At-Sea Monitoring Program (ASM). NMFS monitors the NEFOP/ASM observer provider companies, provides training and certification, performs data quality assessments, processes pre-trip notification, and manages vessel selection across notification fisheries. Observers have played a vital role in the management of the Northeast and Mid-Atlantic fisheries since NEFOP's inception in 1989 and the establishment of ASM in 2010.

NEFOP/ASM observers collect catch, gear, fishing effort, and biological data over a range of commercial fisheries from Maine to North Carolina. Examples include the groundfish, herring, squid, surf clam and ocean quahog, and lobster fisheries. Observer coverage requirements were established under the Magnuson-Stevens Act and the Standardized Bycatch Reporting

Methodology (SBRM) Omnibus Amendment, the Marine Mammal Protection Act and the Endangered Species Act.

Data collected by observers are used to identify key characteristics of commercial fisheries in the Northeast and Mid-Atlantic regions. Catch data and biological information inform stock assessments. Samples from protected species, such as Atlantic sturgeon, provide life history information and data for bycatch estimation.

4.3 North Carolina Estuarine Gill-Net Fisheries

The North Carolina Division of Marine Fisheries (NCDMF) provides at-sea onboard observer coverage for the fall flounder fishery as well as other large and small mesh fisheries throughout the state. Additional large and small mesh trips are observed through the NCDMF alternate platform trips. These trips are conducted from NCDMF-owned vessels where the observers do not ride with the fisherman but observe from a distance.

In addition, the state of North Carolina received an Incidental Take Permit for their anchored estuarine gill-net fishery in July 2014 (Permit number 18102) limiting the number of interactions that can occur through this fishery and making reporting of takes mandatory within 24-48 hours of the take. If take numbers are approached for any Management Unit/season the fishery closes (gear comes out of the water) until the end of that season. The Chowan River is included in that ITP under Management Unit A, the Tar/Pamlico River is included under Management Unit C, the Neuse River is included under Management Unit C, and the Cape Fear River is included under Management Unit E.

4.4 South Carolina American Shad Gill-Net Fishery

Commercial shad fisheries in South Carolina are managed using a combination of seasons, gear restrictions, and catch limits implemented over several management units: Winyah Bay and Tributaries (Waccamaw, Pee Dee, Little Pee Dee, Lynches, Black and Sampit rivers); Santee River; Charleston Harbor (Wando, Cooper & Ashley rivers); Edisto River; Ashepoo River; Combahee River; Coosawhatchie River; Savannah River within South Carolina; Ocean Waters; and Lake Moultrie, Lake Marion, Diversion Canal, Intake Canal of Rediversion Canal and all tributaries and distributaries.

South Carolina DNR collected voluntary landings data by river system since 1979 and instituted mandatory catch and effort reporting in 1998. Beginning in 2000, licensed shad fishermen were also required to account for any sturgeon species captured in their nets. While reporting has not been fully implemented, as many licensed fishermen fish infrequently and provide incomplete, incorrect, or no effort data, SCDNR continues to work successfully with several cooperating commercial American shad gill-net fishermen in order to collect commercial catch and effort data on several river systems. Admittedly, there are likely still some gaps in these data, but they do provide the broadest temporal and spatial view of Atlantic sturgeon bycatch in fisheries for American Shad in South Carolina.

Additionally, in order to address sustainability, further restrictions to South Carolina's shad fishery took place in 2013. These changes in the shad fishery were the first to occur since the closure of the ocean-intercept fishery in 2005. The ASMFC mandated states develop river-specific sustainability plans for American Shad. The plan had to demonstrate that specific shad stocks could support commercial and recreational fisheries that would not diminish potential future stock reproduction and recruitment. Data used, in most cases, are landings that occurred since the 2007 stock assessment (i.e., after 2004). Sustainability for South Carolina Rivers was determined by catch trends (using both fishery-independent and fishery-dependent data), juvenile abundance, and fish passage counts at dams (Post 2012). During the same time, NMFS required South Carolina to account for and reduce the bycatch of Atlantic sturgeon in the shad fishery. To accomplish this, additional statewide gear restrictions (i.e., 50% statewide reduction in allowable gear; 80-90% reduction for high priority rivers) and changes to the legal fishing season were implemented. These two directives far exceeded any changes or restrictions imposed on South Carolina's shad fishery to date. The resulting plan was approved by the ASMFC Shad and River Herring Technical Committee and Management Board in 2013, and led to regulation changes passed into law by the South Carolina General Assembly in late 2013.

5 FISHERY-INDEPENDENT DATA SOURCES

5.1 Stock Assessment Subcommittee Criteria

The SAS established the following set of criteria for evaluating data sets and developing indices of relative abundance for Atlantic sturgeon:

1. Time series: Ideally, the time series should be 40 years long to account for the lifespan of Atlantic sturgeon. Recognizing that would eliminate most surveys, the SAS recommended at least 15 years of data be available in a survey.
2. Survey design: Surveys with statistical designs were preferred, such as surveys with random stratified sampling. Fixed-station surveys were considered if persistence throughout the time series can be demonstrated.
3. Gear: Surveys should operate with gear that is capable of catching Atlantic sturgeon and to which Atlantic sturgeon are available.
4. Temporal and spatial coverage: Only surveys that operate during a time and place where Atlantic sturgeon were available for capture should be considered. Examining the precision or proportion of zero catches of Atlantic sturgeon in a survey can be tools for evaluating this.
5. Methodology: Survey methodology should be consistent throughout the time series or changes should be able to be accounted for in the standardization process.

Fifty surveys were considered by the SAS and nearly half were ruled out for not encountering Atlantic sturgeon (<1% positive tows), or due to incomplete or unavailable data sets (Table 8). The SAS evaluated the remaining 26 data sets and rejected 17 for various reasons as indicated in Table 8 after preliminary data analysis or discussion with the data provider. Abundance indices were developed from the remaining nine surveys. Many of the criteria developed by the SAS had to be relaxed since there are few surveys designed to catch Atlantic sturgeon and many exhibited low occurrence in tows, had limited time series or spatial coverage, or fixed station sampling designs. The list of surveys that were developed into standardized indices of relative abundance of Atlantic sturgeon can be found in Table 9. A length cutoff was used for determining if a survey catches predominantly YOY (<500 mm), juvenile (500-1300 mm), or adult (>1300 mm) Atlantic sturgeon.

5.2 Surveys

5.2.1 Maine-New Hampshire Inshore Groundfish Trawl Survey

5.2.1.1 Survey Design and Methods

The Maine-New Hampshire Inshore Groundfish Trawl (ME-NH Trawl) Survey has been operating since the fall of 2000 and collects samples during the spring (May-June) and fall (October-November) in the coastal waters of Maine and New Hampshire. The survey uses a combination of stratified random sampling and fixed station sampling in five regions and four depth layers. Gear consists of a modified shrimp net with a 2-inch mesh in wings and ½-inch mesh liner in the cod end.

5.2.1.2 Biological Sampling

All catch is identified by species and counted, weighed for aggregate weight, and measured for length including Atlantic sturgeon.

5.2.1.3 Evaluation of Survey Data

Atlantic sturgeon were not caught reliably throughout the time series. When subset to regions 1-3, strata 1-2, and the months of May, October, and November, the amount of positive tows increased to 3%. Based on the lengths provided, this survey catches both juveniles and adults, with an average total length of approximately 1300 mm.

5.2.1.4 Development of Estimates and Index Standardization

An index of relative abundance was developed from the subset of data described above. A full model that predicted catch as a linear function of year, region, depth, and stratum was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial with year, region, and stratum.

5.2.1.5 Abundance Index Trends

Abundance was relatively high in the early time series and then decreased through the mid-2000s. It remained low and then began to increase again in 2014-2015 (Figure 17).

5.2.2 Connecticut Long Island Sound Trawl Survey

5.2.2.1 Survey Design and Methods

The Connecticut Long Island Sound Trawl (CT LIST) Survey is a random stratified survey with 3 bottom types and 4 depth strata that operates from April-December. The survey has been conducted from 1984-present and covers Connecticut and New York waters of Long Island Sound from 5-46 m in depth. The survey uses a 14-m high-rise otter trawl, 102-mm mesh in wings and belly, 76-mm mesh in the tailpiece and 51 mm mesh codend. The net is towed for 30 minutes at 3.5 knots. Catch is sorted by species and starting in 1992 all species are weighed in aggregate.

5.2.2.2 Biological and Environmental Sampling

Atlantic sturgeon are not caught in large numbers in this survey, averaging approximately 14 a year and a total of 458 since the survey began in 1984. Genetic tissue samples and photographs of Atlantic sturgeon collected since 2012 were taken as a condition of the NMFS Biological Opinion under which USFWS funded trawl surveys are operating. Atlantic sturgeon captured since 2009 received a passive integrated transponder (PIT) tag if PIT tag readers and tags were available.

5.2.2.3 Evaluation of Survey Data

The CT LIST survey rarely encounters Atlantic sturgeon, although they are present in the survey seasonally. The survey had 2% positive tows during the spring (May-June) and fall (September-November) months, with more Atlantic sturgeon caught in the fall (n = 311) compared to the spring (n = 111). The average length of sturgeon in these months was 1115 mm (*SD* = 245 mm), indicating that the survey predominantly catches large juveniles.

5.2.2.4 Development of Estimates and Index Standardization

While the survey has been conducted since 1984, environmental data have only been collected since 1992 and not continuously. Standardized indices were developed for the fall months, spring months, and fall and spring months combined. Since the lack of environmental data abbreviated this time series, a nominal index was developed for fall, spring, and fall-spring combined. Index standardization was also completed but did not significantly change the pattern of the index so the nominal index was recommended by the SAS due to its longer time series. Data from 2015 was not included since it was incomplete at the time of the assessment.

5.2.2.5 Abundance Index Trends

For the nominal index developed from the spring and fall months combined (Figure 18), abundance was low through the 1980s and increased through the early 1990s to the highest values in the time series. Abundance decreased again in the mid-1990s and was variable throughout the rest of the time series, with peaks in 1999, 2003, and 2007. Values in 2010-2013 were similar to the low values in the 1980s, with a slight uptick in the terminal year of 2014. Indices specific to the spring or fall months show some seasonal patterns (Figure 19).

5.2.3 New York State Department of Environmental Conservation Juvenile Atlantic sturgeon Abundance Monitoring Program

5.2.3.1 Survey Design and Methods

The New York State Department of Environmental Conservation's (NYSDEC) Juvenile Atlantic sturgeon Abundance Monitoring Program (JASAMP) began in 2006 and takes place in March through early May and targets a specific overwintering area for juvenile ATS, the soft-deep habitats (soft sediments in > 20 ft deep) of Haverstraw Bay (RKM 55-65, RM 35-39). The survey uses anchored gill nets of 7.6-, 10.2-, and 12.7-cm stretch mesh, 61-m long and 2.4-m deep. The three nets, positioned randomly by mesh size, are set perpendicular to shore and fished for approximately two hours through all tide stages (Sweka et al. 2007).

5.2.3.2 Biological and Environmental Sampling

All Atlantic sturgeon collected are measured for TL, FL, weighed, and examined for previous marks. A small piece of flesh is taken from the dorsal fin of each fish for genetic analysis, stored in ethanol, and sent to the genetics repository. Unmarked fish are tagged in the musculature under the dorsal fin with a PIT tag and in the base of the dorsal fin with a USFWS Dart tag. Water quality parameters are measured at all net sets.

5.2.3.3 Evaluation of Survey Data

The time series is too short (2006-2015) in respect to the lifespan of Atlantic sturgeon to be used in this assessment for analyses. The SAS did endorse the development of an index with the intention of using it in future assessments or updates when more years of data become available. Based on the lengths provided, the survey catches small juveniles on average.

5.2.3.4 Development of Estimates and Index Standardization

A full model that predicted catch as a linear function of year, tide, river mile, distance to salt front, bottom salinity, bottom temperature, and bottom dissolved oxygen was compared with nested submodels using AIC. The model with the lowest AIC value was a zero-inflated negative binomial that included year, tide, bottom temperature, distance to salt front, and effort which was included as an offset.

5.2.3.5 Abundance Index Trends

The index of relative abundance of Atlantic sturgeon began in 2006 at its lowest point and gradually increased to its highest value in 2015, with one notable decline in 2013 (Figure 20).

5.2.4 New Jersey Ocean Trawl Survey

5.2.4.1 Survey Design and Methods

The New Jersey (NJ) Ocean Trawl Survey is a multispecies survey that started in August 1988 and samples the nearshore waters from the entrance of New York Harbor south to the entrance of the Delaware Bay five times a year (January, April, June, August, and October). In 1989 there were six cruises (December and February were sampled) and a 20-minute tow duration was adopted. In 1990 the December and January cruises were combined into a single cruise in January. There have been five vessel changes over the course of the survey; the R/V Seawolf has been used since 2002. There are 15 strata with five strata assigned to three different depth regimes; inshore (3 to 5 fathoms), mid-shore (5 to 10 fathoms), and off-shore (10 to 15 fathoms). Station allocation and location is random and stratified by strata size. Approximately 39 tows of 20-minute duration are completed per cruise. The survey extends from Sandy Hook to Cape May, New Jersey, and offshore to the 90’ isobath.

The survey net is a two-seam trawl with forward netting of 4.7-inch stretch mesh and rear netting of 3.1-inches stretch mesh. The codend is 3.0-inches stretch mesh and is lined with a 0.25-inch bar mesh liner. Each trawl is 20 minutes long. A series of water quality parameters, such as surface and bottom salinity, temperature, and dissolved oxygen are also recorded at the start of each tow.

5.2.4.2 Biological Sampling

The total weight of each species is measured in kilograms and the length of all individuals, or a representative sample by weight for large catches, is measured to the nearest centimeter. Through 2015, a total of 362 Atlantic sturgeon were caught by the trawl survey and all were released alive.

5.2.4.3 Evaluation of Survey Data

The time series is relatively long (1990-2015) and the survey operates in a region that encounters sturgeon, particularly when subset to the inshore and mid-shore strata during the months of January, April, June, and October cruises.

5.2.4.4 Development of Estimates and Index Standardization

A standardized index of relative abundance was developed from the subset to years (1990-2015), months and strata as described above. A full model that predicted catch as a linear function of year, stratum, depth, cruise, bottom salinity, bottom temperature, and bottom dissolved oxygen was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year, stratum, and bottom temperature.

5.2.4.5 Abundance Index Trends

The index of abundance began relatively high in 1990 and decreased to a low by the mid-1990s (Figure 21). The index remained variable through the late-1990s and early-2000s but began to increase in the mid-2000s through the terminal year of 2015 with the exception of the small values in 2011-2012.

5.2.5 Northeast Area Monitoring and Assessment Program Trawl Survey

5.2.5.1 Survey Design and Methods

The Northeast Area Monitoring and Assessment Program (NEAMAP) Trawl Survey began sampling the coastal ocean from Martha's Vineyard, Massachusetts to Cape Hatteras, North Carolina since the fall of 2007. The survey area is stratified by both latitudinal/longitudinal region and depth. A four-seam, three-bridle, 400x12-cm bottom trawl is towed for 20 minutes at each sampling site with a target speed-over-ground of 3.0 kts. The net is outfitted with a 2.54-cm knotless nylon liner to retain the early life stages of the various fishes and invertebrates sampled by the trawl. The survey conducts two cruises a year, one in the spring (April-May) and one in the fall (September-November). A total of 150 sites are sampled per cruise, except 160 sites were sampled in the spring and fall of 2009 as part of an investigation into the adequacy of the program's stratification approach.

5.2.5.2 Biological and Environmental Sampling

For each tow, the catch is sorted by species. Atlantic sturgeon are measured for length, weight, and sex when possible. PIT tags, if present, are also recorded. A number of variables (profiles of water temperature, salinity, dissolved oxygen, and photosynthetically active radiation), atmospheric data, and station identification information are recorded at each sampling site.

5.2.5.3 Evaluation of Survey Data

The time series is too short (2007-2015) in respect to the lifespan of Atlantic sturgeon to be used in this assessment for analyses. The SAS did endorse the development of an index with the intention of using it in future assessments or updates when more years of data become available. The survey encountered Atlantic sturgeon at higher rates when subset for April, May, and October and depth strata 1-3. Based on the lengths provided, the survey predominantly catches juveniles in the spring (April-May average TL = 1175 mm +/- 307 mm; n = 82) and adults in the fall (October average TL = 1324 mm +/- 290 mm; n = 98).

5.2.5.4 Development of Estimates and Index Standardization

The data set was subset to April, May, and October and depth strata 1-3 and a standardized index of relative abundance was developed. In the first year of data (2007), only fall data were available. A full model that predicted catch as a linear function of year, stratum, depth, wind speed, salinity, water temperature, air temperature, barometric pressure, and dissolved oxygen was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year, depth, and dissolved oxygen. Abundance indices were also developed for spring and fall months separately. For the spring months (April-May), the model with the lowest AIC value was a negative binominal that included year, depth, and dissolved oxygen. For the fall month (October), the model included year and water temperature.

5.2.5.5 Abundance Index Trends

The survey of relative abundance of Atlantic sturgeon developed from the NEAMAP survey began with low values in 2007 (although this data point only has fall data) and slowly increased to a high at 2010 (Figure 22). The survey declined again in 2011 until another peak in 2014, although with a large margin of error. Indices were standardized for the spring and fall months separately as well (Figure 23) and seasonal differences can be observed, such a large fall peak in 2014 that is not present in the spring.

5.2.6 Virginia Institute of Marine Science Shad and River Herring Monitoring Survey

5.2.6.1 Survey Design and Methods

The Virginia Institute of Marine Science (VIMS) Shad and River Herring Monitoring Survey began in 1998 and operates in the James, York, and Rappahannock rivers during the months of February-May. Staked gill nets of 900-ft in length are used in the James and York rivers at sites that were identified as traditional shad fishing locations. On the Rappahannock River, the staked gill net is 912 ft long. Each gill net is fished one day a week during the spring spawning run.

5.2.6.2 Biological and Environmental Sampling

While this survey is designed to target shad and river herring, Atlantic sturgeon has been encountered during sampling times. Atlantic sturgeon are counted and released. Air temperature, surface water temperature, and salinity are recorded at every sampling event.

5.2.6.3 Evaluation of Survey Data

Atlantic sturgeon were rarely encountered during the months of February and May, so only the months of March and April were used in consideration of developing an index of relative abundance. During these months, a total of 225 Atlantic sturgeon have been caught since 1998 and on average the survey encounters juveniles (March average TL = 801 ± 138 mm; April average TL = 758 ± 202 mm). Because the survey uses a fixed station design, analyzing for persistence was pursued but not completed due to the lack of multiple sampling events at each station.

5.2.6.4 Development of Estimates and Index Standardization

A standardized index of relative abundance of Atlantic sturgeon was developed from this survey using only the months of March and April. A full model that predicted catch as a linear function of year, river, salinity, water temperature, and air temperature was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year, river, and water temperature.

5.2.6.5 Abundance Index Trends

The index of Atlantic sturgeon abundance began relatively high in 1998 and decreased to the lowest points in the survey from 2001-2004 (Figure 24). The index began increasing in 2005 to a series high in 2006 but declined again from 2008-2012. The last years of the survey, 2013-2015, suggested that the population in this region is increasing and it ends on another high point in the terminal year.

5.2.7 North Carolina Program 135 Survey

5.2.7.1 Survey Design and Methods

The North Carolina Program 135 (NC p135) is designed as a striped bass independent gill-net survey. NC p135 is a random stratified multi-mesh monofilament gill-net survey, used to monitor the Albemarle and Roanoke striped bass populations and collect information on other species. The survey began in October 1990 and the fishing year is divided into three segments: (1) a fall/winter survey period, which begins approximately 1 November and continues through 28 February and has 7 sample zones with 22 grids per zone, (2) a spring survey period which begins 1 March and continues through approximately June 30 and operates only in the western Albemarle Sound zone, and (3) a summer survey period which starts July 1 and continues through October 30 in 6 sample zones. Survey activities are conducted in a portion of Croatan Sound, the Alligator River, Chowan River, and in the Albemarle Sound near the mouths of the Roanoke, Yeopim, Perquimans, and Scuppernong rivers. For the fall/winter survey period two gangs of twelve meshes (2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 8, 10 inch stretch) of gill nets are set by each of the two survey crews. Each crew fishes four sets of nets; two floating (large and small meshes separate) and two sinking (large and small meshes separate). The full complement of nets for each crew contains 960 yards of webbing. Nets are hung in 40-yard sections with a hanging coefficient of 0.50 and approximately 9 feet deep. For the fall/winter survey period the soak time for each selected grid is 24 hours. One unit of effort is defined as a sample and sample equals on 40-yard net soaked for 24 hours. Effort for all mesh sizes is equal except when nets are damaged or hampered by debris in rough weather.

The first year (1990) of sampling underwent some changes and therefore was not used in this analysis. Sampling in June and the summer period (July-October) was discontinued after 1994. No other changes could be determined from the program documentation sampling methods since 1991, except the addition of more habitat parameters, and tag and age coding for striped bass. These changes do not impact estimates of abundance for Atlantic sturgeon.

5.2.7.2 Biological and Environmental Sampling

Atlantic sturgeon collected were counted and measured for total length (mm). The date, weather elements, water depth (m), temperature (^{o}C), salinity (ppt), dissolved oxygen (mg/L), and effort parameters are recorded for each mesh/site combination.

5.2.7.3 Evaluation of Survey Data

In the fall (November-February), the survey caught roughly an equal number of juveniles as YOY, but it was variable within years and only two adults were caught in the fall time series. Atlantic sturgeon were predominantly caught in the quadrants 2-7. In the spring, slightly more juveniles were caught than YOY and only one adult was caught in the entire spring time series. There were 1% positive tows in the fall months, slightly less in spring months.

5.2.7.4 Development of Estimates and Index Standardization

Both a fall (November-February) and a spring index were developed from this survey. A full model that predicted catch as a linear function of year, quadrant, depth, and surface temperature was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year, so the spring index was developed as a nominal index. For the fall index, the negative binomial with year, quadrant, and surface temperature had the lowest AIC.

5.2.7.5 Abundance Index Trends

For the spring index, values were low from the first year of 1991 until the early 2000s and then low again through the mid-2000s (Figure 25). The index was variable for the remaining years, with peaks in 2008 and 2013-2014 and low points in 2010-2011. For the fall index, abundance began mid-range in 1990 and decreased through the mid-1990s (Figure 26). The index was variable with high points in 1997, 2000, 2007, and 2012 and low points in 2002-2003 and 2010.

5.2.8 South Carolina Edisto Sturgeon Monitoring Project Survey

5.2.8.1 Survey Design and Methods

Sampling Atlantic sturgeon in the Edisto River is part of a long-term monitoring project funded by NOAA through the Atlantic Coastal Fisheries Cooperative Management Act. This sampling for sturgeon occurred from January-May in 1994 and 1995, from January-December in 1996-2000, from March-December in 2001-2003, and during May-September in 2004-2015. The sampling gear targeted juveniles at or near the salt front, and the primary sampling method was drift gillnets 92 meters long, 7.5 meters deep, and with 12.5 and 14.0 cm stretched-mesh monofilament, although set nets were also used during some years (i.e., 2000, 2001 and 2002). The sampling site was consistent year-to-year (RKM 28.2) as the gear was fished in a snag-free portion of the river and this was the only adequate sampling location in the brackish estuary. Exceptions occurred in low flow years (i.e., 2000, 2001 and 2002) when nets were set further up river in order to increase catches of juveniles. During 1994-2003 project objectives focused solely on length distribution of younger fish and targeted mostly YOY (<500mm). Beginning in 2003, effort was standardized to address overall abundance for all life stages. Catch rates were variable and may be an indicator of varying year class strength or sampling inefficiencies due to environmental factors (e.g., water salinity or river discharge) that fluctuate at the sampling location year-to-year.

5.2.8.2 Biological and Environmental Sampling

Fork length, total length, and weight is measured on captured Atlantic sturgeon and PIT tag information is recorded. Station number and temperature are also collected at each sampling site.

5.2.8.3 Evaluation of Survey Data

Because this was a fixed station survey focused on an area near the salt front, an analysis for persistence was attempted but not completed since there were too few stations for the analysis. Atlantic sturgeon were encountered during this survey but not at the St. Pierre strata. From 1994-2015, over 4,000 Atlantic sturgeon (174-2,102 mm TL) including 2,003 age-1 Atlantic sturgeon (< 525 mm) have been collected.

5.2.8.4 Development of Estimates and Index Standardization

A standardized index of relative abundance for Atlantic sturgeon was developed excluding the St. Pierre strata because no Atlantic sturgeon were caught there. A full model that predicted catch as a linear function of year, station, and temperature was compared with nested submodels using AIC. Because there was no standardized sampling design for effort in years 1994-2003, and was solely focused on targeting juveniles and included multiple gears, the model was applied for years 2004-2015 only when consistent effort and gears were used. Also, in order to account for years with high freshwater input when YOY dominated the catch, fish <550mm were excluded from the time series. This approach allowed for more appropriate abundance estimates across the time series for age 2 and older fish that are able to tolerate a wider range of salinities. The model with the lowest AIC value was a negative binomial that included all variables.

5.2.8.5 Abundance Index Trends

The index of relative abundance developed from the South Carolina Edisto survey data was variable from 2004-2015 (Figure 27), with a declining trend in the last 3 years.

5.2.9 US Fish and Wildlife Cooperative Tagging Cruise

5.2.9.1 Survey Design and Methods

The US Fish and Wildlife Service Cooperative (USFWS Coop) Winter Tagging Cruise began in 1988 and operated from January-February in the overwintering grounds off North Carolina and Virginia (the last USFWS Coop was conducted in 2016). Most of the habitat surveyed during the cruise was within state waters, although some years the survey went beyond state waters. This survey does not have a statistical design and all habitat types are not sampled equally since effort is targeted for striped bass, restricted to depths over approximately eight meters (for safety reasons) and hard-bottom habitats are avoided (to avoid damage to habitat and gear). Although its goals were to capture and tag migratory striped bass, Atlantic sturgeon were encountered on a regular basis and were tagged from 1988 through 2010. Four stern trawlers and one side trawler have been used during this survey and maximum tow duration is 30 minutes in order to reduce bycatch and maximize survival.

5.2.9.2 Biological and Environmental Sampling

When Atlantic sturgeon are captured, they are counted, tagged, measured, and weighed. Tissue from the barbell or caudal fin clip is also removed for genetic analysis and some pectoral fin spine sections have been removed in the past for ageing. Since 1994, all Atlantic sturgeon have been scanned for coded wire tags or PIT tags. All untagged Atlantic sturgeon are tagged prior to release. Environmental variables are collected with each tow including surface temperature, depth, air temperature, and surface salinity.

5.2.9.3 Evaluation of Survey Data

The lack of statistical design for this survey was a concern for the SAS, but Atlantic sturgeon were encountered regularly so an index of relative abundance was developed. There are gaps in the survey (the survey was not conducted on the trawl vessel in 2012 and 2013 due to funding issues) and due to the lack of permits for handling sturgeon in recent years, methodology changed to avoid encountering them. For this reason, only the years of 1988-2010 were considered for index standardization. The survey predominantly catches juveniles (average TL = 992 mm, SD = 196 mm).

5.2.9.4 Development of Estimates and Index Standardization

A standardized index of relative abundance was developed for this survey. A full model that predicted catch as a linear function of year, depth, air temperature, water temperature, salinity (although not complete throughout the time series), and latitude and longitude was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year and depth.

5.2.9.5 Abundance Index Trends

The index of relative abundance for Atlantic sturgeon developed from the USFWS Coop cruise was variable throughout the time series (Figure 28). There were some peaks in abundance in 2002 and 2006-2009 but many low points including the terminal year of 2010.

5.3 Summary of Index Data

Nine fishery-independent surveys were developed into indices of relative abundance of Atlantic sturgeon, although NEAMAP, JASAMP, and SC Edisto were not used in modeling approaches due to the short time series. Those surveys may be included in the modeling approaches in future assessment updates when they reach the 15-year minimum standard.

Many of the criteria for survey selection had to be relaxed and therefore many of the surveys developed into indices only encountered sturgeon in 1-3% of the tows. Time series ranged from 9-26 years, none of which reached the goal of a 40-year time series. Two of the nine surveys, VIMS Shad and River Herring Monitoring Survey and SC Edisto, were from fixed station surveys where persistence could not be established due to limited stations in those surveys for the analysis. Index values and associated standard errors vary from survey to survey (Table 10; Figure 29).

6 METHODS AND RESULTS

6.1 Effective Population Size

6.1.1 Background of Analysis

Effective population size is a population genetics metric that provides important information on the genetic welfare of populations (Palstra and Ruzzante 2008; Husemann et al. 2016). This measure describes an idealized population with the same rate of genetic loss as the observed population (Wright 1938). In practice, effective population size is usually much smaller than census population size (Vucetich et al. 1997; Palstra and Fraser 2012). A variety of factors, such as fluctuations in abundance, skewed sex-ratios, non-random mating, and variability in reproductive success can reduce effective population size below the census population size.

Effective population size complements traditional demographic perspectives. This metric is directly linked to the rate of genetic drift, a process through which genetic diversity is lost through random chance (Husemann et al. 2016). Over time, genetic drift leads to allelic fixation and populations may lose their ability to adapt to future change (Lande 1988). Moreover, when effective population sizes are low, genetic drift can override selective pressures and erode fitness. Given the recent demographic bottlenecks (Secor 2002) and limited contemporary gene flow observed in Atlantic sturgeon (Grunwald et al. 2008), estimates of effective population size can help inform managers on the status and recovery of populations.

Estimates of effective population size were generated for 11 rivers and a sound using a genetic baseline developed at the U.S. Geological Survey (USGS) Leetown Science Center in Kearneysville, West Virginia. In addition, the availability of a large amount of genetic data for the Hudson River enabled an examination of changes in effective population size through time (1996-2015) for this population

6.1.2 Methods

Genetic Baseline

Genotypes from 1,658 Atlantic sturgeon representing 50 collections from 11 rivers plus one sound (Albemarle, North Carolina) were used to characterize the effective population size of

Atlantic sturgeon populations (Table 11). All individuals included in the baseline were captured in the riverine environment, except for one collection, Albemarle Sound. The Albemarle Sound samples were collected in tidal waters outside of a known spawning area. This is a known weakness of the current baseline, as it may represent sturgeon from several spawning populations within the Carolina DPS. Leetown Science Center is actively working with another agency to incorporate additional collections from the Carolina DPS, however these samples were not yet available at the time this report was prepared. River-resident juveniles (<500 mm TL; RRJ) and adults (≥1,500 mm TL) were included in the baseline. Individuals outside of this size-criteria were excluded from the genetic baseline due to the extensive dispersal of juvenile and adult Atlantic sturgeon outside of spawning. The only exception is that subadults were used to characterize the St. Lawrence River, as these were the only samples that we have been able to access. All collections within a river were aggregated to maximize the number of samples available to produce each estimate. Estimates were also generated for each collection from the Hudson River to facilitate an examination of trends over time.

Extraction of DNA and Genotyping

Atlantic sturgeon samples were genotyped at the USGS Leetown Science Center. Whole genomic DNA was extracted from tissue samples using the Qiagen Blood and Tissue extraction kit (Qiagen, Valencia, California, USA). All samples were screened for 12 Atlantic sturgeon microsatellite loci (*LS*19, *LS*39, *LS*54, *LS*68, *Aox*12, *Aox*23, *Aox*45, *AoxD*170, *AoxD*188, *AoxD*165, *AoxD*44, *AoxD*241; described in May et al. 1997; King et al. 2001; Henderson-Arzapalo and King 2002).

Estimation of Effective Population Size

Estimates of effective population size (N_e) were generated for each collection in NeEstimator (Do et al. 2014) using a rare allele cutoff of 0.02. Confidence intervals (95%) were produced using the jackknife approach.

6.1.3 Results

Effective population sizes varied considerably across the range of Atlantic sturgeon. Several rivers in the baseline exhibited very low effective population sizes (e.g., York, Albemarle, Ogeechee, and James; Table 11; Figure 30). The Hudson and Altamaha rivers exhibited two of the largest effective population sizes observed across the range of Atlantic sturgeon. This is consistent with earlier reports that these are the largest contemporary populations in the United States (ASSRT 2007; Kahnle et al. 2007; Peterson et al. 2008), and previously published estimates of effective population size (Moyer et al. 2012; O'Leary et al. 2014). The Savannah River also showed large effective population size relative to the other U.S. populations.

The Hudson River collections were the most robust in terms of sample size and length of the time series. Estimates of effective population size for the Hudson River ranged from 74.2 to 479.1 and were similar for adults and juveniles between 2006 and 2015 (Table 12; Figure 31). Confidence intervals were broad and in many instances had upper limits that could not be interpreted (infinite). Still, there may be a trend towards a reduction in effective population size between the early samples (1996-1997) and the more recent samples (2006-2015). Given the uncertainty of estimates in the current time series, future studies may consider the use of genomic approaches to provide more precise estimates of effective population size.

Based on this analysis, many Atlantic sturgeon populations are considered at significant risk of genetic drift, allelic fixation, and loss of genetic diversity (Kimura and Ohta 1969; Allendorf 1986). This is supported by reports by O'Leary et al. (2014) and Farrae et al. (2017), who projected future losses of genetic diversity for several populations. Moreover, many of the populations that were not represented in our genetic baseline are thought to be small and as such likely have very small effective population sizes. These relict populations are likely to be at even greater risk for loss of genetic diversity (Moyer et al. 2012). Since genetic diversity is linked to population fitness and future adaptive potential (Reed and Frankham 2003; Jump et al. 2009), continued monitoring and management consideration of effective population size in Atlantic sturgeon populations is warranted (Moyer et al. 2012).

6.2 Bycatch Estimates

6.2.1 Northeast Fisheries Observer Program and the At-sea Monitoring Program

6.2.1.1 Background of Analysis and Model Description

Analysis subsequent to previous estimates of sturgeon discards (Stein et al. 2004; ASMFC 2007), indicated that ratio estimators used in these early analyses may not be sufficient because Atlantic sturgeon encounters within defined spatial and temporal strata were more heterogeneous than desirable for a ratio estimator. Additionally, an examination of observer data indicated that the species mix within a trip may be a better predictor of Atlantic sturgeon encounter rates than the traditional variables used to describe a stratum such as mesh and gear, and a model-based approach may help to resolve some of the heterogeneity within a stratum. Accordingly, a generalized linear model (GLM) framework was developed to estimate Atlantic sturgeon discards in federal waters (Miller and Shepherd 2011).

This GLM framework was carried forward to estimate Atlantic sturgeon discards for this benchmark assessment. The GLM modeled Atlantic sturgeon takes on each trip as a function of the trip-specific species mix, year, and quarter. In Miller and Shepherd (2011), the species mix considered was comprised of those species currently managed with federal fishery management plans. However, in the approach applied here, the species considered as covariates were those species caught most on observed hauls encountering Atlantic sturgeon. More specifically, the total hail weights were estimated for all individual species on hauls that encountered Atlantic sturgeon and the species included as covariates were those whose cumulative sums represented 95% of the total hail weights on these hauls (Table 13 and Table 14). Depth and mesh were also examined as potential covariates; however, these variables were not included because they were often missing and can change substantially over the course of a trip. The composition of species landed on a trip was thought to be a proxy for differences in mesh size and depth.

Following and Miller and Shepherd (2011), a quasi-Poisson assumption was used for modeling Atlantic sturgeon takes as a function of species landed, year, and quarter factors, permitting the variance to be greater than that associated with a Poisson distribution. Each species was included as a binary predictor variables; runs that included species landed weights as continuous variables had convergence problems. The general model for the log-average take on a trip i was:

$$\ln(\hat{T}_i) = \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \cdots + \hat{\beta}_p X_{pi}$$

where $X_{1i}, \ldots, X_{pi}$ represent the p species, gear, quarter covariates including any modeled interactions, and $\hat{\beta}_p$ represent estimated parameters.

Candidate models were fit separately to all observed bottom otter trawl and gill-net (sink and drift) trips. Models were fit to an appropriate subset of observer trips between 2000 and 2015. This subset of observed trips included all coastal statistical areas (Figure 32) and those observer programs that encountered Atlantic sturgeon and had a representative geographic range. Model selection was robust to the choice of included areas and observer programs. The species included as covariates for each gear are detailed in Tables 1 and 2 for otter trawls and gill nets, respectively.

Candidate models included the following factors and interactions:

1. No covariates
2. Quarter
3. Year
4. Quarter + Year + Quarter:Year
5. Species
6. Species + Quarter + Species:Quarter
7. Species + Year + Species:Year
8. Species + Year + Quarter + Species:Quarter + Species:Year
9. Species + Year + Quarter + Species:Quarter + Species:Year + Year:Quarter
10. Species + Year + Quarter + Species:Quarter + Species:Year + Year:Quarter + Species:Quarter:Year

For each gear (otter trawl and gill net), the best performing model was selected based on $QAIC_c$; the preferred model was the one with the minimum $QAIC_c$ value.

To predict Atlantic sturgeon take for all commercial landings, landings for each trip between 2000 and 2015 in the vessel trip report (VTR) database were determined for each species covariate. Using the estimated coefficients from the best performing model for each gear, the expected Atlantic sturgeon take was predicted for each VTR trip where information was available on whether the species was landed, and, if necessary, year and quarter. Total annual discard estimates were the sums of all predictions from the best-performing model for trips made in the relevant year.

To estimate dead bycatch, GLMs were fit to data based only on those Atlantic sturgeon encounters where individuals were recorded as dead. These models, however, resulted in nonsensical estimates for the total expected Atlantic sturgeon take when expanded to the VTR trips, presumably due to low sample sizes. As a result, dead discards were estimated by calculating the proportion of observed Atlantic sturgeon recorded as dead and applying this proportion to the total take estimate.

To explore patterns in Atlantic sturgeon bycatch, the distributions of depths and temperatures on observed hauls encountering Atlantic sturgeon were compared to those hauls that did not encounter Atlantic sturgeon using Kolmogorov-Smirnov tests.

6.2.1.2 Results

The best performing model fitted to trip-specific observer bottom otter trawl data was model 6 that allowed quarterly effects of the species mix on Atlantic sturgeon take (Table 15 and Table 16). Model 10 failed to converge. The best performing model fitted to trip-specific observer gillnet data was model 9 that allowed yearly and quarterly effects of the species mix on Atlantic sturgeon take as well as the interaction between year and quarter (Table 17 and Table 18). Model 10 again failed to converge.

The best performing model for each gear type was applied to vessel trip reports to predict Atlantic sturgeon take for all trips. The total bycatch of Atlantic sturgeon from bottom otter trawls ranged between 624–1,518 fish over the time series (Table 19; Figure 33). The proportion of the encountered Atlantic sturgeon recorded as dead ranged between 0–18% and averaged 4%. This resulted in annual dead discards ranging from 0–209 fish. Likewise, the total bycatch of Atlantic sturgeon from sink and drift gill nets ranged from 253–2,715 fish (Table 20; Figure 34). The proportion of Atlantic sturgeon recorded as dead ranged between 12–51% and averaged 30%, resulting in annual dead discards ranging from 110–690 fish.

Otter trawls and gillnets caught similar sizes of Atlantic sturgeon, with most fish in the 100 – 200 cm total length range, although both larger and smaller individuals were encountered (Figure 35).

Over all gears and observer programs that have encountered Atlantic sturgeon, the distribution of haul depths on observed hauls that caught Atlantic sturgeon was significantly different from those that did not encounter Atlantic surgeon (KS test: $D = 0.60$, $p < 0.001$) with Atlantic sturgeon encountered primarily at depths less than 20 m (Figure 36). Likewise, the distribution of surface water temperatures on observed hauls encountering Atlantic sturgeon was significantly different from those not encountering Atlantic sturgeon KS test: $D = 0.14$, $p < 0.001$) with Atlantic sturgeon primarily encountered at water temperatures of approximately 45–60º F (Figure 37). The spatial distribution of Atlantic sturgeon encounters on observed bottom otter trawls and gillnets by semester are depicted in Figure 38-Figure 41.

6.2.2 North Carolina estuarine gill-net fishery Atlantic sturgeon bycatch estimates

6.2.2.1 Background of Analysis and Model Description

Data

The North Carolina Division of Marine Fisheries' (NCDMF) Sea Turtle Bycatch Monitoring Program (Program 466) and Alternative Platform Observation Program (Program 467) are the primary programs by which the NCDMF collects information on bycatch from the state's commercial fisheries. Currently, these programs are limited to observations of North Carolina's estuarine gill-net fishery.

The number of commercial fishery trips observed by Programs 466 and 467 in management unit A has been limited (Figure 42), though most Atlantic sturgeon bycatch occurs in this area. To supplement information on bycatch of Atlantic sturgeon in management unit A for the purposes of model development, data from NCDMF's Striped Bass Independent Gill-Net Survey (Program 135) were used. While this program uses a variety of mesh sizes, only data collected from those mesh sizes that are permitted in the commercial fishery were used in the analysis (small: 3.0 and 3.5 ISM; large: 5.0, 5.5, and 6.0 ISM). Additionally, data collected during times and in areas when and where commercial fisheries are restricted were excluded from the analyses.

An estimate of total effort for North Carolina's estuarine gill-net fishery was needed to predict the bycatch for the entire fishery. Total effort was estimated by combining information from three NCDMF monitoring programs: Sea Turtle Bycatch Monitoring Program (see above), Trip Ticket Program, and Commercial Fish House Sampling Program (Program 461). Effort was measured as soak time (days) multiplied by net length (yards).

Commercial fisheries statistics in North Carolina are collected under a mandatory reporting program, the NCDMF Trip Ticket Program (Lupton and Phalen 1996). Data on individual fishing trips are recorded on trip ticket forms used by state-licensed fish dealers to document all transfers of fish sold from the fishermen to the dealer. Information reported on these forms includes transaction date, area fished, gear used, landed species, and total weights of each individual species, as well as fisherman and dealer information. The Trip Ticket Program is considered a census of all North Carolina landings and fishing trips.

Modeling

A GLM framework was used to predict Atlantic sturgeon interactions in North Carolina's estuarine gill-net fishery based on data collected during 2004 through 2015. Only those variables available in all data sources could be considered as potential covariates in the model. Available variables included year, mesh size, season, and management unit. Mesh sizes were categorized as large (≥5 inches) or small (<5 inches). Seasons were designated as: winter (December–February); spring (March–May); summer (June–August); and fall (September–November). Throughout this section (estimation of incidental takes), the term "year" is based on the season designation such that a year includes the month of December from the previous calendar year and the months January through November from the current calendar year.

Management units are shown in Figure 42. Management units A1, A2, and A3 were combined into a single management unit, unit A, for modeling purposes. Interactions were modeled independent of fish disposition (i.e., live or dead).

The numbers of Atlantic sturgeon occurring as bycatch was modeled by a set of explanatory variables and an offset term for effort. The variables investigated (and available) included year, mesh size, season, and management unit, all of which were treated as categorical variables. Using effort as an offset term in the model assumes that the number of Atlantic sturgeon interactions is proportional to fishing effort (A. Zuur, Highland Statistics Ltd., pers. comm.). Due to the small sample size and to maintain parsimony, no interactions between covariates were considered in the model. Code to compute many of the analyses were adapted from Zuur et al. (2009, 2012) and was implemented in R (R Core Team 2017).

The Poisson distribution is commonly used for modeling count data; however, the Poisson distribution assumes equidispersion—that is, the variance is equal to the mean. Count data are more often characterized by a variance larger than the mean, known as overdispersion. Some causes of overdispersion include missing covariates, missing interactions, outliers, modeling non-linear effects as linear, ignoring hierarchical data structure, ignoring temporal or spatial correlation, excessive number of zeros, and noisy data (Zuur et al. 2009, 2012). A less common situation is underdispersion in which the variance is less than the mean. Underdispersion may be due to the model fitting several outliers too well or inclusion of too many covariates or interactions (Zuur et al. 2009).

Data for each species were first fit with a standard Poisson GLM and the degree of dispersion was then evaluated. If over- or underdispersion was detected, an attempt was made to identify and eliminate the cause of the over- or underdispersion (to the extent allowed by the data) before considering alternative models, as suggested by Zuur et al. (2012). In the case of overdispersion, a negative binomial distribution can be used as it allows for overdispersion relative to the Poisson distribution. Alternatively, one can use a quasi-GLM model to correct the standard errors for overdispersion. If the overdispersion results from an excessive number of zeros (more than expected for a Poisson or negative binomial), then a model designed to account for these excess zeros can be applied. There are two types of models that are commonly used for count data that contain excess zeros. Those models are zero-altered (two-part or hurdle models) and zero-inflated (mixture) models (see Minami et al. 2007 and Zuur et al. 2009 for detailed information regarding the differences of these models). Minami et al. (2007) suggests that zero-inflated models may be more appropriate for catches of rarely encountered species; therefore, zero-inflated models were considered here if deemed appropriate.

All available covariates were included in the initial model and assessed for significance using the appropriate statistical test. Non-significant covariates were removed using backwards selection to find the best-fitting predictive model.

Estimation of Bycatch

Predicted numbers of Atlantic sturgeon bycatch were computed using the best-fitting GLM and assuming effort levels equivalent to those observed in 2004 through 2015. The GLM coefficients were applied to the corresponding predictor variables in the trip-level effort data to predict bycatch numbers. The proportion of fish observed dead was applied to the estimates of total bycatch to obtain estimates of dead discards.

6.2.2.1 Results

The best-fitting GLM was a standard Poisson model (Table 21) and all covariates (e.g., year, season, mesh, units) were found to be significant (Table 22). A Cook's distance plot suggests there were no outliers with a high impact on the regression parameters estimated by the Poisson GLM (i.e., no observations where Cook's distance > 1; Figure 43). There were no obvious patterns in the plots of the residuals (Figure 44-Figure 47). The model was found to provide an overall significant fit to the data (χ^2 = 1,626.2, df = 19, p < 0.0001).

Predicted total bycatch numbers for 2004 to 2015 ranged from a low of 1,286 Atlantic sturgeon in 2011 to a high of 13,668 Atlantic sturgeon in 2008 (Table 23, Figure 48). The percent of observed Atlantic sturgeon recorded as dead ranged from 0 - 20%, with an overall mean of 6%. Estimates of dead discards ranged from 0 – 424 fish (Table 23, Figure 48). Estimates of total bycatch in the most recent years (2010-2015) were generally lower than estimates for the earlier years (2004-2009).

Atlantic sturgeon caught in North Carolina's estuarine gillnet fishery were predominantly juveniles, with most fish less than 100 cm total length (Figure 49).

6.2.3 South Carolina American Shad fishery sturgeon bycatch estimates

The South Carolina Department of Natural Resources (SCDNR) manages American shad populations and collects fishery-independent and fishery-dependent data for the major shad rivers in the state. SCDNR collected voluntary landings data by river system since 1979 and instituted mandatory catch and effort reporting in 1998. Beginning in 2000, licensed shad fishermen were also required to account for any sturgeon species captured in their nets. Annual catch rates for sturgeon can be calculated using this information combined with provided effort data (Table 24 and Table 25). While reporting has not been fully implemented, as many licensed fishermen fish infrequently and provide incomplete, incorrect, or no effort data, SCDNR continues to work successfully with several cooperating commercial American shad gill-net fishermen to collect commercial catch and effort data on several river systems. Admittedly, there are likely still some gaps in these data, but they do provide the broadest temporal and spatial view of Atlantic sturgeon bycatch in fisheries for American shad in South Carolina. Additionally, SCDNR conducted fishery-independent shad studies for many years in several rivers where similar gear to those in the gill-net fisheries are used. In most cases, overlap with the commercial fishery occurs, which allows for more precise estimates of bycaught sturgeon.

Throughout South Carolina, American shad fisheries take place in estuaries and rivers from mid-January-mid April, depending on area. Fishers use either drift or set gill nets with a stretch mesh size of 13.97 cm. Bycatch of sturgeon in shad fisheries has been studied in both South Carolina and Georgia rivers. Collins and Smith (1997) indicated that catch rates for both Atlantic and shortnose sturgeon varied between 0.010–0.013 (fish per 91.4m of gill-net-hour) for the Winyah Bay, South Carolina, and 0.020–0.066 for the lower Savannah River. As part of the elimination of the shad ocean intercept fishery in 2005, areas where sturgeon were collected in the Winyah Bay are now unlawful to fish. Likewise, a study to estimate total by-catch and mortality of shortnose sturgeon in the Altamaha River, Georgia's commercial shad fishery indicated catch rates were highest during January and February (Bahn et al. 2012). As a result of these finding, Georgia's shad fishery was essentially closed to fishing in areas that are in close proximity to sturgeon spawning grounds in the Altamaha River.

Beginning in 2000, SCDNR collected monthly catch reports for all shad fishers throughout the state. Reports indicate pounds of shad caught but also account for when sturgeon were captured during netting events. Between years 2000-2015, a total of 1,479 Atlantic sturgeon were reported in the Winyah Bay and Waccamaw, Pee Dee, and Santee rivers' shad fisheries (Table 24) in the Carolina DPS. Average annual effort during the same time series equaled 4,029,432 net yards per hour with an average annual catch-per-unit-effort (CPUE) of 0.00035 Atlantic sturgeon per net yards per hour. It is important to note, since shad regulation changes in 2013 as part of requirements of South Carolina's Shad Sustainably Plan, reported numbers of Atlantic sturgeon for Carolina DPS river's decreased by 88% and CPUE decreased by 84%. These are significant decreases to already low levels of overall impact.

Between years 2000-2015 a total of 68 Atlantic sturgeon were reported in the Edisto, Combahee, and Savannah rivers' shad fisheries (Table 25) in the South Atlantic DPS. Average annual effort during the same time series equaled 327,842 net yards per hour with an average annual CPUE of 0.000013 Atlantic sturgeon per net yards per hour. It is important to note, since shad regulation changes in 2013 as part of requirements of South Carolina's Shad Sustainably Plan, reported numbers of Atlantic sturgeon for South Atlantic DPS rivers were zero. These are also significant decreases to already low levels of overall impact and relatively high numbers of Atlantic sturgeon catches in the time series compared to relatively low effort suggests Atlantic sturgeon populations in these rivers may be recovering.

6.2.4 Comparison of Bycatch Estimates

It is hard to compare the estimates from the NMFS and North Carolina observer programs to the estimates from the South Carolina logbook program due to the differences in how the data are collected. The South Carolina data are self-reported and are most likely an underestimate, since under-reporting is known to occur, while the NMFS and North Carolina estimates are developed from a sample of fishing trips in these regions and have their own degree of uncertainty.

South Carolina fishers reported an average of 4.25 Atlantic sturgeon caught per year in rivers in the South Atlantic DPS and 92.4 Atlantic sturgeon per year in waters in the Carolina DPS. No information was provided on the percent of those fish that were encountered dead or the size range of fish captured.

Estimates of total bycatch from the NMFS observer programs (gillnets and trawls combined) were lower than estimates from the North Carolina observer programs, but estimates of dead bycatch were similar (Figure 50) because the NMFS observer programs encountered a higher proportion of dead fish on gillnet hauls than North Carolina did. Estimates of bycatch from the NMFS observer program averaged 1,139 Atlantic sturgeon caught per year with 295 dead (25.9% dead) in the gillnet fishery and 1,062 Atlantic sturgeon caught per year with 41 fish dead (3.9% dead) in otter trawl fishery. Estimates of bycatch from the North Carolina observer programs averaged 4,179 Atlantic sturgeon caught per year with 218 dead (5.2% dead).

The NMFS observer program also encountered a different size range of fish than the North Carolina observer programs did. The Atlantic sturgeon observed in the NMFS program were larger, primarily subadults and adults, while the fish observed in the North Carolina programs were smaller, mostly juveniles with few adults observed (Figure 51). This is not surprising given that the NMFS programs mainly observe trips in coastal ocean waters while the North Carolina programs observe trips in estuarine waters, so they are observing fisheries that interact with different components of the Atlantic sturgeon population. This highlights the importance of having observer coverage in coastal, inshore and estuarine fisheries.

6.3 Mann-Kendall

6.3.1 Analysis Description

The Mann-Kendall test was performed to evaluate temporal trends in the indices. The Mann-Kendall test is a non-parametric test for monotonic trend in time-ordered data (Gilbert 1987). A total of 14 indices were evaluated and so the Holm-Bonferroni method was applied to counteract the problem of multiple comparisons. The method is intended to control the familywise error rate (the probability of making one or more false discoveries or type I errors) through adjustment of the p values.

6.3.2 Results

Only one statistically significant temporal trend was detected among the indices evaluated (Table 26). The juvenile index derived from the spring component of North Carolina's Program 135 survey exhibited a significant upward trend over the time series (1990-2015). No other significant trends were detected.

6.4 Power Analysis

6.4.1 Background of Analysis and Model Description

Power analysis was used to calculate the probability of detecting trends in the abundance indices developed from fishery-independent data using the methods of Gerrodette (1987) in R (RCT 2017). Using this approach, changes in abundance can take place due to constant increments (linear model) or at a constant rate (exponential model). Linear trends were modeled as $A_i=A_1[1+r(i-1)]$ where A_i represents the abundance as a function of an index of time

(i) and r is a constant increment of changes as a fraction of the starting abundance index (A_1). Exponential trends were modeled as $A_i=A_1(1+r)^{i-1}$. For a linear change, r=R/(n-1) where R is the overall fraction change in abundance. For an exponential change, $r=(R+1)^{1/(n-1)} - 1$. For each survey, the median CV can be calculated as the median proportional standard error or ($SE(A_i)/A_i$). The SAS established a reference point of a power of 0.80 for surveys to detect an increasing trend.

6.4.2 Model Configuration

All fishery-independent surveys that were developed into abundance indices were tested in the power analysis. Variability in abundance as a function of both linear and exponential change was tested using a one-tailed test. Power was calculated for a change (R) of ±50% over a 20-year time period for both a linear and exponential trend and R = 0.026 for a linear trend and R = 0.022 for an exponential trend. If spring and fall components of a survey were available, both were tested.

6.4.3 Model Results

Coast-wide

Median CVs, or proportional standard error, ranged from 0.202–1.108 for the surveys analyzed and power values ranged from 0.13 to 0.98 (Table 27). As expected, surveys with low CVs had higher power and those with high CVs had lower power. Exponential trends indicated slightly higher power than linear trends. For both linear and exponential trends, the ability to detect decreasing trends was higher than that of increasing trends. The surveys with greater than a 0.80 power of being able to detect a 50% increase in abundance were NC p135 (fall only), SC Edisto, and JASAMP. The remaining surveys all fell below the desired power of 0.80 and therefore the ability to detect trends in the past 20 years is limited for many of the surveys used in this assessment.

Gulf of Maine DPS

The only abundance index for Atlantic sturgeon in this region was developed from the ME-NH Trawl Survey. This survey had the highest median CV (1.108) of all the surveys used in this assessment and the lowest power to detect a 50% increase in abundance over 20 years. For linear trends, the power was 0.13 and for exponential trends it was 0.16, well below the desired power of 0.80.

New York Bight DPS

Three surveys that were developed into indices of relative abundance for this region were tested for their power to detect 50% change in abundance for Atlantic sturgeon over 20 years. For the spring-only, fall-only, and spring-fall combined CT LIST survey index, the CVs were high and therefore the power was low (0.18-0.28) to detect an increasing trend over 20 years. JASAMP had a low median CV compared to other surveys tested and had higher power to detect trends. The power to detect an increasing trend in this survey was 0.89, above the desired value of 0.80. The NJ Ocean Trawl survey had a median CV of 0.518 and the power to detect an increasing trend over 20 years was 0.30-0.32.

Chesapeake Bay DPS

Of the surveys used in modeling for Atlantic sturgeon, only the VIMS Shad and River Herring Monitoring survey operates solely in the Chesapeake Bay. This survey had a high median CV (0.443) and low power to detect a 50% increase over 20-years at 0.37 for a linear trend and 0.39 for an exponential trend, well below the desired power of 0.80.

Carolina DPS

Both the fall and spring components of abundance indices for Atlantic sturgeon developed from the NC p135 survey were tested using power analysis. Compared to the surveys in other DPSs, this survey had relatively low median CVs (0.211 for the fall and 0.301 for the spring). For the fall component, the power to detect a 50% increase over 20 years was 0.87, above the desired value of 0.80. For the spring component, the power was much lower at 0.62 and 0.63 for linear and exponential trends, respectively.

South Atlantic DPS

The abundance index developed from the SC Edisto was tested for its power to detect a 50% increase in Atlantic sturgeon abundance over 20 years. This survey had a very low median CV (0.202) and the analysis indicated that the power was 0.89, above the desired power of 0.80. Of all the surveys used in the assessment, this one had the highest power to detect an increasing trend in Atlantic sturgeon abundance.

6.5 Cluster Analysis

6.5.1 Background of Analysis and Model Description

Cluster analysis was used to identify common trends in the fishery-independent survey data. Trends were identified using hierarchical agglomerative cluster analysis with a group average linking method using linear (Pearson) correlations as the measures of similarity. The analysis was used to determine if the abundance indices indicate any spatial or temporal clustering, i.e., spring and fall surveys or surveys within a DPS cluster together.

6.5.2 Model Configuration

Cluster analysis was performed in R (RCT 2017) on five of the six surveys that were developed into abundance indices and had at least 15 years of data, including seasonal components when available. These surveys included ME-NH Trawl, CT LIST (fall index), NJ Ocean Trawl, VIMS Shad and River Herring Monitoring, and NC p135 (spring and fall indices). The analysis requires continuous data sets with no missing values so 2015 data was omitted since it was not available for all surveys, the USFWS Coop was omitted from the analysis due to its terminal year of 2010, and the spring component of the CT LIST survey was omitted because it had missing data in 2010. Two time periods were tested to accommodate as many surveys as possible. The first time period tested, 1991-2014, was the longest but was restricted to four indices (CT LIST-fall, NJ Ocean Trawl, NC p135-spring, and NC p135-fall). The second time period tested, 2000-2014, was shorter but included six indices (ME-NH Trawl, CT LIST-fall, NJ Ocean Trawl, VIMS Shad and River Herring Monitoring, NC p135-spring, and NC p135-fall).

6.5.3 Model Results

For the cluster analysis on the 1991–2014 time period, two clusters were identified in the data with NC p135 spring and fall surveys in one cluster and CT LIST (fall) and NJ Ocean Trawl surveys in a second cluster (Figure 52). The results indicated some spatial structure with the survey components from the Carolina DPS clustering together and two surveys from the New York Bight DPS clustering together.

For the cluster analysis on the 2000–2014 time period, there were two clusters as indicated by the dendrogram (Figure 53). The surveys from CT LIST (fall) and ME-NH Trawl clustered together. While these surveys do not come from the same DPS, they are the two most northern surveys in the analysis and may represent some spatial clustering. The second cluster included the spring and fall component of the NC p135 survey, the NJ Ocean Trawl survey, and the VIMS Shad and River Herring Monitoring survey. Within this cluster there was some sub-structure, with the NC surveys grouping together and the NJ Ocean Trawl and VIMS survey clustering together. While there is no DPS level clustering occurring in this time period and the two surveys in the New York Bight DPS were in different clusters, there is some possible spatial structure between northern and southern surveys.

6.6 Conn Method

6.6.1 Background of Analysis and Model Description

When several population abundance indices provide conflicting signals, hierarchical analysis can be used to estimate a single population trend. The abundance indices for Atlantic sturgeon were combined into a composite index using hierarchical modeling as described in Conn (2010). This method assumes each index samples a relative abundance but that the abundance is subject to sampling and process errors. It can be used on surveys with different time series and selectivities, but it does assume that indices are measuring the same relative abundance.

6.6.2 Model Configuration

All available indices for juveniles and adult Atlantic sturgeon were standardized to their means. This included relative abundance indices from the ME-NH Trawl, CT LIST, NJ Ocean Trawl, VIMS Shad and River Herring Monitoring, NC p135, and the USFWS Coop surveys. If there was a fall or spring component, the fall components of the survey were selected to try to keep the indices during one time period. The indices were combined into one hierarchical index using the methods as described by Conn (2010) and the analysis was performed in R (RCT 2017). Additionally, the Conn method was applied to a subset of indices for an index of surveys that primarily catch juvenile Atlantic sturgeon (CT LIST, VIMS Shad and River Herring Monitoring, and NC p135) and one that catches both adults and juveniles (USFWS Coop, ME-NH Trawl, and NJ Ocean Trawl).

6.6.3 Model Results

The hierarchical model developed from all the available abundance indices predicted a stable abundance from 1984–2015, with peaks in the 1980s and late-1990s as well as in 2006 and 2007 (Figure 54). The index showed an increasing trend in the last three years, although there is a wide confidence interval around most of the estimates. A comparison of the individual indices and the Conn index can be seen in Figure 55.

The estimates of the standard deviation of the process error for each of the indices were also examined. High values suggest that the index may be a poor index for tracking abundance whereas lower values indicate indices that may be better tracking the population or it could suggest that these indices are measuring different populations. The standard deviation of the process errors for the USFWS Coop, ME-NH Trawl, and NJ Ocean Trawl surveys were much higher than those of CT LIST, VIMS Shad and River Herring Monitoring, and NC p135 (Figure 56). This may indicate that the USFWS Coop, ME-NH Trawl, and NJ Ocean Trawl surveys may not be tracking the population or it may be reflecting differences in sampling programs between all of the surveys (see Conn 2010 for a more thorough discussion). In fact, the three indices with the lowest process error variance are classified as catching juveniles while the three indices with higher process error variance catch both juveniles and adults (Table 9). Additionally, the three surveys that catch predominantly juvenile Atlantic sturgeon occur inshore while the three that catch juveniles and adults operate offshore on the mixed population.

The three abundance indices that were classified as juvenile indices (CT LISTS, VIMS Shad and River Herring Monitoring, and NC p135) were combined into a hierarchical index using the Conn method, excluding indices that catch juveniles and adults (Figure 57). The pattern of abundance was similar to the combined index using all six juvenile and adult indices but with smaller confidence intervals. The pattern of juvenile abundance appeared steady throughout the time series, with no large peaks or valleys. Moderate peaks occur in the mid-1980s and late-1990s as well as in 2006-2007, with the lowest values occurring in the late 1980s, 2003, and 2010.

Excluding surveys that caught predominantly juveniles, the three surveys catching both juveniles and adults (USFWS Coop, ME-NH Trawl, and NJ Ocean Trawl) were combined to create a hierarchical index using the Conn method (Figure 58). These three surveys had very large estimates of process error variance, suggesting that they may not be tracking abundance. The plot of abundance shows very large confidence intervals and no discernible pattern through the time series.

6.7 Dynamic Factor Analysis

6.7.1 Background of Analysis and Model Description

Dynamic factor analysis (DFA) can be used to identify a set of underlying trends when there are several time series of abundance indices available. The Multivariate Auto-Regressive State Space (MARSS) model is a package available in R (RCT 2017) that can be used for analyzing time-series data, including performing DFA. The model incorporates both process and observation error and explains variations in the indices using linear combinations of a set of hiding random walks. For a full description of the model see Holmes et al. 2014.

6.7.2 Model Configuration

Using the abundance indices for Atlantic sturgeon, DFA was used to find the number of trends from one (implying a coast-wide stock) to four trends (representing 4 DPSs, excluding the South Atlantic DPS since there were no abundance indices representing that area that had >15 years of data). Using the six available abundance indices, DFA was performed on the detrended data by calculating z-scores. If seasonal components of a survey were available, the fall component was chosen for analysis. Several possible models were used to test for underlying trends using four structures for the R matrix, or the observation variance-covariance matrix:

1. Same variances and no covariance ("diagonal and equal")
2. Different variances and no covariance ("diagonal and unequal")
3. Same variance and same covariance ("equalvarcov") and
4. Difference variances and covariances ("unconstrained")

6.7.3 Model Results

Many parameters would not converge using the full time series (1984-2015), so the time series was shortened to begin in 1990 when more surveys had data. Assuming unequal variances and no covariance for the observation errors (R matrix), many parameters did not converge to the maximum likelihood values despite increasing the number of model iterations, possibly because the amount of data did not support the amount of parameters the model was estimating. The model was rerun assuming equal variances and no covariance and most of the parameters did converge. The results indicate that there is one underlying trend in the data (Table 28) and that this is best model based on the AICc values.

The DFA analysis concluded that there is only one trend in the Atlantic sturgeon abundance index data. This implies that the indices have similar trends, or no trend, and therefore are possibly capturing the coast-wide stock rather than DPS-specific trends. This is likely due to having a combination of juvenile and adult indices as well as localized indices and others that sample the mixed offshore population.

6.8 Population Viability Analysis

6.8.1 Background of Analysis and Model Description

Estimates of extinction risk can be important when performing an assessment on a species that is threatened or endangered. The MARSS package in R (Holmes et al. 2014) has developed a population viability analysis (PVA) approach that can be used to calculate extinction risk metrics by fitting a univariate state-space model to population data with observation and process error. This approach uses a density-independent, stochastic exponential growth model in log space. PVA has been shown to produce accurate and reliable predictions and is a good tool for managing threatened or endangered species (Brook et al 2000), although there has been conflicting evidence regarding its application and use (Ellner et al. 2002). The results of the PVA depend on the quality of the data. A long time series as well as surveys that properly and consistently sample the species are necessary (Coulson et al. 2001). This poses a challenge for making predictions about the Atlantic sturgeon population, as most regions lack a survey that would be analogous to census data or a long-term data set of population count estimates.

Additionally, the several available abundance indices suffer from low detection rates, often as low as 1% positive tows, because they are not directed for Atlantic sturgeon. During the Atlantic sturgeon status review by NMFS (2007), there were only two populations that had abundance estimates available: the Hudson and Altamaha Rivers (Schueller and Peterson 2006; Kahnle et al. 2007). Currently, there are localized abundance estimate time series available, such as the swept area estimates from NEAMAP for 2008-2012 (Kocik et al. 2013) and juvenile abundance estimates (Farrae 2009; Schueller and Peterson 2010; Hale et al. 2016) and effective population size (Moyer et al. 2012) in 2004-2007 for the Altamaha River in Georgia. Yet there are no long term population estimates to perform a robust PVA at the coast-wide or DPS level.

PVA has been performed on a few sturgeon species. Jager et al. (2011) developed a PVA for the endangered shortnose sturgeon in the Ogeechee River system in Georgia. This analysis benefited from population estimates from 1990-2009 since the goals of the Recovery Plan (NMFS 1998) required abundance, age structure, and recruitment be determined for segments of the population. This model was adapted for the lower Columbia white sturgeon but is in development and has not been peer-reviewed so it is currently not used for management (ODFW 2011). The Canadian stock of the Atlantic sturgeon performed a Bayesian belief network analysis (Nantel 2010) to calculate probabilities of threats to the population but this was done for exploratory purposes and not for stock status (COSEWIC 2011).

While the data available for the current Atlantic sturgeon stock assessment does not support a PVA analogous to other sturgeon species, an attempt was made to apply the PVA code in the MARSS package to the available abundance indices. Because of the lack of robust data for this analysis, these should be taken as exploratory and not for management. The MARSS PVA is a model with process and observation variability that estimates the parameters u (growth rate), Q (Process errors), and R (observation errors).

While the MARSS PVA approach estimates the mean population growth rate and process variability under the assumption that the data have observation error, the more classic approach was developed by Dennis et al. (1991). The Dennis model, or method, assumes there is no observation error and thus the variability is all from process error.

6.8.2 Model Configuration

Both the MARSS PVA and the Dennis method were used for Atlantic sturgeon in this report. DFA indicated that there is one underlying trend in the Atlantic sturgeon data, therefore all available abundance indices were combined using the Conn approach (Conn 2010) that was developed as described in this report (see sections 6.6-6.7). PVA was used to evaluate if there has been any population growth for Atlantic sturgeon using the Conn index as well as each individual abundance index and any combination of surveys that represented the same DPS, mainly CT LIST and NJ Ocean Trawl (NY Bight DPS).

6.8.3 Model Results

6.8.3.1 Conn Index

PVA was performed on the Conn index using the 1984-2015 time series. Using the MARSS PVA approach with process and observation errors, the *Q* estimate (process error) was zero which means the maximum-likelihood estimate that the data are generated by is a process with no environment variation and only observation error and the model would not converge on a reasonable estimate for growth (Table 29). Using the Dennis et al. (1991) approach, the growth rate was estimated to be 1.2% (SE = 0.11) with *Q*=0.36, although the growth rate for this model was not significant (*P*=0.91). Therefore, the PVA performed on the coast-wide Conn index indicates that no significant growth or decline in the population has taken place over the time series (1984-2015).

While the population has not shown significant growth over the entire time series, the data was shortened to 1998-2015 to see if there has been growth since the moratorium took place in 1998. As opposed to the coast-wide analysis, all parameters converged using the MARSS PVA. The population growth rate was -0.01% [CI: -3.3%, 3.2%], although the confidence interval includes zero. The Dennis method was also run and indicated an approximately 1% per year decline and this result was also not significant (*P*=0.95). Therefore, the PVA indicates that no significant growth or decline in the population has taken place since the moratorium. Risk figures are shown in Figure 59.

6.8.3.2 Gulf of Maine DPS

Maine-New Hampshire Inshore Groundfish Trawl Survey
PVA was attempted on the ME-NH Trawl abundance index data for 2000-2015. The MARSS PVA would not converge on a solution and the *Q* parameter estimates for the Dennis method provided values that were outside a reasonable range (Table 29).

6.8.3.3 New York Bight DPS

Connecticut Long Island Sound Trawl
PVA was attempted on the CT LIST fall abundance index data for 1984-2015. The MARSS PVA would not converge on a solution and the *Q* parameter estimates for the Dennis method provided values that were outside a reasonable range (Table 29).

New Jersey Ocean Trawl
PVA was attempted on the NJ Ocean Trawl fall abundance index data for 1990-2015. The MARSS PVA would not converge on a solution and the *Q* parameter estimates for the Dennis method provided values that were outside a reasonable range (Table 29).

Combined Connecticut Long Island Sound Trawl and New Jersey Ocean Trawl
MARSS PVA has a feature where multi-site and subpopulation data can be combined and analyzed. Because CT LIST and NJ Ocean Trawl surveys are both located in the New York Bight DPS, they were combined within the MARSS package (Figure 60) and analyzed to see if the New York Bight has experienced any significant population growth from 1984-2015. Assuming the CT

LIST and NJ Ocean Trawl surveys represent a single population with independent and non-identical errors, results indicate an increase in the population of 4.9% [CI:-10.9%, 20.7%], although the confidence interval includes zero (Table 29). Additionally, the Dennis method also estimated the population growth rate to be 4.9% although these results were not significant (*P*=0.261). Therefore, no significant growth was detected in the New York Bight region using PVA.

6.8.3.4 Chesapeake Bay DPS

VIMS Shad and River Herring Monitoring

The MARSS PVA was run on the VIMS Shad and River Herring Monitoring abundance index data for 1998-2015. The population growth rate of the population was estimated to be -1.8%, although the confidence intervals around that estimate were wide and included zero (Table 29). The Dennis method estimated a similar population growth rate of -1.6% with similarly large errors. The results from the Dennis method were not significant (P=0.953). Therefore, no significant growth was detected in the VIMS index data using PVA.

6.8.3.5 Carolina DPS

North Carolina Program 135 Survey

The MARSS PVA was run on the fall portion of the NC p135 index data from 1990-2015. Using the MARSS PVA, the population growth rate was 3.9 % [CI: 0.1%, 7.8%], indicating that this population is growing (Table 29). Positive growth was not confirmed with the Dennis approach which found the population was decreasing at 1.5%, although these results were not significant (*P*=0.941).

6.8.3.6 US Fish and Wildlife Cooperative Tagging Cruise

PVA was attempted on the USFWS Coop abundance index data for 1988-2010. The MARSS PVA would not converge on a solution and the *Q* parameter estimates for the Dennis method provided values that were outside a reasonable range (Table 29).

6.9 Autoregressive Integrated Moving Average (ARIMA)

6.9.1 Background of Analysis and Model Description

Observed time series of abundance data are variable, reflecting changes in fish populations, within survey sampling variability, and varying catchability over time (Pennington 1986). Autoregressive Integrated Moving Average (ARIMA) models provide a means to filter measurement error from process variability (Box and Jenkins 1976; Helser and Hayes 1995), and hence allow us to more closely track a population than the raw data (Pennington 1986). ARIMA models provide time series estimates of abundance where the variance of the fitted estimates is less than the variance of the observed time series.

6.9.2 Model Configuration

Relative abundance indices used in this analysis are shown in Table 30. ARIMA models were only fit to indices with at least 15 years of data, without any missing data points (exploratory analyses indicated that model results could be sensitive to missing values).

ARIMA models were implemented using the *fishmethods* package in R (Nelson 2017; RCT 2016) and generally followed the approach of Helser and Hayes (1995) who extended Pennington's (1986) approach of *a priori* specification of an ARIMA model in which the population's size follows a random walk process. Helser and Hayes (1995) used bootstrap methods to infer population status relative to an index-based reference point. They used a two-tiered approach for this evaluation, whereby they specified the probability of being above or below a reference point and the associated statistical level of confidence (i.e., 80%) in this specification. Their approach takes into account the uncertainty in both the value of the fitted survey index for a given year and the reference point to which the population level is compared (Helser and Hayes 1995). This report used a parsimonious approach to this end that did not require subjective determination of an associated level of statistical confidence (e.g., 80%, 90% or 95%) by applying the approach used in Shertzer et al. (2008), NEFSC (2013), and ASMFC (2016). For bootstrapping, 1,000 samples were generated.

The terminal year of a given survey was compared to two index-based reference points: 1) the 25^{th} percentile of the fitted time series (ASMFC 2013), and 2) the fitted abundance index from 1998 (implementation of ASMFC moratorium for Atlantic sturgeon). Related to the former reference point, we ran models using a) all available data for a given survey, and b) truncating all datasets to a common set of years (2000-2015) to explore whether the results were sensitive to the specific years over which the 25^{th} percentile was calculated. Surveys that started after 2000 or had fewer than 15 years of data were omitted from this secondary analysis. For the later reference point (i.e., 2, above), for surveys that started after 1998, the terminal year was compared to the first year of the survey. See Table 30 for specifics. Probabilities greater than or equal to 0.50 were considered credible evidence that an index value was greater than a reference point (ASMFC 2013). Index values were log transformed prior to analysis [ln(y+0.01)].

The influence of the first data point on an ARIMA result has been raised as a concern in previous assessments where ARIMAs have been used (e.g., ASMFC 2012). Consequently, the sensitivity of the results to the influence of data points early in the time series was explored by re-running ARIMAs where the first 4 years of data were sequentially removed, one year at a time, in a reverse-retrospective fashion (e.g., run model with all years of data, run model removing the first year of data, run model removing the first two years of data, three years, etc.).

Finally, as a compliment to analyses reported elsewhere in this document, the significance of trends in each fitted index was evaluated by following the Mann-Kendall methods described in Section 6.3.

6.9.3 Model Results

Descriptive statistics from all model runs are provided in Table 32. When adjusted for multiple tests (Holm 1979; RCT 2017), residuals from all model fits were normally distributed (Table 32).

Fitted indices, grouped by DPS, are plotted in Figure 61, Figure 62, and Figure 63. Significant trends (Holm-adjusted p-values ≤ 0.05) are indicated with a + or – (for positive or negative trends, respectively) in Figure 61, Figure 62, and Figure 63, and summarized in Table 30.

6.9.3.1 Gulf of Maine DPS

Maine-New Hampshire trawl survey

Descriptive statistics from the ME-NH Trawl survey ARIMA are provided in Table 32. The fitted index declined from 2000 through the late 2000s before rising through 2015 (Figure 61, Figure 62, and Figure 63). No significant trend was detected in this index (Mann-Kendall τ -0.30, padj = 0.46; Table 30). The index is credibly above the 25th percentile of the time series [P(2015 index > 25th pctl) = 0.73; Table 30)]. Figure 64 suggests little change in this conclusion provided the time series includes at least 15 years of data.

This survey started in 2000, so a comparison against the index in 1998 is not possible; the index is credibly below the index in 2000 [P(2015 index > 2000 index) = 0.28; Table 30)], the first year in the time series. Figure 65 suggests little change in this conclusion provided the time series includes at least 15 years of data.

6.9.3.2 New York Bight DPS

Descriptive statistics from surveys conducted in the New York Bight DPS are provided in Table 32. Fitted indices are provided in Figure 61, Figure 62, and Figure 63. Terminal year fitted indices from all surveys in this DPS were credibly above both the 25th percentile of their respective surveys and their index value in 1998 (not all surveys had index values through 2015). The CT LIST spring nominal index, CT LIST fall nominal index, and the CT LIST combined spring-fall index had significant (α = 0.05, Mann Kendall Test) increasing trends (Table 30).

Connecticut Long Island Sound Spring Nominal Index

The CT LIST spring (nominal) index declined through about 1990, increased through the early 2000s, and has been stable since then (Figure 63). Over the entire time series this index showed a significant increasing trend (Mann Kendall τ = 0.40, p_{adj} = 0.01). Due to missing data points the model was fit with data only through 2014. The index value in 2014 is credibly above both the index value from 1998 and the 25th percentile of the time series (Table 30). The conclusion regarding status relative to 1998 was sensitive to the starting year of the survey (Figure 65).

Connecticut Long Island Sound Fall Nominal Index

The CT LIST fall (nominal) index shows a significant increasing trend over the time series (Mann Kendall τ = 0.86, p_{adj} < 0.0001; Table 30 and Figure 63). Due to missing data points the model was fit with data only through 2009. The index value in 2009 is credibly above both the index value from 1998 and the 25th percentile of the time series. These conclusions are robust to the starting year of the survey (Figure 64 and Figure 65).

Connecticut Long Island Sound Combined Spring and Fall Nominal Index
The combined spring and fall index closely mirrors the CT LIST fall-only index (Figure 61 and Figure 63). This combined index also showed a significant increasing trend over the time series (Mann Kendall $\tau = 0.78$, $p_{adj} < 0.0001$; Table 30). The index in 2009 (terminal year due to missing values) was credibly above both the 25th percentile of the time series and the index value in 1998 (Figure 64 and Figure 65).

New Jersey Ocean Trawl
The New Jersey ocean trawl index declined through the mid-1990s (the time of commercial fishery closure in NJ) after which it increased, peaking in the mid-2000s, before dipping slightly and again rising (Figure 61, Figure 62, and Figure 63). The index in 2015 was credibly above both the 25th percentile of the time series and the index in 1998 (Table 30, Figure 64, and Figure 65).

6.9.3.3 Chesapeake Bay DPS

Virginia Institute of Marine Science (VIMS) Shad and River Herring Monitoring Survey
Two indices were developed from the VIMS Shad and River Herring Monitoring survey: an index including the James, York, and Rappahannock rivers, and an index including only the James River. These indices were very strongly correlated with each other (Figure 66). Both indices show a sinuous pattern with peaks in 1998, 2006, and 2015 (Figure 61, Figure 62, and Figure 63). Fitted indices from this DPS had no significant trend ($\alpha = 0.05$, Mann Kendall Test; Table 30). The indices in 2015 were credibly above the 25th percentile of their respective time series (Figure 64). The indices in 2015 were likely below their respective index values in 1998, though this conclusion is sensitive to survey start year (Figure 65). Descriptive statistics from these surveys are provided in Table 32.

6.9.3.4 Carolina DPS

Descriptive statistics from surveys conducted in the Carolina DPS are provided in Table 32. Fitted indices are provided in Figure 61, Figure 62, and Figure 63. Terminal year indices in this DPS were all credibly above the 25th percentile of their respective survey time series (Table 30). Terminal year indices in this DPS were all credibly above their respective index value in 1998 except for the North Carolina p135fall YOY index. Fitted indices from this DPS had either no significant trend or significantly increasing trends ($\alpha = 0.05$, Mann Kendall Test). The USFWS Coop cruise survey in this DPS was strongly positively correlated with NC p195 spring indices and the NJ Ocean Trawl index and strongly negatively correlated with the ME-NH Trawl index (Figure 66). Fitted NC p135 spring indices tend to be strongly positively correlated with fitted indices in CT LIST and the Conn index. Fitted indices in NC p135 in fall are strongly correlated with fitted indices from NJ Ocean Trawl and the Conn index.

US Fish & Wildlife Service (USFWS) Cooperative Tagging Program Index

The USFWS Coop index declined through about 1995, after which it increased through 2008, before declining through 2010 (this index ends in 2010; Figure 61, Figure 62, and Figure 63). This index had a significant increasing trend over its duration (Mann Kendall $\tau = 0.64$, $p_{adj} = 0.0002$, Table 30). This index is credibly above both the 25th percentile of the time series and the index in 1998 (Figure 64 and Figure 65).

North Carolina Program 135 Spring YOY & Juvenile Index
This index generally increased over its duration, save a large decline between 2000 and 2005 and a smaller decline between 2008 and 2010 (Figure 61, Figure 62, and Figure 63). The increasing trend over the time series was significant (Mann Kendall $\tau = 0.69$, $p < 0.0001$; Table 30). The index in 2015 is credibly above both the 25th percentile of the time series and the index value in 1998 (Figure 64 and Figure 65).

North Carolina Program 135 spring YOY index
The fitted index generally increased from its inception through 2002 before declining through 2012, and subsequently rising (Figure 63). The trend in the fitted index over the time series was not significant (Table 30). The index value in 2015 is credibly above both the 25th percentile of the time series and the index in 1998 (Table 30, Figure 64 and Figure 65).

North Carolina Program 135 Spring Juvenile Index
The fitted index increased from the survey's inception through the early 2000s, and again from the mid-2000s through 2013 (Figure 61, Figure 62, and Figure 63). The increasing trend in the fitted index over the time series was significant (Table 30), and the index in 2015 is credibly above both the 25th percentile of the time series and the index in 1998 (Figure 64 and Figure 65).

North Carolina Program 135 Fall YOY & Juvenile Index
The fitted index declined from inception of the survey through 1994 before generally rising over the duration of the time series (Figure 61, Figure 62, and Figure 63). The trend in the fitted index was significantly increasing (Table 30). The index in 2015 was credibly above both the 25th percentile of the time series and the index in 1998 (Figure 64 and Figure 65).

North Carolina Program 135 Fall YOY Index
The fitted index declined from the survey's inception through 1996 before increasing through 2001 and subsequently declining and stabilizing over the reminder of the time series (Figure 61, Figure 62, and Figure 63). The trend in this index was not significant (Table 30). The index in 2015 is credibly above the 25th percentile of the time series (Figure 64). The index is not credibly above the index in 1998, though the probability of this hovers just below 0.50 (Figure 65). This conclusion is sensitive to the survey start year.

North Carolina Program 135 Fall Juvenile Index
The fitted index from this survey declined through 1994 before increasing through 2012 and stabilizing for the remainder of the time series (Figure 61, Figure 62, and Figure 63). The trend from the fitted index over the time series was significantly increasing (Table 30). The index in

2015 is credibly above both the 25th percentile of the time series and the index in 1998 (Figure 64 and Figure 65).

6.9.3.5 South Atlantic DPS

There were no indices from the South Atlantic DPS that met the SAS's time-series length requirements.

6.9.3.6 Coast-wide index

Conn Index

Descriptive statistics from the Conn index are provided in Table 32. This index declined and generally rose between 1984 and 1990; the index declined between 1990 and 1996, after which the index has generally risen (there are two 2-3 year periods of stabilization). By 1996, closures of the Atlantic sturgeon fishery had been instituted in all Atlantic Coast states except for Rhode Island, Connecticut, Delaware, Maryland, and Georgia, all of which adopted a 2.13 m (7-foot) minimum size limit (ASSRT 2007). ASMFC instituted a moratorium in 1998.

The Conn index is credibly above both the 25th percentile of the time series and the index value in 1998 (Figure 64 and Figure 65); this conclusion is insensitive to the survey start year (Figure 64 and Figure 65). Finally, since this index is a composite of all indices, it is not surprisingly strongly correlated with several indices: NC p135 fall juvenile and fall YOY & juvenile indices, NC p135 spring juvenile and spring YOY & juvenile indices, and the NJ Ocean Trawl index (Figure 66).

6.9.4 ARIMA Summary

When using all available years of data for all indices, the terminal year index values were all credibly above the 25th percentile of their respective time series (Table 30). When truncating surveys to a common set of years (2000–2015) the terminal year of only one index, NC p135 spring YOY index, was not credibly above the 25th percentile of the time series (Table 30 and 0), suggesting that the all-year analysis was robust. The situation with respect to index values in 1998 is a little more mixed (Table 30). The 2015 index from the Gulf of Maine DPS (ME-NH Trawl survey) is not credibly above the index value in 2000 (survey started in 2000). All terminal year indices from surveys in the New York Bight DPS are credibly above their respective 1998 index values. Terminal year index values from surveys in the Chesapeake Bay DPS are not credibly above their respective 1998 index values (these indices are very strongly correlated with each other; Table 30, Figure 66). Finally, terminal year index values for all fitted indices in the Carolina DPS, save one, are above their respective 1998 index values (Table 30).

All surveys examined had, over their entire duration, either no significant trend or an increasing trend (Table 30). Similarly, fitted indices exhibited either strong positive correlations among one another (arbitrarily defined as ≥ +0.60), or no strong correlation among each other, except for the ME-NH Trawl index where we saw strong negative (arbitrarily defined as ≤ -0.60) correlations with one fitted index in the Carolina DPS, and one in the New York Bight DPS (Figure 66). Fitted indices from a given survey where ages were split out or combined tended to be strongly positively correlated with each other (e.g., NC p135 spring juvenile index strongly positively correlated with NC p135 spring juvenile and YOY index; Figure 66).

In general, conclusions regarding terminal year status relative to the 25th percentile reference point were insensitive to survey start year provided surveys had at least 15 years of data (Figure 64). Conclusions regarding status relative to 1998 were mixed suggesting some caution when interpreting results where we saw a change in status as a function of survey start year (Figure 65). Removing years of data sometimes increased the probability of the terminal year being above the index in 1998 (e.g., VIMS Shad and River Herring Monitoring survey) and sometimes decreased the probability (CT LIST spring nominal index). We explored alternate methods of time series smoothing (e.g., splines and loess smoothers), but these alternate methods require subjectivity in determining just how much smoothing to apply. The model-based ARIMA approach removes that subjectivity, increases the precision of the index, allows us to quantify the status of a terminal year (or any other year) index accounting for uncertainty in the index and reference point, and filters out measurement error (Pennington 1986; Helser and Hayes 1995).

6.10 Mixed Stock Analysis

Overview

Atlantic sturgeon from different populations and DPSs mix extensively in marine and estuarine waters. One known aggregation occurs near the mouth of the Hudson River in the New York Bight (Dunton et al. 2010). In the early 1990s, an intercept-fishery targeted Atlantic sturgeon off the coast of New York and New Jersey. Spine samples archived from sturgeon harvested by this fishery (provided by Dave Secor, Chesapeake Biological Laboratory; see Stevenson and Secor 1999) presented a unique opportunity to examine changes in stock composition over time when compared against recent mixed stock analyses. In addition, Dewayne Fox (Delaware State University) provided a large number of tissue samples collected from adult Atlantic sturgeon that were captured and tagged off the coast of Delaware during the spring. A series of published mixed stock analyses of Atlantic sturgeon captured in coastal environments allowed for comparisons to be made across space and time (Table 33). One mixed stock analysis (Wirgin et al. 2015a) was not included in comparisons, as most of these fish were included in the current analysis on adults captured off the Delaware coast.

Extraction of DNA and Genotyping

DNA was extracted from samples collected from fish harvested in the Hudson River intercept fishery (1993–1995; n = 83) and tagged more recently (2009–2016; n = 391) off the coast of Delaware. Samples were genotyped at the USGS Leetown Science Center. Whole genomic DNA was extracted from tissue samples using the Qiagen Blood and Tissue extraction kit (Qiagen, Valencia, California, USA). All samples were screened for 12 Atlantic sturgeon microsatellite loci (*LS*19, *LS*39, *LS*54, *LS*68, *Aox*12, *Aox*23, *Aox*45, *AoxD*170, *AoxD*188, *AoxD*165, *AoxD*44, *AoxD*241; described in May et al. 1997, King et al. 2001, and Henderson-Arzapalo and King 2002). Due to the age of the Hudson River intercept fishery samples, genotypes could not be obtained at all loci for many of the individuals.

Genetic Baseline

Genotypes from 1,658 Atlantic sturgeon representing 50 collections from 11 rivers plus one sound (Albemarle, North Carolina) were used to characterize the genetic signature of potential source populations (Table 34). All individuals included in the baseline were captured in the riverine environment with the exception of one collection, Albemarle Sound. The Albemarle Sound samples were collected in tidal waters outside of a known spawning area. This is a known weakness of the current baseline, as it may represent sturgeon from several spawning populations within the Carolina DPS. Leetown Science Center is actively working with another agency to incorporate additional collections from the Carolina DPS, however these samples were not yet available when these assignments were run. River-resident juveniles (<500 mm TL) and adults (≥1,500 mm TL) were included in the baseline. Individuals outside of this size criterion were excluded from the genetic baseline due to the extensive dispersal of subadult and adult Atlantic sturgeon outside of spawning. The only exception is some subadults were used to characterize the St. John River, as these were the only samples that we have been able to access. This is expected to have minimal influence on the current analysis, given that the St. John River is very far away from the study area. All collections were grouped by river to provide a reference for assignment testing.

Genetic Assignments

Genetic assignment testing was conducted using GeneClass2 (Piry et al. 2004) using the criterion of Rannala and Mountain (1997) with the previously described genetic baseline as a reference. The efficiency of this approach was tested by assigning known samples to rivers within the baseline. Overall, 84.9% of individuals were correctly assigned to their river of origin, and 95.2% of individuals were correctly assigned to their DPS of origin (Table 35).

Next, GeneClass2 was used to assess the origin of genotyped individuals. The river with the highest assignment probability was assumed to be the river of origin. Most assignment probabilities were strong (>90%). However, these results should be interpreted with some caution as the assignments are based solely on allele frequencies, and it is possible that by chance an individual has a genotype that is more common in another population. This is especially true for individuals where fewer than 12 loci were scored, as was common in the historic samples from the intercept fishery (mean = 9.3 scored loci/sample; range: 2-12).

Synthesis of mixed stock analyses

Based on the mixed stock analysis, the New York Bight intercept fishery primarily harvested sturgeon from the Hudson River population (Figure 67). However, the harvested fish were clearly not restricted to the Hudson River population, as many fish from the Delaware River were taken in addition to individuals from more distant sources (Figure 67). In the sample of 83 fish, the presence of four separate DPSs was detected and some Atlantic sturgeon from Canada (Figure 67). This suggests that the fishery impacted populations across the coast, and continued to impact other populations (especially the Delaware River population) after local moratoriums had been enacted. More recent surveys of stock composition (Dunton et al. 2012; Waldman et al. 2013; O'Leary et al. 2015; and the Delaware Coast assignments presented here; Figure 67 and Figure 68) are consistent with this result, and suggest that ongoing bycatch in the New York Bight may continue to have a coast-wide impact on the recovery of Atlantic sturgeon (Dunton et al. 2015). Collectively, these results highlight the importance of this area for many Atlantic sturgeon populations, and the potential for localized mortality to impact populations across the United States.

These results (39.6% Hudson River origin) are not consistent with Waldman et al. (1996) which reported that the overwhelming majority (97.2%) of Atlantic sturgeon captured in the New York Bight were from the Hudson River population. However, Waldman et al. (1996) used a less-resolved genetic approach (mitochondrial DNA and RFLP versus microsatellites; see comparison of assignment accuracy in Waldman et al. 2013) and lacked baseline samples for the Albemarle Sound, as well as the Delaware, James, and York Rivers. Thus, it is likely that Waldman et al. (1996) lacked the power to identify additional stocks in the fishery, and these were likely present in their samples yet undetected.

In general, the relative abundance of each DPS observed in the New York Bight appears to have been relatively consistent over time (Figure 68). However, the small historical proportion of Atlantic sturgeon from the Chesapeake Bay (James and York Rivers), Carolina (Albemarle Sound; entirely absent), and South Atlantic (Edisto, Savannah, Ogeechee, and Altamaha Rivers) DPSs relative to recent observations may suggest that these populations are recovering, at least with respect to the New York Bight DPS (Figure 67, Figure 68). Additionally, recent work by Savoy et al. (2017) suggests that there may be some recovery occurring within the Connecticut River. However, these fish were not represented in any of the genetic baselines and therefore have not been resolved in any of the mixed stock analyses to date.

6.11 Conventional Tagging Model

Conventional tagging data were available through the USFWS Cooperative Coastal Sturgeon Tagging Program Database. The database collects information on the release and recapture of shortnose and Atlantic sturgeon tagged with conventional streamer tags (as opposed to acoustic tags, although some fish are double-tagged) by thirty-three partners from Maine to Georgia, including state agencies, federal agencies, and academic institutions. The program has existed since 1988. Over 20,000 Atlantic sturgeon have been tagged, with a recapture rate of approximately 9%.

Although the conventional tagging database provides a longer time-series of tagged fish than the acoustic tagging dataset, the SAS had concerns about the reliability of the dataset, including the low recapture rate, the uncertainty in the reporting rate, and the potential for incomplete reporting.

6.12 Acoustic Tagging Model

6.12.1 Background of Analysis and Model Description

The Cormack–Jolly–Seber (CJS) model is an open capture–recapture model that provides estimates of detection probability (probability that a tagged fish will be detected by a receiver if present), and apparent survival (a fish's probability of surviving and being in an area covered by receivers; Kéry and Schaub 2012). Each tagged individual in the model has a capture history based on whether it was alive and detected for a given sampling period. Hightower et al. (2015) previously analyzed a subset (from South Atlantic and Carolina DPSs) of this dataset using the CJS model.

6.12.2 Acoustic Tagging Data

Atlantic sturgeon have been implanted with acoustic transmitters by a number of researchers throughout the Atlantic Coast. Data for this analysis were provided by 12 different researchers and state agencies from all five DPSs. A total of 1,331 tagged Atlantic sturgeon detection records (Table 36) were available from a period of January 2006–December 2015 (Figure 69). The size of Atlantic sturgeon at tagging ranged from 298–2,680 mm TL (Figure 70). Atlantic sturgeon were assigned to a "home" DPS via genetic information (collected at tagging and analyzed in conjunction with this assessment) when possible. Otherwise, individuals were assigned to a DPS based on tagging location.

6.12.3 Model Configuration

The model was constructed in Program R and run using WinBUGS. The model code was based on that of Kéry and Schaub (2012) and Hightower et al. (2015). A simulation study was used to evaluate model performance. The model estimates survival and detection probability on monthly data time-steps. Monthly estimates of survival were then converted to annual estimates. A variety of modeling scenarios were evaluated with different temporal and DPS varying estimates of both survival and detection probability. Additionally, tags were analyzed based on three size groups: all combined, adults (>1,300 mm TL), and juveniles (<1,300 mm TL). The best model for each size group was selected using Deviance Information Criterion (DIC).

6.12.4 Model Results

6.12.1.1 Coast-wide Results

Overall, the mean survival estimate was high for all Atlantic sturgeon, at 0.96 (0.84–0.99, 95% credible interval; Table 37). Adult survival (0.94, 0.71–1.00) was slightly higher than juvenile survival (0.91, 0.63–1.00). This translates into total mortality (Z) estimates of 0.04 for all Atlantic sturgeon, 0.06 for adults only, and 0.09 for juveniles. Estimates from the best supported model used a single survival estimate, but had varying monthly detection. All models produced similar estimates of survival (~0.90), suggesting robust results. Detection was lower in winter and early spring months (Figure 71), and slightly higher for juveniles. This is consistent with observations of Atlantic sturgeon moving to areas with poor receiver coverage or areas where receivers are pulled seasonally (e.g., coastal Delaware). Juvenile Atlantic sturgeon had a higher detection probability, likely because they tend to remain within inshore areas with generally better receiver coverage.

Estimated annual survival was somewhat higher than estimated by Hightower et al. (2015) for the subset of this data, while Kahnle et al. (2007) estimated annual adult Atlantic sturgeon survival to range between 0.76-0.92. Additionally, for related gulf sturgeon, Pine et al. (2001) estimated subadult and adult survival of 0.84 and Rudd et al. (2014) estimated survival to range from 0.70–0.98 for four different population groups.

6.12.1.2 DPS-Specific Results

Individual DPS mean survival estimates were variable and lower than the coast-wide pooled estimates (Table 38). Estimates from the best supported model used a single survival estimate, but had varying monthly detection. Monthly detection estimates were like those of the coast-wide estimates. Pooled size estimates for the Carolina and South Atlantic DPSs were like the results of Hightower et al. (2015) for rivers in those same DPSs. Mean survival estimates for adult (Table 39) and juvenile (Table 40) size groups was widely variable among DPSs. Mean survival estimates were lower for individual DPSs than coast-wide. The Carolina DPS (0.34, 0.02–0.87) adult and Gulf of Maine DPS (0.35, 0.02–0.91) and South Atlantic DPS (0.62, 0.13–0.96) juvenile estimates were especially low, although the credible intervals were very wide.

Mean survival estimates were lower for individual DPSs than for the coast-wide population. This was a result of how mean estimates are derived in the model. The CJS model appeared to be somewhat sensitive to sample size and credible intervals were generally wider in groups with smaller sample sizes (Table 36). The posterior distributions of survival were left skewed and had an upper bound of 1.0, so that greater uncertainty tended to pull mean estimates down. Using the same model, Hightower et al. (2015) also observed a higher pooled than individual survival estimate in all but one of their study rivers and credible intervals were all larger for individual estimates.

Further tagging studies may be required to improve estimates in areas with poor estimates and small sample sizes. If survival is actually high, adding additional years of telemetry data will improve and increase estimates of survival, since there would be additional opportunities to detect tagged sturgeon that may have been unobserved previously, although still alive. The next step for using acoustic tagging data should involve method with a spatial component, such as multi-state modeling (Kéry and Schaub 2012). This would allow for the quantifying of movements and has already been successfully used for sturgeon populations (Rudd et al. 2014).

6.13 Stock Reduction Analysis

Stock reduction analysis attempts to answer the question “given what we know about the life history of a species, how productive would the stock have to have been to sustain the observed catch and end up where it is now?”

The two modeling frameworks explored in this assessment are Depletion-Based Stock Reduction Analysis (DBSRA; Dick and MacCall 2011) and Stochastic Stock Reduction Analysis (SSRA; Walters et al. 2006). The major difference between the two approaches is the population model that underlies the analysis: DBSRA uses a surplus production model and SSRA uses an age-structured model.

6.13.1 Depletion-Based Stock Reduction Analysis

6.13.1.1 Background of Analysis and Model Description

Depletion-based stock reduction analysis (DBSRA) is a technique proposed by Dick and MacCall (2010, 2011) to generate sustainable yield reference points for data-poor groundfish stocks in the Pacific Northwest. It is a variation on stochastic stock reduction analysis (Walters et al., 2006) that uses a production model rather than an age-structured model to describe the underlying population dynamics.

In this approach, a population is described by a model, in this case the Pella–Tomlinson–Fletcher (PTF) surplus production model:

$$B_{t+1} = B_t + \gamma \cdot MSY \cdot \left(\frac{B_t}{K}\right) - \gamma \cdot MSY \cdot \left(\frac{B_t}{K}\right)^n - C_t \qquad (1)$$

In this formulation, *n* is the shape parameter that defines where the maximum productivity of the stock occurs relative to *K*, the carrying capacity or virgin biomass:

$$\frac{B_{MSY}}{K} = n^{\frac{1}{(1-n)}}$$

When $n = 2$, the PTF model is equivalent to the Schaefer model, where $B_{MSY} = 0.5K$. When $n < 2$, the maximum productivity of the stock occurs at a biomass less than half of *K*, whereas when $n > 2$, the maximum occurs at greater than half of *K*. The parameter γ is entirely dependent on *n:*

$$\gamma = \frac{n^{\left(\frac{n}{n-1}\right)}}{n-1} \qquad (2)$$

MSY represents the maximum sustainable yield of the stock. Dick and MacCall reparametrized *MSY* as a function of the shape of the productivity curve, *K,* and U_{MSY}:

$$MSY = K \cdot \frac{B_{MSY}}{K} \cdot U_{MSY} \qquad (3)$$

It has been noted that the PTF model tends to overestimate production at low stock sizes when the production curve is skewed away from the traditional symmetrical Schaefer shape. Therefore, Dick and MacCall implemented a hybrid production function that estimate production using the Schaefer function below a certain biomass and the PTF function above it.

We can select reasonable values for B_{MSY}/K and U_{MSY} based on our knowledge of the life history of this species and meta-analysis of other, similar species, and then ask the question: if the population sustains *y* years of observed catch, what did the virgin population size have to be in order to both sustain those catches without being driven to extinction and end up at some known fraction of *K* at the end of the time series?

Selecting point values for B_{MSY}/K and U_{MSY}, as well as for the final target B_y/K ratio, will give us one solution. By instead drawing values from distributions for those parameters, we can incorporate our uncertainty about those parameters into the final estimates of *K*, and by extension B_{MSY} and the proposed overfishing limit.

The formulation of Dick and MacCall's DBSRA as implemented here includes three extensions: (1) catch is not assumed to be known without error and instead is drawn from a series of annual distributions; (2) the population is not necessarily assumed to start at *K*, but from a proportion of *K* that is drawn from a distribution; and (3) *K* is assumed to have changed over time in stanzas, with *K* in later years being calculated as a proportion of virgin *K*. The proportion of virgin *K* in later years is also drawn from a distribution.

6.13.1.2 Model Configuration

It is not possible to separate historical landings by DPS. The oldest historical fisheries tended to operate on mature individuals returning to spawn, but there have also been significant removals from ocean fisheries, including the directed ocean intercept fisheries off New York and the Carolinas and bycatch from other ocean fisheries. In addition, even in-river fisheries may harvest fish from another DPS that are visiting to feed or shelter in the estuaries. Therefore, this model treats the coast-wide meta-complex of Atlantic sturgeon populations as a single stock.

The total removals time series for this model (Table 41) includes US Fish Commission landings data from 1887–1949, state and federal landings data obtained from ACCSP from 1950–2015, and estimates of bycatch from the Northeast Fisheries Pelagic Observer Program (2000–2015; see Section 4.2) and NC's inshore gill-net monitoring program (2004–2015; see section 4.3). The DBSRA requires input in total weight, so for estimates of bycatch in numbers, data on mean weight of observed sturgeon were used to convert numbers into weight.

There are gaps in the earliest years of the historical catch record; these most likely do not represent true years of zero catch, but rather a lack of reporting. A loess smoother was used to interpolate years of missing catch over the first 25 years of the data series (Figure 72).

Removals were assumed to have some degree of uncertainty around them. For each run, a time-series of removals was created by drawing an estimate of catch for each year from independent lognormal distributions with the mean equal to the reported annual value and a CV which varied depending on the time period and the assumed reliability of reporting from that period (Table 41; Figure 73).

The analysis draws values needed to parameterize the hybrid PTF function from distributions specified by life history analysis, meta-analysis of similar species, and expert opinion. The values drawn are natural mortality, the ratio of F_{MSY} to M, the ratio of B_{MSY} to K, and the ratio of biomass in the terminal year to K. In addition, for some runs, the ratio of biomass in the initial year to K and the ratio of K in recent years to virgin K were also drawn from distributions.

The distributions of M, F_{MSY}/M, and B_{MSY}/K were assumed to be informative (lognormal or beta distributions) while the distributions for the other parameters were uniform.

The parameters and their distributions are described in 0 and Figure 74.

6.13.1.3 Model Results

Overall rates of success–runs that ended at the correct B_{2015}/K ratio and did not drive the population extinct–were low. The model preferred runs where the ratio of B_{2015}/K was higher (Figure 75). The model struggles to reconcile the high catches at the beginning of the time series with the lack of recovery with the low observed catch in recent years. Allowing K to vary over time–suggesting lower productivity in recent years–increased the number of successful runs.

Across different sensitivity runs, estimates of virgin K were very similar (Figure 77), with the base single K model having a median K = 27,988 mt and the base two-stanza K run having a median initial K = 27,724 mt.

For the 2-stanza K model, the model preferred runs with a median K scalar of approximately 0.46 (Figure 78), suggesting the current carrying capacity of the Atlantic coast is K = 12,777 mt. Estimates of current K were similar across sensitivity runs for the 2-stanza model as well (Figure 78).

This model cannot be used to evaluate stock status, since stock status relative to K is one of the inputs (Figure 74). However, trends are similar across runs regardless of final stock status, with the population declining rapidly from the beginning of the time-series to the early 1900s to a low but stable abundance, with the population beginning to increase again from the late 1990s onwards.

ARIMA trend analysis generally suggested either no trends or increasing trends for the indices examined, which is generally consistent with the DBSRA result.

6.13.2 Stochastic Stock Reduction Analysis (SSRA)

6.13.2.1 Background of Analysis and Model Description

Walters *et al.* (2006) developed stochastic stock reduction analysis (SSRA) to answer the question:

> *"If the stock had average unfished recruitment R0 and exhibited recruitment over time that varied around a mean recruitment relationship (around a stock–recruitment curve) in a pattern similar to that observed*

for other populations, how probable is it that stock size would end up at or near the present estimated size given the observed history of catch?"

Conceptually, this is very similar to the DBSRA, but SSRA uses an age-structured model to describe the population dynamics instead of a surplus production model. Abundance at age ($N_{a,y}$) is calculated as:

$$N_{a+1,y+1} = N_{a,y} \cdot e^{-M_a}\left(1 - v_a U_y\right) \qquad (4)$$

Where M_a is natural mortality at age, v_a is vulnerability to the fishery at age, and U_y is the annual exploitation rate.

Vulnerability is specified as an input to the model (unlike a traditional catch-at-age model where vulnerability/selectivity is estimated by the model). The annual exploitation rate is calculated as:

$$U_y = \frac{C_y}{\sum_a N_a v_a w_a} \qquad (5)$$

Where C_y is annual removals in weight, and w_a is individual weight at age.

Age-1 abundance every year is specified as:

$$N_{1,y+1} = \frac{K\left(\frac{R_0}{SSB_0}\right)SSB_y}{1+\left[\frac{K-1}{SSB_0}\right]SSB_y} e^{\vartheta_y} \qquad (6)$$

Where R_0 is virgin recruitment, K is the Goodyear recruitment compensation ratio, and ϑ_y are the annual recruitment deviations around the stock-recruitment relationship.

By specifying K and ϑ_y based on life history information and meta-analysis of similar species and then fitting to an estimate of population size in recent years or an index of abundance, we can estimate R_0. By resampling from the recruitment deviations, we can develop a distribution of the probability of being at abundance N in the terminal year, given virgin recruitment R_0.

Like the DBSRA, this is not intended to be a stand-alone stock assessment model but instead to provide information on historical unfished population sizes and productivity. Walters et al. (2006) used white sturgeon as a proof of concept in their original paper, and Ahrens and Pine (2014) used this approach to develop habitat-based recovery targets for Gulf sturgeon.

6.13.2.2 Model Configuration

As with the DBSRA, since we cannot separate landings by DPS for the time-series, this model is applied to the coast-wide meta-population of Atlantic sturgeon. The time series of catch is the same as used for the DBSRA (Table 41).

Natural mortality was estimated using the Lorenzen equation as described in section 2.6.1. Weight at age was calculated as described in section 2.4. Maturity at age was taken from Kahnle (2007). Vulnerability was defined in two periods, a directed period from 1887–1997 and a bycatch/incidental period from 1998–2015. The directed selectivity was taken from Kahnle (2007), and the bycatch selectivity was calculated for the Egg-per-Recruit analysis as described in Section 6.14. The Goodyear compensation ratio was set at 5.0, the same value used by Walters et al. (2006) for white sturgeon and by Ahrens and Pine (2014) for Gulf sturgeon.

There are no estimates of absolute abundance for the coast-wide Atlantic sturgeon population, so the model was tuned to fisheries-independent indices of abundance. The CT Long Island Sound Trawl Survey, which samples the mixed ocean population and goes back to 1984, was used as the base case index, and the hierarchical coast-wide index of adult abundance derived using the Conn method (see Section 6.6) was used as sensitivity run.

The SSRA was implemented in ADMB with estimates of recruitment deviations drawn outside the model in R from a normal distribution with a mean of 0 and a standard deviation of 0.6, following the work of Rose et al. (2001). Attempts were made to estimate recruitment deviations within ADMB, but there was not enough information in the indices to allow the model to converge. Average unfished recruitment, R_0, and index catchability was estimated internally.

6.13.2.3 Model Results

The SSRA was not stable. Without estimates of absolute abundance to scale the population at the end of the time-series, q had to be constrained to prevent the model from allowing the population to recover to levels above the initial conditions, similar to the behavior of the DBSRA. When q was constrained, many of the deterministic runs of the model, with different parameterization of selectivity or other sensitivity runs, would not converge, even without recruitment deviations added in. As a result, the uncertainty in the estimates from the resampled runs is an underestimate the true uncertainty.

The SSRA estimated virgin average recruitment (R_{0+}) at 32,300 age-1 fish (Figure 80). Estimates of recruitment in the Altamaha River in recent years was 1,072–2,033 individuals (Schueller and Peterson 2010); in the Ogeechee River was 450 individuals (Farrae et al. 2009); and in the Delaware River was 3,656 individuals (Hale et al. 2016), suggesting current recruitment, at least within river systems where estimates are available, is below virgin unfished recruitment for the coast.

Trends in spawning stock biomass (SSB) and abundance were similar to trends estimated by the DBSRA and the scale of the initial biomass was similar for both models (0 and Figure 82). The SSRA also suggests that the population has been trending upwards in recent years.

Estimates of exploitation were high at the beginning of the time-series but have declined to very low levels in recent years (Figure 83).

Both the DBSRA and the SSRA, when unconstrained, showed the population recovering rapidly from the mid-1900s onward, to levels at or above virgin conditions. Our current perception of the stock is that this is not true. This suggests that either we are missing a source of mortality that is acting to keep the population at lower levels, or that productivity has changed and the lower levels of removals we see today have a larger impact on the population than they would have at the beginning of the time-series.

6.14 Egg-per-Recruit

6.14.1 Background of Analysis and Model Description

The eggs-per-recruit analysis was applied to data that were considered the best representation of the stock on a coast-wide scale. To evaluate the sensitivity of the model to differences in life history parameters among the different DPSs, the analysis was also run assuming life history parameters representative of a northern region (slower growing, longer lived) and life history parameters representative of a southern region (faster growing, shorter lived). Based on data availability, data from the New York Bight DPS were used to represent the northern region and data from the Carolina DPS were used to represent the southern region. The required life history parameters were not currently available from the Gulf of Maine DPS or South Atlantic DPS.

6.14.2 Model Configuration

Growth

The von Bertalanffy age-length function was used to predict length at age. The parameters were those estimated in section 2.4 of this report and those used here are summarized in Table 43.

The length-weight relationship was described in section 2.4 of this report and the parameters used here are summarized in Table 44.

For the coast-wide and northern region eggs-per-recruit models, a maximum age of 60 years was assumed. A maximum age of 40 years was assumed for the southern region model.

Spawning

Estimates of age and length at maturity were difficult to identify. One maturity schedule was found in Kahnle et al. (2007) and was applied here to all configurations (Figure 84).

There is limited information available on fecundity parameters for Atlantic sturgeon. The data that are available were collected from South Carolina (Smith et al. 1982) and the Hudson River (van Eenannaan et al. 1996; van Eenannaam and Doroshov 1998; Table 45). After extensive discussion, the SAS felt the linear length-fecundity relationship estimated by van Eenannaam and Doroshov (1998) was the most appropriate to incorporate into the eggs-per-recruit model representing the coast-wide stock and was also used for the northern region (Figure 85). The linear weight-fecundity relationship estimated by Smith et al. (1982) was used for the southern region eggs-per-recruit model (Figure 86).

Spawning was initially assumed to occur every three years for the coast-wide stock, but preliminary analyses found that changing this assumption had no impact on model results.

Mortality

The eggs-per-recruit model incorporated three sources of mortality: natural, bycatch, and ship strikes. Natural mortality was assumed to vary with age based on the estimates derived in Section 2.6.1 using the Lorenzen method (Figure 87). A range of bycatch and ship strike mortality values was evaluated and is described below.

Selectivity

Age-specific selectivity vectors were derived for bycatch mortality and ship strike mortality. Bycatch selectivity was determined following the methods of Restrepo et al. (2007), which is a simple approach based on equilibrium catch curves. Bycatch lengths for Atlantic sturgeon were available from the NEFOP/ASM data set and Delaware State University (DSU). These lengths were collected from both gill nets and trawls. The lengths were converted to ages based on the von Bertalanffy age-length relationship described earlier. These data were then used to estimate frequency at age (Figure 88). A linear regression is then applied to the log_e-transformed observed proportion at age, p_a, for fully-selected ages (here, ages 12+):

$$log_e(p_a) = b_1 + b_2 \times a$$

The selectivity can then be estimated from the ratio of observed proportions to predicted proportions:

$$\hat{p}_a = e^{\hat{b}_1 + \hat{b}_2 \times a}$$

$$\hat{S}_a = \frac{p_a}{\hat{p}_a}$$

and then re-scaled so the maximum is 1.0 (Figure 89).

Here, the estimation of selectivity was taken several steps further (modified Restrepo approach). Based on the results of the Restrepo approach, the SAS felt selectivity was likely maximum at ages 18 and older (Figure 89). The Restrepo-based selectivity vector was re-scaled so the maximum was 1.0 at age 18, and the selectivity at older ages was fixed at age 18 (Figure 90). A logistic function was fit to this adjusted curve to estimate the final selectivity curve that was assumed for bycatch in the eggs-per-recruit model (Figure 91).

Following Brown and Murphy (2010), Atlantic sturgeon were assumed to be fully vulnerable to ship strikes at age 3 and not vulnerable at all at ages 1 and 2 (knife-edge selectivity; Figure 92).

Eggs-per-Recruit Model

The number of pre-spawners in the model was computed as:

$$PreSpawn_0 = 1 \qquad \text{where } a = 1$$

$$PreSpawn_a = PreSpawn_{a-1} \times e^{-Z_a} \qquad \text{where } a > 1$$

Z_a is the sum of mortality at age (natural + bycatch + ship strike) after accounting for selectivity. Selectivity at age for ship strikes was divided by three for the coast-wide and northern region models to account for ship strikes occurring at an assumed rate of every three years. In the southern region model, ship strikes were assumed to occur every five years.

The number of spawners in the population was computed as:

$$Spawn_a = PreSpawn_a \times \frac{m_a}{3}$$

where m_a is maturity at age a. The value of three (3) in the denominator is to account for spawning every third year. Varying this value did not have an impact on model results.

The number of female spawners, $Spawn_{a,fem}$, was estimated by multiplying the number of spawners at age by the assumed sex ratio, 0.50.

For the coast-wide and northern region models, the number of eggs laid per female was estimated based on the length-fecundity relationship estimated by van Eenannaam and Doroshov (1998) and described earlier. The linear weight-fecundity relationship estimated by Smith et al. (1982) was used for the southern region model. The total number of eggs laid at age, E_a, was computed as the number of female spawners multiplied by the derived fecundity at age, fec_a:

$$E_a = Spawn_{a,fem} \times fec_a$$

Eggs-per-recruit, EPR, was calculated as:

$$EPR = \frac{\sum_a E_a}{PreSpawn_{a=1}}$$

The EPR analysis was used to find the value of Z that resulted in an EPR that was 50% of the EPR of an unfished stock (i.e., no anthropogenic mortality). This was accomplished based on assumed values for bycatch and ship strike mortality rates. First, ship strike mortality was assumed equal to 0.0 and the value of bycatch mortality that would result in Z at $EPR_{50\%}$ was determined using Excel's solver optimization tool. This value was the maximum bycatch mortality allowed and was used to set the upper limit of the range of bycatch mortality explored. Similarly, bycatch mortality was set equal to 0.0 to find the value of ship strike mortality that would result in Z at $EPR_{50\%}$ and the maximum value of ship strike mortality considered. Starting with values of 0.0, bycatch and ship strike mortality values were incremented by 0.01 (finding *Z* at $EPR_{50\%}$ at each increment) until the maximum value was reached.

In order to make the results more compatible with those of the tagging model (see Section 6.12.4), the estimated full *Z* values were converted to number-weighted mean values, using the numbers-at-age-per-recruit values of a population with that level of Z. Estimates of number-weighted Z were calculated for all ages, adults (>130 cm), and fish age 4 to 21 (the age range in the tagging model).

6.14.3 Model Results

Coast

For the coast-wide analysis, the EPR associated with an unfished stock was 1.7 million eggs per recruit. This results in an $EPR_{50\%}$ of 0.85 million eggs per recruit. Values of $Z_{50\%EPR}$ ranged from 0.12 to 0.13 for all fish, ranged from 0.068 to 0.072 for adult fish, and ranged from 0.085 to 0.094 for tagged fish (aged 4 to 21), depending on the assumed level of input mortality (Table 46). The estimated value of $Z_{50\%EPR}$ (number-weighted) increased for all fish and tagged fish (fish aged 4 to 21) as total *F* increased. For adult fish, values of $Z_{50\%EPR}$ decreased with increasing *F*.

Northern Region

For the northern region model, the EPR associated with an unfished stock was 1.1 million eggs per recruit, which results in an $EPR_{50\%}$ of 0.57 million eggs per recruit. Values of $Z_{50\%EPR}$ ranged from 0.12 to 0.13 for all fish, ranged from 0.086 to 0.090 for adult fish, and ranged from 0.10 to 0.11 for tagged fish (aged 4 to 21), depending on the assumed level of input mortality (Table 47). Like the coast-wide model, $Z_{50\%EPR}$ (number-weighted) increased for all fish and tagged fish (aged 4 to 21) with increasing *F* and decreased for adult fish with increasing *F*.

Southern Region

The EPR associated with an unfished stock was 254,249 eggs per recruit for the southern region model. This results in an $EPR_{50\%}$ of 127,125 eggs per recruit. Values of $Z_{50\%EPR}$ ranged from 0.15 to 0.16 for all fish, ranged from 0.12 to 0.13 for adult fish, and ranged from 0.12 to 0.13 for tagged fish (aged 4 to 21), depending on the assumed level of input mortality (Table 48). Similar to the coast-wide and northern DPS models, $Z_{50\%EPR}$ (number-weighted) increased for all fish and tagged fish (aged 4 to 21) with increasing *F* and decreased for adult fish with increasing *F*.

Discussion

Estimated values of $Z_{50\%EPR}$ were very low, reflecting the long-lived, slow-growing, slow to mature life history of Atlantic sturgeon. This analysis suggests Atlantic sturgeon cannot sustain high levels of anthropogenic mortality.

The estimated values of $Z_{50\%EPR}$ increased as total *F* increased for all fish and tagged fish (aged 4 to 21). For adult fish, values of $Z_{50\%EPR}$ decreased with increasing *F*. Values of $Z_{50\%EPR}$ were higher for the southern region model as compared to the northern region model over the range of bycatch and ship strike mortalities evaluated; however, the range of $Z_{50\%EPR}$ values was extremely small, with only tiny differences in $Z_{50\%EPR}$ for the bycatch-only scenario and the ship strike-only scenario.

7 DISCUSSION

Atlantic sturgeon are not well monitored by the existing fishery-independent and -dependent data collection programs, and the uncertainty in the data hinders the SAS's ability to make strong quantitative conclusions. Trend analysis of most indices showed either no significant trends or increasing trends, suggesting stable or increasing populations of Atlantic sturgeon. Effective population size estimates were generally small, although highly uncertain in some cases. Low effective population sizes do not necessarily translate into low absolute abundance levels, but they may raise concerns about the potential for the loss of genetic diversity and the resilience of Atlantic sturgeon populations. Estimates of total mortality were very low. Observer coverage was not sufficient to fully characterize coast-wide Atlantic sturgeon bycatch and bycatch mortality. Bycatch mortality estimates derived from NMFS data were very similar in magnitude to those derived from NCDMF data. At the coast-wide level, Z was estimated at 0.04, below the estimates of $Z_{50\%EPR}$. Z estimates are low but are in the ballpark of other published estimates for Carolina and South Atlantic rivers. At the coast-wide level, total mortality appears to be low and sustainable. Estimates of Z from individual DPSs were less reliable (with much wider confidence intervals), reflecting smaller sample sizes at the DPS level.

Qualitatively, Atlantic sturgeon are showing signs of recovery relative to 1998, so it is important to continue management actions that have contributed to this (the moratorium, habitat restoration/protection, better bycatch monitoring) and work on improving them (e.g., identifying bycatch and ship strike hotspots and ways to reduce those interactions).

There has been a tremendous amount of new information about Atlantic sturgeon collected in recent years, which doesn't resolve the issue of the lack of historical data, but puts stock assessment scientists and fisheries managers on a better path going forward to continue to monitor stocks of Atlantic sturgeon and work towards its restoration.

7.1 Stock Status Determination Criteria

Atlantic sturgeon received full protection in its designation as a federally endangered species in 2012 (Federal Register 2012). However, there remains no NOAA Recovery Plan against which to evaluate Atlantic sturgeon status at the coast-wide or DPS-level. Also, for a species that has been under a moratorium for nearly twenty years, the traditional "overfished" and "overfishing" status designations are not as meaningful.

For this assessment, quantitative stock status was determined via the probability that the terminal year of the indices for a given DPS was greater than the index values from the start of the moratorium in 1998 (as evaluated by the ARIMA analysis), and by comparing estimates of total mortality from the tagging model to estimates of $Z_{50\%EPR}$.

Because the available indices only cover the most recent time period, long after the height of exploitation, metrics like trends in landings and consideration of anecdotal historical records were used to determine a qualitative biomass or abundance status relative to historical levels. In all DPSs and at the coast-wide level, Atlantic sturgeon were determined to be depleted, a term that acknowledges the impact of not just directed fishing mortality, but also bycatch mortality, ship strikes, and reductions in productivity due to habitat loss.

Given the limited data available to establish quantitative metrics to determine stock status, the SAS also considered more qualitative criteria such as the appearance of Atlantic sturgeon in rivers where they had not been documented in recent years (Table 1), discovery of spawning adults in rivers they had not been documented before, and increases in anecdotal interactions such as reports of jumping Atlantic sturgeon by recreational angler and ship strikes. These qualitative metrics come with the caveat that these increases in documented Atlantic sturgeon abundance may in some cases be the result of increased research and attention, not a true increase in abundance. However, this kind of qualitative information is still important in describing the current status of Atlantic sturgeon.

7.2 Stock Status Determination

Coast-wide

At the coast-wide level, Z was estimated at 0.04 which is below the threshold estimate of $Z_{50\%EPR}$ and each DPS was above the threshold estimate (Table 49 and Table 50, Figure 93). While DBSRA results could not be used to evaluate stock status for the coast-wide stock, trends were similar across runs regardless of final stock status, with the population declining rapidly from the beginning of the time-series to the early 1900s to a low but stable abundance and increasing again from the late 1990s onwards (Figure 76). SSRA analyses suggested that trends in SSB and abundance were similar to trends estimated by the DBSRA and the scale of the initial biomass was similar for both models (0 and Figure 82). The SSRA also suggests that the population has been trending upwards in recent years. SSRA suggests that estimates of exploitation were high at the beginning of the time-series but have declined to very low levels in recent years (Figure 83). EPR analyses suggest that Atlantic sturgeon cannot sustain high levels of anthropogenic mortality.

The SAS considers all DPSs of Atlantic sturgeon to be depleted relative to historical levels. In recent years, when using all available years of data for all indices, the terminal year index values were all credibly above the 25th percentile of their respective time series. When comparing index values in 1998 to 2015 using ARIMA, stock status varied. Using this metric for stock status determination, the Gulf of Maine and Chesapeake Bay DPS were below their 1998 values while the New York Bight and Carolina DPS as well as the coast-wide stock were above their 1998 values (Table 50, Figure 93). The South Atlantic DPS could not be evaluated using this metric since it did not have a survey in the region that fulfilled the criteria to be used in ARIMA. The Conn index, used as an index of the coast-wide meta-population, was credibly above its 1998 value (Table 50, Figure 93). In addition to the quantitative metrics in Table 50, all of the DPSs showed qualitative signs of improving populations such as increased presence of Atlantic sturgeon, including in rivers where species interactions had not been reported in recent years, and the discovery of spawning in rivers where it had not been previously documented.

Gulf of Maine DPS

Trend analysis for the ME-NH Trawl indicated there was no significant trend over the time-series, but that the index in 2015 was likely to be above the 25th percentile of the time-series according to the ARIMA. This index was likely below its value in 2000 (Figure 94); the survey started in the year 2000, and so could not be compared to the reference 1998 year as the other surveys were. Some challenges for using this index as a proxy for the DPS was that the index has relatively wide confidence intervals, even after standardization due to small proportion of tows that were positive for sturgeon. In addition, this index operates in marine waters, so may encounter sturgeon from other DPSs as well as from the Gulf of Maine. Anecdotal evidence suggests that the population is stable or increasing and in the last decade there have been sightings or capture of fish in the Penobscot River, Saco River, and Presumpscot River where sturgeon have not been documented in many years. The mortality estimate for pooled adults and juveniles, Z=0.30, is higher than estimates of $Z_{50\%EPR}$ for both the coast and the northern region from the EPR model, indicating total mortality is too high for the Gulf of Maine DPS (Table 49, Figure 95). However, estimates of total mortality for Gulf of Maine fish from the tagging model had very wide confidence intervals.

New York Bight DPS

There has been documented spawning in the New York Bight DPS in the Connecticut, Hudson, and Delaware Rivers. ARIMA results suggest that the terminal year fitted indices from all surveys in New York Bight DPS were credibly above both the 25th percentile of the surveys and index value in 1998 (not all surveys had index values through 2015) (Figure 96). The CT LIST spring nominal index, CT LIST fall nominal index, and the CT LIST combined spring-fall index had significant (α = 0.05, Mann Kendall Test) increasing trends (Table 30); the time series trend in the NJ Ocean Trawl index was not significant (P > 0.05). The mortality estimate for pooled adults and juveniles, Z=0.09, is lower than the estimate of $Z_{50\%EPR}$ for the northern region from the EPR model (Table 49, Figure 97). Estimates of total mortality for New York Bight DPS fish from the tagging model had the narrowest credible intervals for any DPS, but they still included the Z-threshold.

Given the results of this assessment the New York Bight DPS of Atlantic sturgeon is considered above the level of abundance reported in 1998. The Hudson River conducts a juvenile abundance survey (NYDEC JASAMP) which did not meet the criteria for time series length for the assessment, but since 2006 it shows a positive trend. This increasing trend is somewhat tempered by a recent study (Kazyak et al. *in preparation*) that estimated the 2014 Hudson River Atlantic sturgeon spawning run was 450 (95% CI = 205-987) individuals. If skipped spawning is taken into consideration (Bain 1997), the annual run estimate appears to be similar to the total adult population ($\widehat{N}$ = 873) reported by Kahnle et al. (2007) for the last decade of the commercial fishery. In the Delaware River, an observed reduction in catch of fishery-independent bottom trawls and a directed gill net survey in the mid-estuary were used in the 1998 assessment to describe a decrease in relative abundance of Atlantic sturgeon. Population estimates based on mark and recapture of subadult Atlantic sturgeon from the gill net survey dropped from 5,600 in 1991 to less than 1,000 in 1995 with no recaptures collected in 1996 or

1997 (ASMFC 1998). Unfortunately, the mid-estuary gill net survey targeting subadults was not continued. However, both bottom trawl surveys suggest an increasing trend in relative abundance of predominately subadults since 1998 (Park 2016) supporting the results of the current assessment.

Chesapeake Bay DPS

In 1998, Atlantic sturgeon were thought not to use Chesapeake Bay tributaries for spawning. It is now known that spawning definitely occurs in the James and York (Pamunkey sub-tributary) Rivers, and likely occurs in the Nanticoke River (Marshyhope sub-tributary). Spawning is suspected to occur in several other tributaries (Rappahannock and other sub-estuaries of the York and Nanticoke Rivers). The fitted index from this DPS had two large oscillations and no significant trend over the duration of their respective time series ($\alpha = 0.05$, Mann Kendall Test; Table 26). ARIMA results indicated that the index in 2015 was credibly above the 25th percentile of its respective time series (Figure 64), but that the 2015 index was likely below the 1998 index (Figure 98). Still, because the index exhibited two large oscillations, this last analysis of status may be less relevant to trends in abundance. The mortality estimate for pooled adults and juveniles, Z=0.13, is higher than estimates of $Z_{50\%EPR}$ for both the coast and the southern region from the EPR model, indicating total mortality is too high for the Chesapeake Bay DPS (Table 49, Figure 99). However, estimates of total mortality for Chesapeake Bay fish from the tagging model had wide confidence intervals.

Carolinas DPS

In the Carolina DPS, Atlantic sturgeon have been verified to spawn in the Roanoke River, and are suspected to spawn in the Tar-Pamlico, Neuse, and Cape Fear Rivers in North Carolina as well as, the Pee Dee and Cooper Rivers in South Carolina based on recent tagging studies and collections of river-resident age-0 and age-1 fish. Many of the spawning populations in the Carolina DPS have not been verified through egg or larval collections, and that there are few long term data on relative sturgeon abundance. However, anecdotal evidence suggests spawning is occurring in more rivers than previously believed but spawning success is likely variable thus emphasizing the importance of protecting spawning and nursery habitats and migration corridors within the Carolina DPS. Based on the results of the ARIMA and trend analysis for the Carolina DPS, terminal year indices were all credibly above the 25th percentile of its respective survey time series. Terminal year indices in the Carolina DPS were all credibly above its respective index value in 1998 except for the North Carolina p135-fall index (Figure 100). Fitted indices from the Carolina DPS had either no significant trend or significantly increasing trends ($\alpha = 0.05$, Mann Kendall Test). The mortality estimate for pooled adults and juveniles, Z=0.25, is higher than estimates of $Z_{50\%EPR}$ for both the coast and the southern region from the EPR model, indicating total mortality is too high for the Carolina DPS (Table 49, Figure 101). However, estimates of total mortality for Carolina DPS fish from the tagging model had very wide credible intervals.

South Atlantic DPS

The SC Edisto survey index time series was not long enough (<15 years) to be included in the ARIMA analysis, so status relative to 1998 is not known. However, trend analysis for this index appear to be stable from 2004-2015. Atlantic sturgeon spawning takes place in the Edisto, Combahee, Savannah, Altamaha, Ogeechee, and Satilla Rivers. Dual spawning events (spring and fall) have also been confirmed in the Edisto River and may occur in other South Carolina Rivers (Post et al. 2014, Farrae et al. 2017). Four Atlantic sturgeon that were at large for up to 16 years were recaptured (originally tagged as YOY, <500mm) in the Edisto River, suggesting that the 1998 moratorium has worked and these fish were not impacted by anthropogenic effects. Repeat annual captures of age 0+ fish indicate successful spawning and recruitment is evident in the Edisto, Savannah, Altamaha, Ogeechee, and Satilla Rivers. Additionally, age 1 population estimates exist for many Georgia Rivers (Bahr and Peterson 2016, Farrae et al. 2009). These estimates along with other qualitative data suggest populations in these South Atlantic DPS rivers appear to be stable, if not increasing.

7.3 Threats and Barriers to Recovery

Primary threats to recovery of Atlantic sturgeon stocks and populations throughout the U.S. Atlantic Coast include fishery and research bycatch (takes) in U.S. and Canadian waters, ship strikes, and habitat loss and degradation including from dredging operations, shoreline modification, water pollution, and dam construction. Other potential emerging threats include invasive species, such as blue and flathead catfish. In regions where sturgeon from different DPSs mix in coastal aggregations, threats to these aggregations (e.g., bycatch mortality and ship strikes) may have disproportionate population effects at the DPS-level.

Bycatch is most likely the primary source of fishing mortality currently and is a primary threat to the recovery of species, particularly where bycatch exists on mixed stock aggregations (e.g., Long Island Sound of New York), because Atlantic sturgeon are long lived, have an older age at maturity, lower maximum fecundity, low natural mortality rates and low abundance, and older ages at which 50% of the egg production is realized. Incidental bycatch of Atlantic sturgeon can occur in most fishery gears including gill nets, pound nets, hoop nets, fyke nets, fish pots, fish traps, crab pots, trawls and hook and line, with gill net and trawl interactions having the highest potential for mortality. Data on bycatch in the ocean is limited due to low to non-existent rates of on-board observer coverage in most fisheries that may encounter sturgeon. Little is known about survival of fish that are captured and released. Total losses from bycatch are unknown and may be hindering recovery of stocks. Though bycatch remains a threat to recovery of Atlantic sturgeon it may not be as severe of a threat as in the past. Since Atlantic sturgeon were listed under the ESA, many fisheries that interact with Atlantic sturgeon have been modified to minimize these interactions through various means such as the requirements of incidental take permits for Atlantic sturgeon and sea turtles, as well as changes to fisheries required by American Shad Sustainability Plans.

In addition to bycatch, poaching of Atlantic sturgeon is also known to occur. Incidents of poaching have been documented by law enforcement in Virginia, South Carolina and New York (ASSRT 2007). In some cases, the fish were killed for personal consumption, and in others, they were intended for the black market. The magnitude of removals due to poaching is unknown, but since the $Z_{50\%EPR}$ rates are so low, even small levels of poaching could hinder stock recovery.

Ship strikes also remain as a source of mortality and a threat to recovery for Atlantic sturgeon. Due to the high volume of large cargo vessel traffic in relatively shallow shipping channels where Atlantic sturgeon pass through to get to and from ocean waters and spawning grounds, ship strike mortality may threaten the recovery of Atlantic sturgeon, particularly in the New York Bight (Hudson and Delaware Rivers), the Chesapeake Bay (James, York and Nanticoke Rivers) and the Carolina (Cape Fear River and Charleston Harbor) DPSs. Due to the highly migratory behavior of Atlantic sturgeon, ship strike impacts in any DPS waterbody may play a role in threats to Atlantic sturgeon throughout its range (e.g., mixed stock aggregations).

For Atlantic sturgeon, habitat loss and degradation, hypoxia, and climate change are also threats and barriers to recovery. Spawning and nursery habitats occur in the highest segments of estuaries just below the fall line where low volumes, depths, and channel widths make them particularly vulnerable to shoreline modifications, dredging, and flow regulation (see Appendix A – Habitat). Since the early-mid 1800s, building of dams has cut off access to historical spawning grounds. Changes to flow regimes caused by dams may also alter the accessibility of the remaining spawning habitat below the dams and interfere with Atlantic sturgeon's ability or willingness to return to their natal spawning grounds. Deposition of dredged materials from major shipping and navigation channels across the Atlantic coast has resulted in the loss of historical Atlantic sturgeon spawning and nursery habitat. Maintenance dredging of shipping channels and for beach renourishment projects also has the potential to affect habitat essential to the recovery of the species. Additional negative impacts to Atlantic sturgeon habitat due to dredging, dam construction, and shoreline operations include reduced water quality, changes in flow rates, nutrient loading which can lead to low dissolved oxygen and hypoxic zones. Some of the impacts of the loss of historical spawning and nursery grounds may be reversed by dam removal projects (e.g., the removal of the Edwards Dam on the Kennebec River in 1999, the Penobscot River Restoration Project), or habitat mitigation and restoration. DO levels below 3 ppm are stressful to sturgeon. Low DO was a historic problem in the Hudson (untreated sewage); DO has increased as a result of improved sewage treatment, however still continue to be an issue in older urban areas (e.g., New York City). Research has shown that the survival, growth, and movement behaviors of young sturgeon (age 0-1) are sensitive to hypoxia; post-juvenile stages show more resilience to hypoxic conditions. Summertime hypoxia remains systemic throughout much of the shallow water Chesapeake Bay and is likely curtailing the amount of available habitat to Atlantic sturgeon. Regional warming and changed seasonality will likely influence how Atlantic sturgeon use habitat throughout its range for foraging, reproduction and nursery grounds (Najjar et al. 2010). Low overall rates of climate warming was predicted to severely decrease summertime carrying capacity for juvenile Atlantic sturgeon (Niklitschek and Secor 2005). Several states and regions have either implemented, developed, or initiated development of regional water plans aimed to meet future water needs for both water quantity and water quality (ground water and surface water) for Atlantic sturgeon and other marine (and freshwater) species (e.g., New York and Georgia).

In addition to degrading habitat, construction projects such as dredging, bridge construction, and underground power line installation may also result in mortality due to ship strikes or other accidental interactions.

Invasive species such as blue catfish and flathead catfish may be another potential threat to Atlantic sturgeon recovery. Blue catfish are generalist piscivores and are present in Atlantic sturgeon nursery and spawning habitats in the Chesapeake Bay, Carolina, and South Atlantic DPSs (Schloesser et al. 2011). Flathead catfish are abundant in the Carolina DPS (south of the Albemarle Sound area) and the South Atlantic DPS, and concerns have been raised that flathead catfish may be harming the recovery of anadromous fish in mid-Atlantic rivers (Brown et al., 2005). Evidence that these species prey upon young-of-year Atlantic sturgeon is inconclusive. Moser et al. 2000 tested whether flathead catfish preyed on shortnose sturgeon (30 cm) in a controlled system, and despite sturgeon being the only prey available, none were consumed. However, a direct observation of an Atlantic sturgeon in the gut contents of a flathead catfish was made by Flowers et al. (2011) from the Satilla River. A recent study found no physical or genetic evidence of Atlantic sturgeon was found in the stomachs of 2,495 blue and flathead catfish collected from the James River (Schmitt et al. (2017), Bob Greenlee, VA Dept. of Fish and Game, personal communication). However, that study was conducted from March-May, and thus may have missed the period when fall-spawned young-of-year were available to the catfish. More research is needed to determine whether these invasive species are a threat to Atlantic sturgeon recovery.

8 RESEARCH RECOMMENDATIONS

The SAS identified several research recommendations that would benefit Atlantic sturgeon and future stock assessments. Research recommendations have been categorized as future research, data collection, and assessment methodology and ranked as high or moderate priority. Recommendations with asterisks (**) indicate improvements that should be made before initiating another benchmark stock assessment. The SAS recommends that an update be considered in 5 years and a benchmark stock assessment considered in 10 years given the life history of Atlantic sturgeon and the need for more data. The SAS and TC recommend that during the years between this assessment and the next, members remain proactive about monitoring research programs, maintaining tagging networks and genetic databases, and continuing to initiate or participate in activities that accomplish some of the research recommendations listed below.

Future Research

High Priority

Identify spawning units along the Atlantic coast at the river or tributary and coast-wide level.

**Expand and improve the genetic stock definitions of Atlantic sturgeon, including developing an updated genetic baseline sample collection at the coast-wide, DPS, and river-specific level for Atlantic sturgeon, with the consideration of spawning season-specific data collection.

Determine habitat use by life history stage including adult staging, spawning, and early juvenile residency.

Expand the understanding of migratory ingress of spawning adults and egress of adults and juveniles along the coast.

Identify Atlantic sturgeon spawning habit through the collection of eggs or larvae.

Investigate the influence of warming water temperatures on Atlantic sturgeon, including the effects on movement, spawning, and survival.

Moderate Priority
Evaluate the effects of predation on Atlantic sturgeon by invasive species (e.g., blue and flathead catfish).

Data Collection

High Priority
**Establish regional (river or DPS-specific) fishery-independent surveys to monitor Atlantic sturgeon abundance or expand existing regional surveys to include annual Atlantic sturgeon monitoring. Estimates of abundance should be for both spawning adults and early juveniles at age. See Table 8 for a list of surveys considered by the SAS.

**Establish coast-wide fishery-independent surveys to monitor Atlantic sturgeon mixed stock abundance or expand existing surveys to include annual Atlantic sturgeon monitoring. See Table 8 for a list of surveys considered by the SAS.

**Continue to collect biological data, PIT tag information, and genetic samples from Atlantic sturgeon encountered on surveys that require it (e.g., NEAMAP). Consider including this level of data collection from surveys that do not require it.

**Encourage data sharing of acoustic tagged fish, particularly in underrepresented DPSs, and support programs that provide a data sharing platform such as The Atlantic Cooperative Telemetry Network. Data sharing would be accelerated if it was required or encouraged by funding agencies.

**Maintain and support current networks of acoustic receivers and acoustic tagging programs to improve the estimates of total mortality. Expand these programs in underrepresented DPSs.

**Collect DPS-specific age, growth, fecundity, and maturity information.

**Collect more information on regional vessel strike occurrences, including mortality estimates. Identify hot spots for vessel strikes and develop strategies to minimize impacts on Atlantic sturgeon.

**Monitor bycatch and bycatch mortality at the coast-wide level, including international fisheries where appropriate (i.e., the Canadian weir fishery). Include data on fish size, health condition at capture, and number of fish captured.

Assessment Methodology

High Priority

**Establish recovery goals for Atlantic sturgeon to measure progress of and improvement in the population since the moratorium and ESA listing.

**Expand the acoustic tagging model to obtain abundance estimates and incorporate movement.

Moderate Priority

Evaluate methods of imputation to extend time series with missing values. ARIMA models were applied only to the contiguous years of surveys due to the sensitivity of model results to missing years observed during exploratory analyses.

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10 TABLES

Table 1. Evidence for spawning tributaries and sub-populations for U.S. Atlantic sturgeon. Level of certainty assigned to spawning sub-populations are, **(1) Confirmed** – Eggs, embryo, larvae, or YOY (<30 cm TL) observed in tributary; **(2) Highly likely** - Large adults physically observed expressing gametes in freshwater tidal reaches of the tributary; discrete genetic composition associated with adults or early life stages within a tributary; **(3) Suspected** - Adults observed (either by telemetry, capture, ship strikes, or 2nd hand accounts) in upper reaches of tributaries; recent historical accounts (last 30 years) of adults observed in upper reaches of tributaries; presence of river-resident juveniles (Age-1, <50cm TL); **(4) Unknown**; and **(5) Suspected historical** - (Yes/No) either confirmed, highly likely or suspected, but no physical observations of such criteria in the last 30 years. PC = personal communication. Note that this is not to be considered a comprehensive list of rivers and tributaries along the U.S. Atlantic coast.

DPS	River System/ Tributary	Spawning Certainty	Evidence	Reference(s)
Gulf of Maine	St. Croix	4	No mention of sturgeon in Atkins 1887; salt wedge almost to the first dam in summer	Larsen and Doggett 1979 (in ASMFC 1998)
	Penobscot	5	Suspected historical, possibly extirpated; current telemetry detections not in freshwater reaches	Altenritter et al. 2017
	Kennebec	1	Larvae captured	Wippelhauser et al. 2017
	Merrimack	4	Subadults and adults captured and tagged since 1990s	ASSRT 2007 (citing Knyard & Keiffer)
New York Bight	Tauton	5	Historical records indicate spawning occurred; sparse observations reported	ASSRT 2007
	Connecticut	1	Collection of river-resident juveniles	Savoy et al. 2017
	Hudson	1	Ripe females captured, YOY and age 1 fish captured, genetics	Amanda Higgs, PC; ASA Analysis and Communication 2013
	Delaware	1	Collection of YOY and age-1 fish, movements of spawning adults (assessed histologically), in-river mortality events of spawning adults (ship strikes)	Breece et al. 2013; Hale et al. 2016

Table 1. *Continued*

DPS	River System/Tributary	Spawning Certainty	Evidence	Reference(s)
Chesapeake Bay	James	1	Ripe females captured and detected; YOY captured; genetics	Balazik et al. 2012a; Hager et al. 2014; Hilton et al. 2016
	York- Pamunkey	2		
	Nanticoke-Marshyhope	2	Ripe females	C. Stence, PC
	Potomac	4	Insufficient evidence of Atlantic sturgeon to make a determination	D. Secor, PC
	Upper Nanticoke	3	Telemetry detections of adults on spawning grounds during fall	M. Balazik, PC; I. Park, PC; D. Secor, PC; J. Kahn, PC
	Rappahannock	2	Telemetry detections of adults on spawning grounds during fall; expression of gametes in tidal freshwater	
	Mattaponi	2	Telemetry detections of adults on spawning grounds during fall, field observations of ripe females and expressing milt from males	
Carolina	Chowan	4	Insufficient evidence of Atlantic sturgeon to make a determination	Post et al. 2014
	Roanoke	1	Embryos collected, spring and fall	Yarrow 1874; Worth 1904; Smith et al. 2015
	Tar/Pamlico	3	Collection of YOY and Age-1 fish	M. Loeffler, PC
	Neuse	2	Age-1, large juveniles, sub-adults and adult fish collected during FI monitoring efforts; historical YOY collections	M. Loeffler, PC; W. Laney, PC
	White Oak	4	Insufficient evidence of Atlantic Sturgeon to make a determination	M. Loeffler, PC

Table 1. *Continued*

DPS	River System/Tributary	Spawning Certainty	Evidence	Reference(s)
Carolina (continued)	New	4	Insufficient evidence of Atlantic Sturgeon to make a determination	M. Loeffler, PC
	Cape Fear	2	Tagged ripe adult during spring spawning season	Post et al. 2014
	Waccamaw	4	No sturgeon detected upriver of the confluence with Big Bull Creek to N.C.	Post et al. 2014
	Great Pee Dee	2	Telemetry detections of adults and collection of YOY and Age-1 fish	Post et al. 2014
	Black	3	Telemetry detections of adults upriver of the highest receiver (RKM 74)	Post et al. 2014
	Santee	2	Capture of Age-1 fish and potential YOY during high flow events	Post et al. 2014
	Cooper	2	Capture of ripe males; capture of juveniles in 1980s	Collins and Smith 1997; Duncan et al. 2004; Post et al. 2014
	Wando	4	No detected Atlantic sturgeon upriver; small coastal river	B. Post, PC
	Stono	4	No detected Atlantic sturgeon upriver; small coastal river	B. Post, PC
South Atlantic	Edisto	1	Capture of ripe females, juveniles and Age-1 fish	Collins and Smith 1997; Post et al. 2014; Farrae et al. 2017
	Combahee	3	Telemetry detections of large adults in the fall	Post et al. 2014
	Coosawhatchie	5	Historical commercial fishery	Post et al. 2014
	Broad	4	No detected Atlantic sturgeon upriver	Post et al. 2014
	Savannah	1	Telemetry detections of adults upstream near New Savannah Bluff Lock and Dam (RKM 301) during fall	Post et al. 2014; Bahr and Peterson 2016

Table 1. *Continued*

DPS	River System/Tributary	Spawning Certainty	Evidence	Reference(s)
South Atlantic (continued)	Ogeechee	3	Mark-recapture study found river-resident juveniles	Farrae et al. 2009
	Altamaha	1	Capture of age-1 and juveniles; genetics	Peterson et al. 2008; Schueller and Peterson 2010; Ingram and Peterson 2016
	Satilla	1	Capture of YOY and age-1 fish; genetics	Fritts et al. 2016
	St. Marys	3	Adults observed	Fritts and Peterson 2011; Fox and Peterson 2017
	St. Johns	5	Genetics and tagging indicate Atlantic sturgeon found in this river are migrants	Fox et al. 2017.

Table 2. Parameters estimates and associated standard errors of the total length (cm)-weight (g) relationship for Atlantic sturgeon by DPS.

DPS	n	a	SE[a]	b	SE[b]
All	6,304	0.00513	0.000286	3.05	0.0107
Gulf of Maine	618	0.0119	0.00211	2.85	0.0354
New York Bight	735	0.0235	0.00428	2.76	0.0345
Chesapeake Bay	190	0.00549	0.00306	3.06	0.109
Carolina	4,761	0.00186	0.000119	3.25	0.0129

Table 3. Parameters estimates and associated standard errors of the von Bertalanffy age-length (total; cm) relationship for Atlantic sturgeon by DPS.

DPS	n	L_∞	SE[L_∞]	K	SE[K]	t_0	SE[t_0]
All	2,539	286	2.08	0.0622	0.00140	-0.340	0.129
New York Bight	2,679	299	2.37	0.0511	0.00104	-1.82	0.102
Chesapeake Bay	239	451	63.4	0.0283	0.00601	-2.80	0.493
Carolina	1,901	182	1.29	0.169	0.00473	-0.759	0.0719

Table 4. Parameter estimates of the von Bertalanffy age-length (cm) relationship from selected papers.

Location	Sex	Length Type	L_∞	K	t_0	Source
Hudson River & Hudson Bight (NY)	female	Fork	259	0.0639	1.02	Van Eenennaam and Doroshov (1998)
Hudson River & Hudson Bight (NY)	male	Fork	201	0.113	0.870	Van Eenennaam and Doroshov (1998)
Hudson River & New York Bight (NY)	female	Total	256	0.07	-3.23	Stevenson and Secor (2000)
Hudson River & New York Bight (NY)	male	Total	180	0.25	2.37	Stevenson and Secor (2000)
Atlantic Ocean (NJ coast)	pooled	Fork	171	0.163	0.7	Johnson et al. (2005)
Atlantic Ocean (NJ coast)	female	Fork	422	0.023	-7.5	Johnson et al. (2005)
Atlantic Ocean (NJ coast)	male	Fork	205	0.080	-4.0	Johnson et al. (2005)
Atlantic Ocean, Hudson River (NY), Delaware River and Bay (DE)	pooled	Total	279	0.057	-1.28	Dunton et al. (2016)
Saint John River (Canada)	female	Total	264	0.04	-0.94	Stewart et al. (2015)
Saint John River (Canada)	male	Total	230	0.06	-0.60	Stewart et al. (2015)
Saint John River (Canada)	pooled	Total	254	0.05	-0.86	Stewart et al. (2015)
Albemarle Sound (NC)	pooled	Fork	269	0.0903	-0.148	Armstrong (1999)
Albemarle Sound (NC)	pooled	Fork	218	0.117	-0.102	Armstrong (1999)

Table 5. Estimates of mortality based on longevity, growth parameters, and catch curve analysis.

M yr^{-1}	Population	Method	Source
0.05	Hudson River	Longevity=95% survival; longevity=60 years	Stevenson 1997
0.07	Hudson River	Hoenig 1983; longevity=60 years	Kahnle et al. 1998
0.13	Hudson River	Pauly 1980; mean T=13 C; HR von B parameters	Stevenson 1997
0.19-0.24	Altamaha River	Catch Curve Analysis	Peterson et al. 2008

Table 6. Age-constant estimators of natural mortality for Atlantic sturgeon.

Reference	Equation	M
Hoenig 1983 (rule-of-thumb)	$M = 3 / t_{max}$	0.050
Hewitt and Hoenig 2005	$M = 4.22 / t_{max}$	0.070
Updated Hoenig 1983 (Then et al. 2014)	$M = \exp[1.717-1.01*\ln(t_{max})]$	0.089
Updated Hoenig Non-linear least squares (Then et al. 2014)	$M = 4.899 * t_{max}^{-0.916}$	0.115
Updated growth-based estimator (Then et al. 2014)	$M = 4.118*K^{0.73} * L_{\infty}^{-0.33}$	0.084

Where t_{max} = maximum age

K and L_{∞} = von Bertalanffy growth coefficients

Table 7. Age-varying estimates of natural mortality for Atlantic sturgeon.

Age	M	Age (cont.)	M
1	0.305	40	0.036
2	0.192	41	0.036
3	0.144	42	0.035
4	0.118	43	0.035
5	0.101	44	0.035
6	0.089	45	0.035
7	0.080	46	0.035
8	0.073	47	0.035
9	0.068	48	0.035
10	0.064	49	0.035
11	0.060	50	0.034
12	0.057	51	0.034
13	0.055	52	0.034
14	0.053	53	0.034
15	0.051	54	0.034
16	0.049	55	0.034
17	0.048	56	0.034
18	0.047	57	0.034
19	0.045	58	0.034
20	0.044	59	0.034
21	0.043	60	0.034
22	0.043		
23	0.042		
24	0.041		
25	0.041		
26	0.040		
27	0.040		
28	0.039		
29	0.039		
30	0.038		
31	0.038		
32	0.038		
33	0.037		
34	0.037		
35	0.037		
36	0.037		
37	0.036		
38	0.036		
39	0.036		

Table 8. Surveys considered, accepted and rejected for developing indices of relative abundance for Atlantic sturgeon. Asterisks in the “Accepted” column indicate a survey that was developed into an index but should not be used in analysis at this time due to the time series being too short. All surveys are fishery-independent unless indicated with “(FD)” (fishery-dependent).

Surveys Considered	Accepted	Rejected	Reason(s) Rejected						
			Time series too short or broken	Rare occurrence of sturgeon	Unusable as suggested by data submitter	Inconsistent methods, gear changes	Limited covariates	Incomplete dataset or unavailable	FD survey concerns
ME Gillnet		X	X			X	X		
ME-NH Trawl	X								
MA FD Investigation Maintenance Sampling		X		X					
MA FI Trawl Survey		X		X					
MA Industry based survey for cod		X		X					
RI Trawl		X		X	X				
CT LIS Trawl	X								
NY Juvenile Gillnet	X*		X						
NY Hudson River shad gillnet fishery (FD)		X	X						X
NY Hudson River power generator monitoring		X			X	X			
NYSDEC bottom trawl for striped bass		X		X	X				
NJ Ocean Trawl	X								
DE DFW ATS juvenile survey		X	X						
DE trawl (16' and 30')		X		X					
DSU inshore juvenile sampling & offshore sampling		X	X		X				
MD Coastal Offshore Trawl Survey		X		X					

Table 8. *Continued*

Surveys Considered	Accepted	Rejected	Reason(s) Rejected						
			Time series too short or broken	Rare occurrence of sturgeon	Unusable as suggested by data submitter	Inconsistent methods, gear changes	Limited covariates	Incomplete dataset or unavailable	FD survey concerns
VIMS Shad Monitoring	X								
NEAMAP	X*		X						
NC Program 120		X		X					
NC Program 135	X								
NC Program 915		X		X					
SC Edisto River Sturgeon Montoring	X*								
UGA Work		X	X						
USFWS Winter Trawl COOP Cruise	X								
NEFOP / ASM (FD)		X			X	X			X
NEFSC trawl		X		X	X	X			
The following surveys were rejected immediately due to extremely low encounter rates, or due to limited geographic coverage and survey design methods:									
NY Fall Shoals Survey		X				X			
VT Trawl Survey		X							
Upper James River Work		X						X	
James River FRG		X				X		X	
NC AR Gillnet -Fall/Winter		X							
NC AR Gillnet - Spring		X							
Historic Altamaha Study		X						X	
NJ Striped Bass Tagging Survey		X		X					
DE Carcass Report		X							
MD Striped Bass Gillnet Survey		X		X					

Table 8. *Continued*

Surveys Considered	Accepted	Rejected	Reason(s) Rejected						
			Time series too short or broken	Rare occurrence of sturgeon	Unusable as suggested by data submitter	Inconsistent methods, gear changes	Limited covariates	Incomplete dataset or unavailable	FD survey concerns
VIMS Juvenile Fish and Blue Crab Survey		X		X		X			
ChesMMAP		X							
Southeast Area Ocean Gillnet		X	X	X					
NC AS Trawl		X		X					
NC South Gillnet		X	X	X					
Cape Fear Gillnet		X	X						
Carolina Power and Light Surveys		X							
GA Brunswick River Sampling		X	X						
Pee Dee River Run Atl. Sturgeon Gillnet		X	X	X					
Pee Dee River Survey		X							
Winyah Bay		X							
Santee River		X		X					
Two South Carolina Rivers Studies		X	X	X					
Savannah River and Selected Tribs		X	X	X					
Georgia Shad Tagging		X							
SEAMAP		X		X					

Table 9. The survey name, time series length, months included in the index, and average size of Atlantic sturgeon in fishery-independent surveys that were used for developing indices of relative abundance. A length cutoff was used for determining if surveys catch predominantly YOY (<500 mm), juveniles (500-1300 mm), or adults (>1300 mm).

Survey	Years	Index Months	Average size
ME-NH Trawl	2000-2015	5,10,11	Juveniles & Adults
CT LIST	1984-2014	5-6,9-11	Juveniles
NYDEC JASAMP	2006-2015	3-5	Small Juveniles
NJ Ocean Trawl	1990-2015	1,4,6,10	Juveniles & Adults
VIMS Shad	1998-2015	3-4	Juveniles
NEAMAP	2007-2015	4-5,10	Juveniles & Adults
NC p135	1991-2015	Spring	Juveniles
NC p135	1990-2015	Fall (11-2)	Juveniles
SC Edisto	2004-2015	1-12	Juveniles & Adults
USFWS Coop	1988-2010	1-2	Juveniles & Adults

Table 10. Index values for fishery-independent surveys and associated standard errors.

Year	ME-NH Trawl		CT LIST		CT LIST (spring only)		CT LIST (fall only)		NYDEC JASAMP	
	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)
1984			0.0458	0.0213	0.0938	0.0690	0.0303	0.0173		
1985			0.0120	0.0085	0.0000	0.0000	0.0167	0.0117		
1986			0.0279	0.0130	0.0000	0.0000	0.0448	0.0208		
1987			0.0200	0.0099	0.0083	0.0083	0.0250	0.0143		
1988			0.0150	0.0112	0.0167	0.0167	0.0083	0.0083		
1989			0.0550	0.0226	0.0083	0.0083	0.0833	0.0366		
1990			0.0439	0.0271	0.0077	0.0077	0.0696	0.0474		
1991			0.0188	0.0108	0.0167	0.0117	0.0125	0.0125		
1992			0.1875	0.1090	0.1000	0.1000	0.2750	0.1940		
1993			0.3000	0.2362	0.0250	0.0143	0.4750	0.3932		
1994			0.3000	0.2324	0.0583	0.0432	0.4417	0.3851		
1995			0.0375	0.0233	0.0250	0.0250	0.0375	0.0278		
1996			0.0163	0.0121	0.0167	0.0167	0.0125	0.0125		
1997			0.0313	0.0164	0.0167	0.0117	0.0375	0.0278		
1998			0.1006	0.0548	0.1167	0.0731	0.0375	0.0375		
1999			0.2438	0.1617	0.2250	0.2085	0.1500	0.0855		
2000	0.0375	0.0463	0.0438	0.0205	0.0333	0.0235	0.0375	0.0214		
2001	0.0666	0.0654	0.1154	0.0568	0.0259	0.0259	0.1875	0.1039		
2002	0.0452	0.0392	0.1125	0.0396	0.0833	0.0366	0.1000	0.0579		
2003	0.0364	0.0370	0.1871	0.1435	0.0000	0.0000	0.3867	0.2959		
2004	0.0061	0.0086	0.0503	0.0444	0.0000	0.0000	0.1000	0.0882		
2005	0.0074	0.0107	0.0545	0.0325	0.0500	0.0424	0.0375	0.0214		
2006	0.0329	0.0310	0.1742	0.0896	0.1000	0.0579	0.3225	0.2429	0.61	0.15
2007	0.0073	0.0102	0.1085	0.0588	0.0408	0.0267	0.1625	0.1145	0.67	0.19
2008	0.0243	0.0265	0.0565	0.0330	0.0167	0.0167	0.1250	0.0891	0.70	0.15
2009	0.0278	0.0273	0.1125	0.0494	0.0083	0.0083	0.2125	0.0969	2.15	0.37
2010	0.0112	0.0133	0.0368	0.0368	0.0179	0.0179			2.02	0.33
2011	0.0096	0.0121	0.0313	0.0164	0.0326	0.0242	0.0250	0.0176	2.75	0.57
2012	0.0240	0.0271	0.0438	0.0185	0.0333	0.0165	0.0375	0.0278	3.29	0.62
2013	0.0072	0.0102	0.0250	0.0152	0.0250	0.0186	0.0125	0.0125	1.44	0.32
2014	0.0295	0.0299	0.0760	0.0653	0.0000	0.0000	0.1646	0.1412	5.35	1.07
2015	0.0503	0.0475							5.64	0.79

Table 10 *continued*. Index values for fishery-independent surveys and associated standard errors.

Year	NJ Ocean Trawl		VIMS Shad		NEAMAP		NEAMAP (spring only)		NEAMAP (fall only)	
	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)
1984										
1985										
1986										
1987										
1988										
1989										
1990	1.8658	0.8904								
1991	1.0721	0.5180								
1992	0.9730	0.4775								
1993	0.3850	0.2522								
1994	0.0000	0.0000								
1995	0.1628	0.1257								
1996	0.2605	0.1822								
1997	0.5043	0.2893								
1998	0.0725	0.0785	1.4772	0.3995						
1999	0.9752	0.4851	0.9316	0.4007						
2000	0.0752	0.0785	1.1127	0.6786						
2001	0.3680	0.2287	0.1390	0.1164						
2002	0.3986	0.2316	0.0588	0.0425						
2003	1.3698	0.6576	0.1515	0.0736						
2004	1.0986	0.5530	0.1317	0.0982						
2005	1.8252	0.8496	1.1565	0.3541						
2006	1.5350	0.7161	1.7627	0.3469						
2007	1.5662	0.7278	1.4030	0.3529	0.0115	0.0090			0.0332	0.0250
2008	1.3874	0.6605	0.4405	0.1951	0.0647	0.0170	0.0640	0.0240	0.0858	0.0296
2009	0.7775	0.4098	0.1774	0.0811	0.0755	0.0204	0.0506	0.0201	0.0681	0.0288
2010	0.9820	0.4996	0.1779	0.0623	0.1358	0.0558	0.0926	0.0303	0.1228	0.0737
2011	0.2641	0.1820	0.3497	0.1548	0.0827	0.0309	0.1328	0.0711	0.0536	0.0213
2012	0.1594	0.1271	0.1573	0.0840	0.0686	0.0281	0.0615	0.0418	0.0818	0.0342
2013	1.0456	0.5253	0.5419	0.1688	0.0488	0.0155	0.0638	0.0248	0.0231	0.0123
2014	0.6278	0.3549	0.9026	0.2012	0.1335	0.0817	0.0567	0.0265	0.3075	0.2750
2015	1.9230	0.8934	1.2113	0.5407	0.0470	0.0159	0.0511	0.0241	0.0276	0.0155

Table 10 *continued*. Index values for fishery-independent surveys and associated standard errors.

Year	NC p135 (spring)		NC p135 (fall)		SC Edisto		USFWS Coop	
	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)	Index	SE (Index)
1984								
1985								
1986								
1987								
1988							0.0433	0.0134
1989							0.0088	0.0064
1990			0.0329	0.0063			0.0251	0.0135
1991	0.0022	0.0011	0.0083	0.0022			0.0075	0.0046
1992	0.0046	0.0015	0.0022	0.0011			0.0625	0.0308
1993	0.0010	0.0007	0.0064	0.0020			0.0000	0.0000
1994	0.0085	0.0023	0.0127	0.0028			0.0278	0.0140
1995	0.0026	0.0012	0.0101	0.0026			0.0000	0.0000
1996	0.0044	0.0017	0.0082	0.0022			0.0597	0.0198
1997	0.0104	0.0032	0.0372	0.0056			0.0289	0.0146
1998	0.0130	0.0029	0.0165	0.0031			0.0127	0.0135
1999	0.0054	0.0016	0.0173	0.0033			0.0136	0.0100
2000	0.0234	0.0051	0.0713	0.0093			0.0488	0.0203
2001	0.0253	0.0042	0.0162	0.0033			0.0319	0.0170
2002	0.0069	0.0022	0.0070	0.0021			0.1050	0.0278
2003	0.0028	0.0011	0.0026	0.0015			0.0265	0.0108
2004	0.0005	0.0005	0.0212	0.0038	3.0755	0.5431	0.0031	0.0031
2005	0.0027	0.0012	0.0232	0.0040	2.0760	0.4904	0.0103	0.0106
2006	0.0082	0.0023	0.0130	0.0029	4.8621	0.7685	0.0823	0.0204
2007	0.0064	0.0024	0.0439	0.0062	0.8852	0.2559	0.0746	0.0245
2008	0.0347	0.0050	0.0157	0.0034	1.7584	0.3796	0.1898	0.0352
2009	0.0180	0.0040	0.0114	0.0026	3.3101	0.6104	0.0752	0.0195
2010	0.0091	0.0026	0.0095	0.0026	0.8877	0.2170	0.0082	0.0083
2011	0.0067	0.0024	0.0256	0.0042	3.3358	0.8870		
2012	0.0175	0.0043	0.0360	0.0059	3.2343	0.5757		
2013	0.0683	0.0089	0.0155	0.0034	3.3711	0.6317		
2014	0.0292	0.0050	0.0206	0.0041	2.5827	0.4271		
2015	0.0215	0.0036	0.0162	0.0031	1.8458	0.4060		

Table 11. Summary of Atlantic sturgeon included in the genetic baseline for calculations of effective population size for 11 rivers and one sound. Sturgeon incorporated into the baseline were either river-resident juveniles (<500 mm TL; RRJ) or adults (≥1,500 mm TL). Effective population size estimates were calculated with NeEstimator and are provided with 95% confidence intervals.

DPS	River	Years	Size Class	Samples	Effective Population Size (N_e)
Gulf of Maine	St. Lawrence	2013	Adult	30	39.0 (24.6-76.1)
Gulf of Maine	St. John	1991-1993	Adult	31	115.0 (51.3-Infinite)
Gulf of Maine	Kennebec	1980-2011	Adult	52	63.4 (47.3-91.1)
New York Bight	Hudson	1996-2015	RRJ and Adult	337	144.2 (82.9-286.6)
New York Bight	Delaware	2009-2015	RRJ and Adult	181	56.7 (42.5-77.0)
Chesapeake	York	2013-2015	Adult	136	7.8 (5.3-10.2)
Chesapeake	James	1998-2015	RRJ and Adult	346	40.9 (35.6-46.9)
Carolina	Albemarle	1998-2008	RRJ and Adult	37	14.2 (11.8-17.1)
South Atlantic	Edisto	1996-2005	RRJ	109	55.4 (36.8-90.6)
South Atlantic	Savannah	2000-2013	RRJ	98	126.5 (88.1-205.0)
South Atlantic	Ogeechee	2003-2015	RRJ	115	32.2 (26.9-38.8)
South Atlantic	Altamaha	2005-2015	RRJ and Adult	186	111.9 (67.5-216.3)

Table 12. Hudson River genetics collections used to evaluate changes in effective population size over time. Effective population size estimates were calculated with NeEstimator and are provided with 95% confidence intervals. Sturgeon incorporated into the baseline were either river-resident juveniles (<500 mm TL; RRJ) or adults (≥1,500 mm TL).

Year	Size Class	Samples	Effective Population Size (N_e)
1996	Adult	28	479.1 (86.9-Infinite)
1997	Adult	25	358.5 (89.1-Infinite)
2006	Adult	31	148.4 (60.2-Infinite)
2008	Adult	20	195.2 (52.4-Infinite)
2008	RRJ	23	93.1 (43.5-124139.6)
2009	Adult	40	75.3 (47.3-154.7)
2010	Adult	48	135.1 (82.7-313.2)
2014	RRJ	38	74.2 (46.4-155.3)
2015	Adult	53	179.8 (85.1-4683.5)
2015	RRJ	31	143.8 (70.3-2064.3)

Table 13. Species that represented 95% of the total landings on otter trawl trips that encountered Atlantic sturgeon. Data source: NEFOP/ASM

Common name	Scientific name	Cumulative proportion
Atlantic Croaker	*Micropogonias undulatus*	0.49
Summer Flounder	*Paralichthys dentatus*	0.59
Atlantic Long-Fin Squid	*Loligo paelei*	0.68
Skate, Unclassified	*Rajidae*	0.75
Little Skate	*Raja eriancea*	0.8
Horseshoe Crab	*Limulus polyphemus*	0.82
Spiny Dogfish	*Squalus acanthias*	0.84
Atlantic Cod	*Gadus morhua*	0.86
Winter Skate	*Raja ocellata*	0.88
Scup	*Stenotomus chrysops*	0.89
Yellowtail Flounder	*Pleuronectes ferrugineus*	0.9
Butterfish	*Peprilus triacanthus*	0.92
Striped Bass	*Morone saxatilis*	0.93
Winter Flounder	*Pleuronectes americanus*	0.94
Clearnose Skate	*Raja eglanteria*	0.95

Table 14. Species that represented 95% of the total landings on sink and drift gillnet trips that encountered Atlantic sturgeon. Data source: NEFOP/ASM

Common name	Scientific name	Cumulative proportion
Monkfish	*Lophius americanus*	0.33
Winter Skate	*Raja ocellata*	0.57
Spiny Dogfish	*Squalus acanthias*	0.76
Smooth Dogfish	*Mustelus canis*	0.83
Atlantic Cod	*Gadus morhua*	0.87
Bluefish	*Pomatomus saltatrix*	0.9
Striped Bass	*Morone saxatilis*	0.92
Skate, Unclassified	*Rajidae*	0.93
Pollock	*Pollachius virens*	0.94
Atlantic Croaker	*Micropogonias undulatus*	0.95

Table 15. QAICc values for each successfully converged candidate model fitted to trip-specific observer otter trawl data from 2000-2015. Data source: NEFOP/ASM

Model	QAICc
1	1760.19
2	1748.92
3	1736.75
4	1738.29
5	1378.03
6	1322.82
7	1528.15
8	1490.34
9	1541.93

Table 16. Estimated parameters for model 6 fitted to trip-specific observer otter trawl data from 2000-2015. Data source: NEFOP/ASM

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-5.063	1.069	-4.735	0.000
but.bTRUE	-0.517	0.598	-0.865	0.387
cl.sk.bTRUE	-15.689	7882.510	-0.002	0.998
cod.bTRUE	-0.774	0.997	-0.776	0.438
croak.bTRUE	3.684	0.621	5.935	0.000
fluke.bTRUE	1.085	0.622	1.743	0.081
hshoe.bTRUE	3.245	1.158	2.803	0.005
lit.sk.bTRUE	1.505	1.585	0.950	0.342
loligo.bTRUE	-0.303	0.553	-0.548	0.584
other.bTRUE	0.751	0.951	0.789	0.430
sbass.bTRUE	-0.400	1.042	-0.384	0.701
scup.bTRUE	-2.149	2.026	-1.061	0.289
sp.dog.bTRUE	0.770	1.507	0.511	0.609
unk.sk.bTRUE	-0.930	2.048	-0.454	0.650
wint.fl.bTRUE	0.201	0.903	0.222	0.824
wint.sk.bTRUE	-2.064	1.364	-1.513	0.130
yt.fl.bTRUE	-0.180	1.160	-0.155	0.877
factor(QTR)2	0.978	1.242	0.788	0.431
factor(QTR)3	-0.782	2.278	-0.343	0.731
factor(QTR)4	1.169	1.273	0.918	0.358
but.bTRUE:factor(QTR)2	0.176	0.736	0.239	0.811
but.bTRUE:factor(QTR)3	0.528	0.756	0.699	0.485
but.bTRUE:factor(QTR)4	1.439	0.719	2.002	0.045
cl.sk.bTRUE:factor(QTR)2	15.087	7882.510	0.002	0.998
cl.sk.bTRUE:factor(QTR)3	17.771	7882.510	0.002	0.998
cl.sk.bTRUE:factor(QTR)4	15.403	7882.510	0.002	0.998
cod.bTRUE:factor(QTR)2	-1.427	1.368	-1.043	0.297
cod.bTRUE:factor(QTR)3	-10.872	572.950	-0.019	0.985
cod.bTRUE:factor(QTR)4	0.347	1.174	0.295	0.768
croak.bTRUE:factor(QTR)2	0.217	0.777	0.279	0.780
croak.bTRUE:factor(QTR)3	-1.164	0.734	-1.586	0.113
croak.bTRUE:factor(QTR)4	-2.001	0.762	-2.625	0.009
fluke.bTRUE:factor(QTR)2	0.209	0.817	0.256	0.798
fluke.bTRUE:factor(QTR)3	2.648	2.106	1.258	0.209
fluke.bTRUE:factor(QTR)4	0.445	0.799	0.557	0.578
hshoe.bTRUE:factor(QTR)2	-3.845	1.550	-2.481	0.013
hshoe.bTRUE:factor(QTR)3	-5.491	1.448	-3.791	0.000
hshoe.bTRUE:factor(QTR)4	-2.886	1.357	-2.126	0.033
lit.sk.bTRUE:factor(QTR)2	-0.884	1.633	-0.542	0.588
lit.sk.bTRUE:factor(QTR)3	-0.911	1.646	-0.553	0.580
lit.sk.bTRUE:factor(QTR)4	-1.927	1.722	-1.119	0.263
loligo.bTRUE:factor(QTR)2	-0.043	0.659	-0.065	0.948
loligo.bTRUE:factor(QTR)3	-0.463	0.698	-0.664	0.507
loligo.bTRUE:factor(QTR)4	-0.593	0.673	-0.880	0.379
other.bTRUE:factor(QTR)2	-0.404	1.057	-0.382	0.702
other.bTRUE:factor(QTR)3	-1.873	1.024	-1.830	0.067
other.bTRUE:factor(QTR)4	-1.064	1.112	-0.957	0.338
sbass.bTRUE:factor(QTR)2	0.132	1.341	0.098	0.922
sbass.bTRUE:factor(QTR)3	0.330	1.583	0.209	0.835

Table 16. *Continued*

	Estimate	Std. Error	t value	Pr(>|t|)
sbass.bTRUE:factor(QTR)4	0.542	1.226	0.442	0.659
scup.bTRUE:factor(QTR)2	2.281	2.056	1.110	0.267
scup.bTRUE:factor(QTR)3	2.256	2.075	1.087	0.277
scup.bTRUE:factor(QTR)4	1.190	2.076	0.573	0.567
sp.dog.bTRUE:factor(QTR)2	-2.512	1.768	-1.421	0.155
sp.dog.bTRUE:factor(QTR)3	-1.700	2.524	-0.674	0.501
sp.dog.bTRUE:factor(QTR)4	-0.038	1.584	-0.024	0.981
unk.sk.bTRUE:factor(QTR)2	1.770	2.091	0.846	0.397
unk.sk.bTRUE:factor(QTR)3	-1.448	2.878	-0.503	0.615
unk.sk.bTRUE:factor(QTR)4	1.907	2.107	0.905	0.366
wint.fl.bTRUE:factor(QTR)2	-0.741	0.980	-0.756	0.450
wint.fl.bTRUE:factor(QTR)3	-0.242	1.496	-0.162	0.871
wint.fl.bTRUE:factor(QTR)4	0.536	1.021	0.525	0.600
wint.sk.bTRUE:factor(QTR)2	2.858	1.402	2.039	0.041
wint.sk.bTRUE:factor(QTR)3	-0.481	1.812	-0.266	0.791
wint.sk.bTRUE:factor(QTR)4	2.338	1.433	1.631	0.103
yt.fl.bTRUE:factor(QTR)2	-0.474	1.353	-0.351	0.726
yt.fl.bTRUE:factor(QTR)3	-12.200	592.393	-0.021	0.984
yt.fl.bTRUE:factor(QTR)4	-1.384	1.348	-1.027	0.305

Table 17. QAICc values for each successfully converged candidate model fitted to trip-specific observer sink and drift gillnet data from 2000-2015. Data source: NEFOP/ASM

Model	QAICc
1	6042.44
2	5665.83
3	5884.50
4	5450.15
5	5260.49
6	4939.70
7	4944.05
8	4666.11
9	4639.77

Table 18. Estimated parameters for model 9 fitted to trip-specific observer gillnet data from 2000-2015. Data source: NEFOP/ASM

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-2.495	0.438	-5.701	0.000
blue.bTRUE	-1.082	0.619	-1.749	0.080
cod.bTRUE	-0.808	0.544	-1.484	0.138
croak.bTRUE	0.170	0.468	0.364	0.716
monk.bTRUE	0.772	0.408	1.894	0.058
other.bTRUE	-0.122	0.335	-0.363	0.716
pol.bTRUE	0.148	0.720	0.206	0.837
sbass.bTRUE	1.468	0.366	4.009	0.000
sm.dog.bTRUE	1.123	0.385	2.915	0.004
sp.dog.bTRUE	1.298	0.360	3.602	0.000
unk.sk.bTRUE	1.076	0.731	1.472	0.141
wint.sk.bTRUE	-1.786	0.572	-3.125	0.002
factor(QTR)2	-0.764	0.522	-1.463	0.143
factor(QTR)3	-3.099	1.022	-3.032	0.002
factor(QTR)4	-0.245	0.506	-0.484	0.628
factor(YEAR)2001	-0.757	0.699	-1.084	0.279
factor(YEAR)2002	-2.214	1.049	-2.110	0.035
factor(YEAR)2003	0.667	0.619	1.077	0.281
factor(YEAR)2004	-0.546	0.595	-0.918	0.359
factor(YEAR)2005	-1.018	0.725	-1.404	0.160
factor(YEAR)2006	0.687	0.584	1.177	0.239
factor(YEAR)2007	-0.053	0.569	-0.094	0.925
factor(YEAR)2008	-0.524	0.698	-0.751	0.453
factor(YEAR)2009	-0.433	0.698	-0.620	0.535
factor(YEAR)2010	-0.645	0.767	-0.841	0.401
factor(YEAR)2011	-1.309	0.661	-1.982	0.048
factor(YEAR)2012	-0.141	0.649	-0.217	0.828
factor(YEAR)2013	-0.254	0.753	-0.337	0.736
factor(YEAR)2014	-0.306	0.614	-0.498	0.618
factor(YEAR)2015	-1.524	0.814	-1.871	0.061
blue.bTRUE:factor(QTR)2	1.359	0.527	2.580	0.010
blue.bTRUE:factor(QTR)3	1.045	0.632	1.653	0.098
blue.bTRUE:factor(QTR)4	1.182	0.542	2.180	0.029
blue.bTRUE:factor(YEAR)2001	0.257	0.607	0.423	0.672
blue.bTRUE:factor(YEAR)2002	-0.311	0.753	-0.413	0.680
blue.bTRUE:factor(YEAR)2003	-1.140	0.696	-1.640	0.101
blue.bTRUE:factor(YEAR)2004	-0.196	0.502	-0.390	0.696
blue.bTRUE:factor(YEAR)2005	0.537	0.574	0.936	0.349
blue.bTRUE:factor(YEAR)2006	0.229	0.548	0.418	0.676
blue.bTRUE:factor(YEAR)2007	0.531	0.565	0.940	0.347
blue.bTRUE:factor(YEAR)2008	0.149	0.720	0.207	0.836
blue.bTRUE:factor(YEAR)2009	-1.634	0.824	-1.983	0.047
blue.bTRUE:factor(YEAR)2010	-0.451	0.755	-0.597	0.550
blue.bTRUE:factor(YEAR)2011	-1.133	0.885	-1.280	0.201
blue.bTRUE:factor(YEAR)2012	0.183	0.842	0.218	0.828
blue.bTRUE:factor(YEAR)2013	0.137	0.579	0.236	0.813
blue.bTRUE:factor(YEAR)2014	0.012	0.629	0.020	0.984
blue.bTRUE:factor(YEAR)2015	-0.300	0.496	-0.605	0.545

Table 18 continued.

	Estimate	Std. Error	t value	Pr(>|t|)
cod.bTRUE:factor(QTR)2	-0.257	0.361	-0.711	0.477
cod.bTRUE:factor(QTR)3	0.931	0.638	1.460	0.144
cod.bTRUE:factor(QTR)4	-0.723	0.367	-1.968	0.049
cod.bTRUE:factor(YEAR)2001	0.221	0.784	0.282	0.778
cod.bTRUE:factor(YEAR)2002	0.663	0.800	0.829	0.407
cod.bTRUE:factor(YEAR)2003	0.018	0.727	0.025	0.980
cod.bTRUE:factor(YEAR)2004	0.737	0.587	1.255	0.209
cod.bTRUE:factor(YEAR)2005	0.709	0.725	0.978	0.328
cod.bTRUE:factor(YEAR)2006	-0.935	1.029	-0.909	0.364
cod.bTRUE:factor(YEAR)2007	-1.320	0.836	-1.579	0.114
cod.bTRUE:factor(YEAR)2008	0.072	1.122	0.064	0.949
cod.bTRUE:factor(YEAR)2009	-0.544	0.917	-0.594	0.553
cod.bTRUE:factor(YEAR)2010	0.535	0.737	0.726	0.468
cod.bTRUE:factor(YEAR)2011	1.856	0.696	2.669	0.008
cod.bTRUE:factor(YEAR)2012	1.010	0.676	1.494	0.135
cod.bTRUE:factor(YEAR)2013	1.832	0.787	2.329	0.020
cod.bTRUE:factor(YEAR)2014	2.080	0.662	3.140	0.002
cod.bTRUE:factor(YEAR)2015	-0.557	0.905	-0.615	0.538
croak.bTRUE:factor(QTR)2	0.490	0.451	1.088	0.276
croak.bTRUE:factor(QTR)3	0.944	0.639	1.478	0.139
croak.bTRUE:factor(QTR)4	0.322	0.478	0.674	0.500
croak.bTRUE:factor(YEAR)2001	-0.141	0.660	-0.214	0.830
croak.bTRUE:factor(YEAR)2002	-0.375	0.872	-0.430	0.668
croak.bTRUE:factor(YEAR)2003	-3.029	1.397	-2.168	0.030
croak.bTRUE:factor(YEAR)2004	-0.666	0.631	-1.056	0.291
croak.bTRUE:factor(YEAR)2005	0.561	0.713	0.786	0.432
croak.bTRUE:factor(YEAR)2006	-1.927	0.657	-2.934	0.003
croak.bTRUE:factor(YEAR)2007	-0.326	0.585	-0.557	0.577
croak.bTRUE:factor(YEAR)2008	-0.082	0.771	-0.107	0.915
croak.bTRUE:factor(YEAR)2009	-2.452	1.422	-1.725	0.085
croak.bTRUE:factor(YEAR)2010	-0.782	1.420	-0.551	0.582
croak.bTRUE:factor(YEAR)2011	-13.867	1074.959	-0.013	0.990
croak.bTRUE:factor(YEAR)2012	-14.993	1122.827	-0.013	0.989
croak.bTRUE:factor(YEAR)2013	-1.617	1.407	-1.150	0.250
croak.bTRUE:factor(YEAR)2014	-15.445	811.831	-0.019	0.985
croak.bTRUE:factor(YEAR)2015	-1.787	0.749	-2.386	0.017
monk.bTRUE:factor(QTR)2	-0.163	0.272	-0.599	0.549
monk.bTRUE:factor(QTR)3	-1.077	0.585	-1.842	0.065
monk.bTRUE:factor(QTR)4	0.445	0.332	1.341	0.180
monk.bTRUE:factor(YEAR)2001	0.817	0.596	1.370	0.171
monk.bTRUE:factor(YEAR)2002	1.472	0.786	1.873	0.061
monk.bTRUE:factor(YEAR)2003	-1.075	0.597	-1.801	0.072
monk.bTRUE:factor(YEAR)2004	-0.274	0.546	-0.502	0.616
monk.bTRUE:factor(YEAR)2005	0.992	0.692	1.433	0.152
monk.bTRUE:factor(YEAR)2006	0.149	0.506	0.295	0.768
monk.bTRUE:factor(YEAR)2007	1.750	0.554	3.162	0.002
monk.bTRUE:factor(YEAR)2008	0.694	0.713	0.974	0.330
monk.bTRUE:factor(YEAR)2009	0.163	0.665	0.245	0.806
monk.bTRUE:factor(YEAR)2010	-0.105	0.702	-0.149	0.881
monk.bTRUE:factor(YEAR)2011	-0.726	0.589	-1.232	0.218

Table 18 continued.

	Estimate	Std. Error	t value	Pr(>|t|)
monk.bTRUE:factor(YEAR)2012	-0.371	0.600	-0.619	0.536
monk.bTRUE:factor(YEAR)2013	-0.376	0.674	-0.558	0.577
monk.bTRUE:factor(YEAR)2014	-1.658	0.595	-2.786	0.005
monk.bTRUE:factor(YEAR)2015	-1.230	0.524	-2.345	0.019
other.bTRUE:factor(QTR)2	-0.264	0.237	-1.113	0.266
other.bTRUE:factor(QTR)3	0.622	0.611	1.017	0.309
other.bTRUE:factor(QTR)4	-0.361	0.256	-1.413	0.158
other.bTRUE:factor(YEAR)2001	0.186	0.491	0.379	0.705
other.bTRUE:factor(YEAR)2002	0.412	0.612	0.674	0.500
other.bTRUE:factor(YEAR)2003	0.575	0.522	1.101	0.271
other.bTRUE:factor(YEAR)2004	0.558	0.416	1.341	0.180
other.bTRUE:factor(YEAR)2005	-0.111	0.476	-0.234	0.815
other.bTRUE:factor(YEAR)2006	1.104	0.455	2.424	0.015
other.bTRUE:factor(YEAR)2007	0.301	0.433	0.696	0.487
other.bTRUE:factor(YEAR)2008	0.490	0.557	0.880	0.379
other.bTRUE:factor(YEAR)2009	0.817	0.422	1.934	0.053
other.bTRUE:factor(YEAR)2010	-0.115	0.478	-0.240	0.810
other.bTRUE:factor(YEAR)2011	-0.098	0.541	-0.180	0.857
other.bTRUE:factor(YEAR)2012	-0.309	0.524	-0.589	0.556
other.bTRUE:factor(YEAR)2013	-0.982	0.497	-1.975	0.048
other.bTRUE:factor(YEAR)2014	0.009	0.494	0.018	0.986
other.bTRUE:factor(YEAR)2015	1.527	0.440	3.473	0.001
pol.bTRUE:factor(QTR)2	-0.518	0.508	-1.019	0.308
pol.bTRUE:factor(QTR)3	-0.559	0.661	-0.846	0.397
pol.bTRUE:factor(QTR)4	-0.319	0.474	-0.672	0.501
pol.bTRUE:factor(YEAR)2001	-0.502	1.139	-0.440	0.660
pol.bTRUE:factor(YEAR)2002	-1.163	1.028	-1.131	0.258
pol.bTRUE:factor(YEAR)2003	0.611	0.954	0.641	0.522
pol.bTRUE:factor(YEAR)2004	-1.748	0.965	-1.812	0.070
pol.bTRUE:factor(YEAR)2005	-0.938	1.017	-0.923	0.356
pol.bTRUE:factor(YEAR)2006	-0.901	1.266	-0.711	0.477
pol.bTRUE:factor(YEAR)2007	0.075	1.039	0.072	0.943
pol.bTRUE:factor(YEAR)2008	-0.087	1.329	-0.066	0.948
pol.bTRUE:factor(YEAR)2009	-1.530	1.633	-0.937	0.349
pol.bTRUE:factor(YEAR)2010	0.006	0.916	0.007	0.995
pol.bTRUE:factor(YEAR)2011	0.260	0.783	0.332	0.740
pol.bTRUE:factor(YEAR)2012	-0.662	0.914	-0.724	0.469
pol.bTRUE:factor(YEAR)2013	-0.901	1.121	-0.804	0.421
pol.bTRUE:factor(YEAR)2014	-1.272	0.914	-1.392	0.164
pol.bTRUE:factor(YEAR)2015	-0.902	1.170	-0.771	0.441
sbass.bTRUE:factor(QTR)2	-0.068	0.460	-0.148	0.882
sbass.bTRUE:factor(QTR)3	0.940	0.675	1.393	0.164
sbass.bTRUE:factor(QTR)4	0.422	0.387	1.089	0.276
sbass.bTRUE:factor(YEAR)2001	0.868	0.597	1.454	0.146
sbass.bTRUE:factor(YEAR)2002	0.508	0.756	0.671	0.502
sbass.bTRUE:factor(YEAR)2003	0.229	0.573	0.400	0.689
sbass.bTRUE:factor(YEAR)2004	-0.712	0.605	-1.176	0.240
sbass.bTRUE:factor(YEAR)2005	-0.506	0.784	-0.646	0.518
sbass.bTRUE:factor(YEAR)2006	-0.961	0.732	-1.314	0.189
sbass.bTRUE:factor(YEAR)2007	0.704	0.550	1.280	0.200

Table 18 continued.

	Estimate	Std. Error	t value	Pr(>|t|)
sbass.bTRUE:factor(YEAR)2008	0.071	0.698	0.102	0.919
sbass.bTRUE:factor(YEAR)2009	1.193	0.702	1.699	0.089
sbass.bTRUE:factor(YEAR)2010	-2.041	1.416	-1.441	0.149
sbass.bTRUE:factor(YEAR)2011	-15.528	1239.222	-0.013	0.990
sbass.bTRUE:factor(YEAR)2012	-16.179	1523.573	-0.011	0.992
sbass.bTRUE:factor(YEAR)2013	-18.302	2002.092	-0.009	0.993
sbass.bTRUE:factor(YEAR)2014	-17.858	3207.901	-0.006	0.996
sbass.bTRUE:factor(YEAR)2015	-2.486	1.375	-1.808	0.071
sm.dog.bTRUE:factor(QTR)2	1.145	0.390	2.936	0.003
sm.dog.bTRUE:factor(QTR)3	2.046	0.573	3.570	0.000
sm.dog.bTRUE:factor(QTR)4	-0.112	0.468	-0.239	0.811
sm.dog.bTRUE:factor(YEAR)2001	-1.857	0.654	-2.840	0.005
sm.dog.bTRUE:factor(YEAR)2002	-1.179	0.832	-1.418	0.156
sm.dog.bTRUE:factor(YEAR)2003	-0.847	0.670	-1.264	0.206
sm.dog.bTRUE:factor(YEAR)2004	-1.430	0.708	-2.019	0.044
sm.dog.bTRUE:factor(YEAR)2005	-2.501	1.048	-2.386	0.017
sm.dog.bTRUE:factor(YEAR)2006	-0.836	0.508	-1.645	0.100
sm.dog.bTRUE:factor(YEAR)2007	-1.867	0.552	-3.382	0.001
sm.dog.bTRUE:factor(YEAR)2008	0.053	0.854	0.062	0.951
sm.dog.bTRUE:factor(YEAR)2009	-1.374	0.592	-2.321	0.020
sm.dog.bTRUE:factor(YEAR)2010	0.061	0.719	0.085	0.932
sm.dog.bTRUE:factor(YEAR)2011	-0.644	1.081	-0.596	0.551
sm.dog.bTRUE:factor(YEAR)2012	-0.919	0.669	-1.375	0.169
sm.dog.bTRUE:factor(YEAR)2013	0.817	0.525	1.555	0.120
sm.dog.bTRUE:factor(YEAR)2014	-0.815	0.660	-1.236	0.217
sm.dog.bTRUE:factor(YEAR)2015	-0.621	0.450	-1.381	0.167
sp.dog.bTRUE:factor(QTR)2	-0.438	0.357	-1.224	0.221
sp.dog.bTRUE:factor(QTR)3	0.414	0.550	0.753	0.452
sp.dog.bTRUE:factor(QTR)4	0.721	0.369	1.957	0.050
sp.dog.bTRUE:factor(YEAR)2001	-1.382	0.883	-1.564	0.118
sp.dog.bTRUE:factor(YEAR)2002	-0.995	0.758	-1.312	0.190
sp.dog.bTRUE:factor(YEAR)2003	-1.923	1.101	-1.746	0.081
sp.dog.bTRUE:factor(YEAR)2004	-2.327	0.561	-4.148	0.000
sp.dog.bTRUE:factor(YEAR)2005	-2.330	0.662	-3.523	0.000
sp.dog.bTRUE:factor(YEAR)2006	-1.747	0.693	-2.520	0.012
sp.dog.bTRUE:factor(YEAR)2007	-0.706	0.487	-1.449	0.147
sp.dog.bTRUE:factor(YEAR)2008	-0.395	0.710	-0.556	0.578
sp.dog.bTRUE:factor(YEAR)2009	-4.387	1.468	-2.988	0.003
sp.dog.bTRUE:factor(YEAR)2010	-0.329	0.506	-0.649	0.516
sp.dog.bTRUE:factor(YEAR)2011	-0.774	0.559	-1.384	0.166
sp.dog.bTRUE:factor(YEAR)2012	-1.414	0.582	-2.430	0.015
sp.dog.bTRUE:factor(YEAR)2013	-1.872	0.502	-3.732	0.000
sp.dog.bTRUE:factor(YEAR)2014	-1.433	0.506	-2.835	0.005
sp.dog.bTRUE:factor(YEAR)2015	-0.546	0.472	-1.158	0.247
unk.sk.bTRUE:factor(QTR)2	-0.004	0.618	-0.007	0.995
unk.sk.bTRUE:factor(QTR)3	-0.019	1.143	-0.017	0.987
unk.sk.bTRUE:factor(QTR)4	-0.336	0.650	-0.518	0.605
unk.sk.bTRUE:factor(YEAR)2001	-0.984	1.460	-0.674	0.501
unk.sk.bTRUE:factor(YEAR)2002	0.541	1.025	0.528	0.598
unk.sk.bTRUE:factor(YEAR)2003	-16.305	1422.874	-0.011	0.991

Table 18 continued.

	Estimate	Std. Error	t value	Pr(>|t|)
unk.sk.bTRUE:factor(YEAR)2004	-0.426	0.736	-0.579	0.563
unk.sk.bTRUE:factor(YEAR)2005	-2.128	1.437	-1.481	0.138
unk.sk.bTRUE:factor(YEAR)2006	-1.546	0.775	-1.994	0.046
unk.sk.bTRUE:factor(YEAR)2007	-2.450	1.108	-2.211	0.027
unk.sk.bTRUE:factor(YEAR)2008	-0.983	1.492	-0.659	0.510
unk.sk.bTRUE:factor(YEAR)2009	-1.766	1.439	-1.227	0.220
unk.sk.bTRUE:factor(YEAR)2010	-15.471	1188.913	-0.013	0.990
unk.sk.bTRUE:factor(YEAR)2011	0.008	1.106	0.007	0.995
unk.sk.bTRUE:factor(YEAR)2012	-16.147	1517.068	-0.011	0.992
unk.sk.bTRUE:factor(YEAR)2013	0.131	0.878	0.149	0.882
unk.sk.bTRUE:factor(YEAR)2014	0.201	0.770	0.261	0.794
unk.sk.bTRUE:factor(YEAR)2015	-16.036	726.732	-0.022	0.982
wint.sk.bTRUE:factor(QTR)2	1.329	0.328	4.048	0.000
wint.sk.bTRUE:factor(QTR)3	1.241	0.543	2.287	0.022
wint.sk.bTRUE:factor(QTR)4	1.685	0.358	4.712	0.000
wint.sk.bTRUE:factor(YEAR)2001	0.921	0.651	1.415	0.157
wint.sk.bTRUE:factor(YEAR)2002	0.698	0.706	0.988	0.323
wint.sk.bTRUE:factor(YEAR)2003	0.576	0.737	0.781	0.435
wint.sk.bTRUE:factor(YEAR)2004	1.377	0.598	2.302	0.021
wint.sk.bTRUE:factor(YEAR)2005	0.674	0.661	1.020	0.308
wint.sk.bTRUE:factor(YEAR)2006	-0.926	0.696	-1.331	0.183
wint.sk.bTRUE:factor(YEAR)2007	-0.515	0.643	-0.802	0.423
wint.sk.bTRUE:factor(YEAR)2008	-0.032	0.827	-0.039	0.969
wint.sk.bTRUE:factor(YEAR)2009	1.777	0.705	2.520	0.012
wint.sk.bTRUE:factor(YEAR)2010	1.476	0.760	1.941	0.052
wint.sk.bTRUE:factor(YEAR)2011	2.386	0.663	3.597	0.000
wint.sk.bTRUE:factor(YEAR)2012	1.584	0.721	2.197	0.028
wint.sk.bTRUE:factor(YEAR)2013	1.815	0.748	2.425	0.015
wint.sk.bTRUE:factor(YEAR)2014	1.281	0.673	1.902	0.057
wint.sk.bTRUE:factor(YEAR)2015	0.546	0.596	0.916	0.359
factor(QTR)2:factor(YEAR)2001	0.657	0.649	1.013	0.311
factor(QTR)3:factor(YEAR)2001	-13.559	461.376	-0.029	0.977
factor(QTR)4:factor(YEAR)2001	-1.321	0.717	-1.843	0.065
factor(QTR)2:factor(YEAR)2002	1.518	0.883	1.720	0.085
factor(QTR)3:factor(YEAR)2002	1.863	1.344	1.386	0.166
factor(QTR)4:factor(YEAR)2002	0.665	0.829	0.803	0.422
factor(QTR)2:factor(YEAR)2003	1.046	0.718	1.458	0.145
factor(QTR)3:factor(YEAR)2003	-1.765	1.756	-1.005	0.315
factor(QTR)4:factor(YEAR)2003	-0.519	0.700	-0.741	0.459
factor(QTR)2:factor(YEAR)2004	1.214	0.621	1.956	0.051
factor(QTR)3:factor(YEAR)2004	1.613	1.042	1.549	0.121
factor(QTR)4:factor(YEAR)2004	0.586	0.605	0.969	0.333
factor(QTR)2:factor(YEAR)2005	0.744	0.722	1.030	0.303
factor(QTR)3:factor(YEAR)2005	0.790	1.143	0.692	0.489
factor(QTR)4:factor(YEAR)2005	0.074	0.665	0.112	0.911
factor(QTR)2:factor(YEAR)2006	0.157	0.561	0.279	0.780
factor(QTR)3:factor(YEAR)2006	-0.056	1.083	-0.052	0.959
factor(QTR)4:factor(YEAR)2006	-1.699	0.726	-2.339	0.019
factor(QTR)2:factor(YEAR)2007	-0.030	0.562	-0.053	0.958
factor(QTR)3:factor(YEAR)2007	0.457	1.015	0.450	0.653

Table 18 continued.

	Estimate	Std. Error	t value	Pr(>|t|)
factor(QTR)4:factor(YEAR)2007	-2.339	0.643	-3.636	0.000
factor(QTR)2:factor(YEAR)2008	-0.412	0.771	-0.534	0.593
factor(QTR)3:factor(YEAR)2008	-14.502	394.859	-0.037	0.971
factor(QTR)4:factor(YEAR)2008	-1.017	0.725	-1.402	0.161
factor(QTR)2:factor(YEAR)2009	1.456	0.626	2.325	0.020
factor(QTR)3:factor(YEAR)2009	2.951	1.192	2.476	0.013
factor(QTR)4:factor(YEAR)2009	-1.019	0.661	-1.542	0.123
factor(QTR)2:factor(YEAR)2010	-0.287	0.779	-0.369	0.712
factor(QTR)3:factor(YEAR)2010	-0.816	1.257	-0.649	0.516
factor(QTR)4:factor(YEAR)2010	-0.532	0.761	-0.699	0.485
factor(QTR)2:factor(YEAR)2011	0.069	0.744	0.093	0.926
factor(QTR)3:factor(YEAR)2011	-0.885	1.193	-0.742	0.458
factor(QTR)4:factor(YEAR)2011	-0.680	0.681	-0.999	0.318
factor(QTR)2:factor(YEAR)2012	0.252	0.664	0.380	0.704
factor(QTR)3:factor(YEAR)2012	-13.205	281.847	-0.047	0.963
factor(QTR)4:factor(YEAR)2012	-1.582	0.838	-1.889	0.059
factor(QTR)2:factor(YEAR)2013	0.383	0.771	0.497	0.620
factor(QTR)3:factor(YEAR)2013	0.732	1.137	0.644	0.520
factor(QTR)4:factor(YEAR)2013	0.078	0.768	0.101	0.919
factor(QTR)2:factor(YEAR)2014	0.954	0.676	1.410	0.159
factor(QTR)3:factor(YEAR)2014	0.107	1.228	0.087	0.930
factor(QTR)4:factor(YEAR)2014	0.092	0.704	0.131	0.896
factor(QTR)2:factor(YEAR)2015	2.176	0.819	2.657	0.008
factor(QTR)3:factor(YEAR)2015	-0.334	1.456	-0.229	0.818
factor(QTR)4:factor(YEAR)2015	1.105	0.836	1.321	0.187

Table 19. Annual Atlantic sturgeon bycatch estimates (number of fish) for bottom otter trawl gear based on application of the best performing model (model 6) to otter trawl vessel trip records. Data source: NEFOP/ASM

	Total bycatch estimate	Standard error	Proportion dead	Dead bycatch estimate
2000	1304	214	0	0
2001	1271	208	0	0
2002	1518	216	0	0
2003	1213	163	0	0
2004	1472	190	0	0
2005	1247	154	0.143	178
2006	1168	148	0.179	209
2007	1083	143	0.086	93
2008	910	160	0.161	147
2009	951	142	0.021	20
2010	968	147	0.009	9
2011	892	148	0	0
2012	760	120	0	0
2013	894	151	0	0
2014	717	105	0	0
2015	624	92	0	0

Table 20. Annual Atlantic sturgeon bycatch estimates (number of fish) for coastal ocean gillnet gear based on application of the best performing model (model 9) to gillnet vessel trip records. Data source: NEFOP/ASM

	Total bycatch estimate	Standard error	Proportion dead	Dead bycatch estimate
2000	2242	664	0.128	288
2001	869	458	0.298	259
2002	2715	1796	0.240	652
2003	1119	232	0.212	237
2004	1416	356	0.487	690
2005	690	227	0.306	211
2006	1580	315	0.124	196
2007	1406	332	0.200	281
2008	783	456	0.279	219
2009	1313	678	0.129	169
2010	289	83	0.507	147
2011	414	199	0.440	182
2012	253	67	0.435	110
2013	1746	666	0.375	655
2014	707	203	0.333	236
2015	685	100	0.277	190

Table 21. Estimated coefficients of predictors and their standard errors for the Poisson GLM fit to the NCDMF Atlantic sturgeon bycatch data.

Covariate	Coefficient	Standard Error
Intercept	-8.82791	0.16587
Year—2005	0.66101	0.19339
Year—2006	1.02861	0.18065
Year—2007	0.74343	0.21307
Year—2008	1.4937	0.17847
Year—2009	0.44644	0.2269
Year—2010	0.12413	0.24404
Year—2011	0.31298	0.23273
Year—2012	0.45897	0.19952
Year—2013	0.36929	0.18239
Year—2014	0.26706	0.18355
Year—2015	0.22751	0.17991
Season—Spring	-0.33727	0.09305
Season—Summer	-1.09516	0.17373
Season—Winter	-0.3263	0.09189
Mesh—Small	0.91453	0.07393
Unit—B	-3.01964	0.15197
Unit—C	-2.59923	0.2708
Unit—D	-2.93475	0.50286
Unit—E	-2.62835	0.41189

Table 22. Results of the model selection for the Poisson GLM fit to the NCDMF Atlantic sturgeon bycatch data.

Dropped Term	df	Deviance	AIC	LRT	Pr(>χ^2)
<none>		6,529.4	8,109.1		
Year	11	6,676	8,233.7	146.61	< 2.2e-16 ***
Season	3	6,583.5	8,157.2	54.04	1.099e-11 ***
Mesh	1	6,679.4	8,257.1	150.01	< 2.2e-16 ***
Unit	4	7,419.2	8,990.9	889.74	< 2.2e-16 ***

Table 23. Estimated numbers of Atlantic sturgeon bycatch from NCDMF Atlantic sturgeon bycatch data.

	Total Bycatch	%Dead	Number Dead
2004	2,937	12.0%	352
2005	5,004	7.1%	357
2006	7,291	5.1%	374
2007	5,730	6.1%*	347
2008	13,668	0.0%	0
2009	4,517	6.1%*	274
2010	1,895	6.1%*	115
2011	1,286	0.0%	0
2012	2,118	20.0%	424
2013	2,571	10.0%	257
2014	1,737	3.4%	60
2015	1,390	4.3%	60

*: For years where no Atlantic sturgeon were encountered in the commercial observer data, the percent observed dead over all years was used.

Table 24. Commercial shad fishery catch rates for Atlantic sturgeon within the Carolina DPS (Waccamaw River, Pee Dee River, Winyah Bay, and Santee River), 2000-2015.

Year	Number of Atlantic Sturgeon Caught	Effort (Net Yds/Hr)	CPUE (#ATS/NetYds/Hr)
2000	40	2,284,770	0.0000175
2001	128	3,339,789	0.0000383
2002	74	4,222,339	0.0000175
2003	16	3,881,793	0.0000041
2004	11	4,094,782	0.0000027
2005	0	3,963,111	0.0000000
2006	226	6,607,328	0.0000342
2007	162	2,562,688	0.0000632
2008	76	4,070,683	0.0000187
2009	186	5,110,128	0.0000364
2010	12	3,357,022	0.0000036
2011	173	5,818,003	0.0000297
2012	194	5,617,356	0.0000345
2013	157	3,457,182	0.0000454
2014	14	2,876,558	0.0000049
2015	10	3,207,376	0.0000031

Table 25. Commercial shad fishery catch rates for Atlantic sturgeon within the South Atlantic DPS (Edisto River, Combahee River, and Savannah River), 2000-2015.

Year	Number of Atlantic Sturgeon Caught	Effort (Net Yds/Hr)	CPUE (#ATS/NetYds/Hr)
2000	5	559,575	0.0000089
2001	20	493,149	0.0000406
2002	5	301,618	0.0000166
2003	3	425,421	0.0000071
2004	0	527,201	0.0000000
2005	1	367,849	0.0000027
2006	2	389,517	0.0000051
2007	6	384,197	0.0000156
2008	0	270,265	0.0000000
2009	3	276,875	0.0000108
2010	3	221,982	0.0000135
2011	8	240,967	0.0000332
2012	11	260,664	0.0000422
2013	1	214,095	0.0000047
2014	0	163,182	0.0000000
2015	0	148,910	0.0000000

Table 26. Results of the Mann-Kendall trend analysis. Trend indicates the direction of trend if a statistically significant temporal trend was detected. ns = not significant.

State	Survey	Subset	Available Years	Trend
na	USFWS Coop		1988-2010	ns
Maine/New Hampshire	ME-NH Trawl		2000-2015	ns
Connecticut	Long Island Sound		1992-2014	ns
Connecticut	Long Island Sound	fall	1992-2015	ns
Connecticut	Long Island Sound	spring	1992-2014	ns
New Jersey	Ocean Trawl		1990-2015	ns
Virginia	Trawl Survey		1998-2015	ns
Virginia	Trawl Survey	James River	1998-2015	ns
North Carolina	Program 135	spring	1991-2015	ns
North Carolina	Program 135	spring; YOY	1991-2015	ns
North Carolina	Program 135	spring; juveniles	1991-2015	↑
North Carolina	Program 135		1990-2015	ns
North Carolina	Program 135	fall; YOY	1990-2015	ns
North Carolina	Program 135	fall; juveniles	1990-2015	ns

Table 27. Results of the power analysis by survey for linear and exponential trends in Atlantic sturgeon abundance indices over a twenty-year period. Power were calculated as the probability of detecting a 50% change following the methods of Gerrodette (1987).

Survey	Years	Season	Life Stage	Median CV	Linear Trend		Exponential Trend	
					+50%	-50%	+50%	-50%
ME-NH Trawl	2000-2015	Year-round	Juvenile & Adult	1.108	0.13	0.17	0.16	0.23
CT LIST	1984-2014	Fall	Juvenile	0.709	0.21	0.28	0.23	0.34
CT LIST	1984-2014	Spring	Juvenile	0.796	0.18	0.24	0.20	0.30
CT LIST	1984-2014	Year-round	Juvenile	0.581	0.26	0.36	0.28	0.42
NYSDEC	2006-2015	Spring	Juvenile	0.204	0.89	0.98	0.89	0.98
NJ Ocean Trawl	1990-2015	Year-round	Juvenile & Adult	0.518	0.30	0.42	0.32	0.48
VIMS Shad Monitoring	1998-2015	Spring	Juvenile	0.443	0.37	0.52	0.39	0.57
NEAMAP	2007-2015	Fall	Adult	0.535	0.29	0.41	0.31	0.46
NEAMAP	2008-2015	Spring	Juvenile	0.432	0.38	0.54	0.40	0.58
NEAMAP	2008-2015	Year-round	Juvenile & Adult	0.374	0.47	0.64	0.48	0.68
USFW Coop	1988-2010	Winter	Juvenile & Adult	0.506	0.31	0.44	0.33	0.49
NC p135	1990-2015	Fall	YOY	0.211	0.87	0.97	0.87	0.98
NC p135	1991-2015	Spring	Juvenile	0.301	0.62	0.80	0.63	0.83
SC Edisto	2004-2015	Year-round	Juvenile & Adult	0.202	0.89	0.98	0.90	0.98

Table 28. Model selection results for different structures for the R matrix and for 1 to 4 trends in the data (m). The log likelihood (logLik), number of parameters (K), and AICc values are shown. The model with the lowest AICc has one trend and a diagonal (no covariance) and equal (same variances) R matrix. * = best model.

R	m	logLik	K	AICc
diagonal and equal*	1	-181.97	7	378.85
diagonal and equal	2	-181.57	12	389.76
diagonal and equal	3	-181.57	16	399.87
diagonal and equal	4	-183.21	19	411.21
diagonal and unequal	1	-180.46	12	387.55
diagonal and unequal	2	-177.87	17	395.10
diagonal and unequal	3	-177.58	21	405.55
diagonal and unequal	4	-177.62	24	414.46
equalvarcov	1	-181.56	8	380.30
equalvarcov	2	-181.53	13	392.15
equalvarcov	3	-182.00	17	403.37
equalvarcov	4	-182.25	20	412.08
unconstrained	1	-173.54	27	415.62
unconstrained	2	-170.87	32	427.08
unconstrained	3	-171.14	36	442.33
unconstrained	4	-171.68	39	455.28

Table 29. Results from the MARSS PVA and Dennis Method PVA approaches. Various Atlantic sturgeon surveys, including combinations of some, were included in the analysis. Process errors (Q), observation errors (R), and the population growth rate (U) are reported unless the model would not converge or Q values were out of a reasonable range, as noted. 95% confidence intervals are included in parenthesis for estimates of U.

Survey(s)	MARSS PVA			Dennis Method	
	Q	R	U	Q	U
Conn 1984-2015	Model would not converge			0.36	1.2% (-19.8, 22.2)
Conn 1998-2015	0.09	0.13	-0.01% (-3.3, 3.2)	0.34	-0.9% (-28.5, 26.7)
ME-NH	Model would not converge			Q values unreasonable	
CT LIST	Model would not converge			Q values unreasonable	
NJ Ocean Trawl	Model would not converge			Q values unreasonable	
VIMS	0.82	0.15	-1.8% (-44.9, 41.3)	1.23	-1.6% (-55.3, 52.1)
NC p135	1.2×10^{-4}	0.55	3.9% (0.1, 7.8)	0.94	-1.5% (-40.2, 37.3)
USFW COOP	Model would not converge			Q values unreasonable	
NY Bight (CT, NJ)	0.18	NJ: 0.57 CT: 0.96	4.9% (-10.9, 20.7)	0.06	4.9% (-3.6, 13.4)

Table 30. ARIMA and trend analysis results for Atlantic sturgeon indices of abundance for (a) all years and (b) only overlapping years of 2000-2015. (a) Shown are the probability that the terminal year of an index is greater than the 25th percentile of a time series and the probability that the terminal year of an index is greater than the index value in 1998 (green shading indicates >50% probability); the Mann-Kendall tau (τ) statistics, the Holm-adjusted probability of the Mann-Kendall time series trend being significant, and whether the trend is increasing (+), decreasing (-), or not significant (n.s.). Terminal years other than 2015 are highlighted in yellow. Light grey font indicates a strong within-survey correlation (e.g., CT LIST spring and fall nominal index is strongly correlated with CT LIST fall nominal index). (b) Same as (a), except here, surveys have been truncated to a common set of years to evaluate the influence of specific survey years on probabilities of being above the 25th percentile of a time series.

(a) All years

									Trend analysis results		
DPS	Survey	Months	Ages	P(2015 index > 25th Pctl)	P(2015 index > 1998 index)	N years	First year	Terminal year	M-K τ	M-K p_adj	Trend
GOM	ME-NH Trawl (w/ May)	5,10,11	Juvenile & Adult	0.73	0.28*	16	2000	2015	-0.30	0.4603	n.s.
NYB	CT LIST spring (nom)	5-6	Juvenile	0.68	0.67	31	1984	2014	0.40	0.0123	+
NYB	CT LIST fall (nom)	9-11	Juvenile	0.95	0.82	26	1984	2009	0.86	0.0000	+
NYB	CT LIST spring & fall (nom)	5-6,9-11	Juvenile	0.92	0.65	26	1984	2009	0.78	0.0000	+
NYB	NJ Ocean Trawl	1, 4, 6, 10	Juvenile & Adult	0.90	0.91	26	1990	2015	0.29	0.2129	n.s.
CB	VIMS Shad Monitoring (3R)	3-4	Juvenile	0.96	0.41	18	1998	2015	0.06	1.0000	n.s.
CB	VIMS Shad James River only	3-4	Juvenile	0.95	0.39	18	1998	2015	-0.02	1.0000	n.s.
C	USFW Coop	1-2	Juvenile & Adult	0.71	0.66	23	1988	2010	0.64	0.0002	+
C	NC p135 (spring YOY + Juv)	Spring	YOY & Juvenile	1.00	0.98	25	1991	2015	0.69	0.0000	+
C	NCp135 (spring YOY)	Spring	YOY	0.81	0.78	25	1991	2015	0.35	0.0969	n.s.
C	NC p135 (spring Juv)	Spring	Juvenile	1.00	1.00	25	1991	2015	0.88	0.0000	+
C	NC p135 (fall YOY + Juv)	Fall (11-2)	YOY & Juvenile	0.57	0.51	26	1990	2015	0.50	0.0028	+
C	NC p135 (fall YOY)	Fall (11-2)	YOY	0.54	0.44	26	1990	2015	-0.03	1.0000	n.s.
C	NC p135 (fall Juv)	Fall (11-2)	Juvenile	0.73	0.71	26	1990	2015	0.61	0.0002	+
Coast	Conn Index	Fall	YOY, Juvenile,& Adult	0.62	0.55	32	1984	2015	0.31	0.1004	n.s.

*: ME-NH Trawl survey starts in 2000, therefore this is probability of the 2015 index being above the 2000 index.

Table 30 continued.

(b) 2000-2015

DPS	Survey	Months	Ages	P(2015 index > 25th Pctl)	N Years	First year	Terminal year
GOM	ME-NH Trawl (w/ May)	5,10,11	Juvenile & Adult	0.71	16	2000	2015
NYB	NJ Ocean Trawl	1, 4, 6, 10	Juvenile & Adult	0.95	16	2000	2015
CB	VIMS Shad James River only	3-4	Juvenile	0.96	16	2000	2015
C	NCp135	Spring	YOY	0.31	16	2000	2015
C	NCp135	Spring	juv	0.58	16	2000	2015
C	NCp135	Fall	YOY	0.85	16	2000	2015
C	NCp135	Fall	Juv	1.00	16	2000	2015
Coast	Conn Index	Fall	All ages	0.89	16	2000	2015

Table 31. Summary of tally and percentage of surveys, by DPS, where terminal year index is greater than the 25th percentile of a given time series and the index value in 1998 for a given index for (a) all years available, and (b) subset to a common set of years (2000-2015).

(a) All Available Years

DPS	P(2015 index > 25th Pctl)	P(2015 index > 1998 index)
GOM	1 of 1	0 of 1*
NYB	3 of 3	1 of 1**
CB	1 of 1	0 of 1
C	5 of 5	4 of 5
Coast	1 of 1	1 of 1

DPS	P(2015 index > 25th Pctl)	P(2015 index > 1998 index)
GOM	100%	0%
NYB	100%	100%
CB	100%	0%
C	100%	80%
Coast	100%	100%

* Survey started in 2000

** 2 additional surveys do not include 2015

(b) Only 2000 - 2015

DPS	P(2015 index > 25th Pctl)
GOM	1 of 1
NYB	1 of 1
CB	1 of 1
C	3 of 4
Coast	1 of 1

DPS	P(2015 index > 25th Pctl)
GOM	100%
NYB	100%
CB	100%
C	75%
Coast	100%

Table 32. Summary statistics for ARIMA model results. N = number of years in time series, W = Shapiro-Wilk statistics for normality, adj p = Holm-adjusted probability of rejecting the null hypothesis regarding normality of model residuals, r1, r2, and r3 = the first three sample autocorrelations for the first differenced logged series, (θ) = moving average parameter, SE = standard error of theta, and σ^2 = variance of index. VIMS Shad Monitoring (J-Y-R) = James, York, and Rappahannock rivers.

DPS	Survey	Years avail.	n	W	adj p	r_1	r_2	r_3	θ	SE	σ^2_c
GOM	ME-NH Trawl (w/ May)	2000-2015	16	0.96	1.00	-0.35	-0.13	0.27	0.6	0.32	0.29
NYB	CT LIST spring (nom)	1984-2014	31	0.96	1.00	-0.08	-0.39	-0.03	1	0.24	0.7
NYB	CT LIST fall (nom)	1984-2009	26	0.98	1.00	-0.32	-0.16	-0.02	0.75	0.19	0.98
NYB	CT LIST spring & fall (nom)	1984-2009	26	0.97	1.00	-0.15	-0.3	-0.19	0.74	0.18	0.64
NYB	NJ Ocean Trawl	1990-2015	26	0.89	0.13	-0.46	0.2	-0.23	0.55	0.24	1.55
CB	VIMS Shad Monitoring (J-Y-R)	1998-2015	18	0.98	1.00	0.1	0.02	-0.21	0.09	0.23	0.88
CB	VIMS Shad James River only	1998-2015	18	0.95	1.00	-0.05	0	-0.07	0.05	0.24	1.07
C	USFW Coop	1988-2010	23	0.96	1.00	-0.48	0.29	-0.46	0.87	0.13	0.69
C	NC p135 (spring YOY + Juv)	1990-2015	25	0.94	1.00	-0.17	-0.26	-0.12	0.51	0.31	0.21
C	NCp135 (spring YOY)	1990-2015	25	0.91	0.44	-0.39	-0.17	0.15	1	0.15	0.08
C	NC p135 (spring Juv)	1990-2015	25	0.88	0.08	-0.29	-0.21	-0.09	0.55	0.17	0.15
C	NC p135 (fall YOY + Juv)	1990-2015	26	0.95	1.00	-0.26	-0.26	0.11	0.97	0.3	0.2
C	NC p135 (fall YOY)	1990-2015	26	0.89	0.11	-0.32	-0.26	0.16	1	0.12	0.14
C	NC p135 (fall Juv)	1990-2015	26	0.98	1.00	-0.23	-0.24	0	0.87	0.12	0.1
Coast	Conn Index	1984-2015	32	0.97	1.00	-0.09	-0.38	0.07	0.93	0.16	0.29

Table 33. Characteristics of current and previous mixed stock analysis on Atlantic sturgeon. Abbreviations for baseline populations are as follows: SL – St Lawrence, SJ – St John, KE – Kennebec, HU – Hudson, DE – Delaware, YO – York, JA – James, ALB – Albemarle, ED – Edisto, CO – Combahee, SAV – Savannah, OG – Ogeechee, ALT – Altamaha, and SAT – Satilla. *Omitted from comparisons since most of these fish were included in the present analysis of adult sturgeon captured off the coast of Delawar.

Study	Region	Sample Years	Size/Stage	*n*	Methodology (Baseline Populations)
Hudson intercept	New York Bight	1993-1995	136-229 cm TL	83	Microsatellites (SL, SJ, KE, HU, DE, YO, JA, ALB, ED, SAV, OG, ALT)
Dunton et al. 2012	New York Bight	2005-2009	54-215 cm TL	364	MtDNA control region sequencing (SL, SJ, KE, HU, DE, JA, ALB, ED, CO, SAV, OG, ALT)
Waldman et al. 1996	New York Bight	1993-1994	136-207 cm TL	112	MtDNA RFLP (SL, SJ, HU, ED, SAV, OG, ALT, SAT)
O Leary et al. 2015	New York Bight	2010-2012	71-205 cm TL	460	Microsatellites (SJ, KE, HU, DE, JA, ALB, SAV, OG, ALT)
Waldman et al. 2013	Long Island Sound and Connecticut River	1989-2011 (most 2005-2011)	Adults and subadults	399	MtDNA control region sequencing and microsatellites (SJ, KE, HU, DE, JA, ALB, SAV, OG, ALT)
Wirgin et al. 2012	Bay of Fundy, Canada	2007-2009	46-238 cm TL	181	MtDNA control region sequencing and microsatellites (SJ, KE, HU, DE, JA, ALB, SAV, ALT, OG)
Wirgin et al. 2015a*	Delaware Coast (New York Bight)	2009-2012		261	MtDNA control region sequencing and microsatellites (SJ, KE, HU, DE, JA, ALB, SAV, OG, ALT)
Wirgin et al. 2015b	Mostly in New York Bight and North Carolina coast	2009-2012	122.5 cm TL (mean)	173	MtDNA control region sequencing and microsatellites (SL, SJ, KE, HU, DE, JA, ALB, OG, ED, SAV, ALT)
Delaware coast	New York Bight	2009-2016	Adults	391	Microsatellites (SL, SJ, KE, HU, DE, YO, JA, ALB, ED, SA, OG, ALT)

Table 34. Summary of Atlantic sturgeon collections included in the genetic baseline for assignment to DPS and river of origin. Length data has not yet been recovered for all individuals following the untimely passing of Dr. Tim King. All collections have been classified as including river-resident juvenile (RRJ; <500 mm TL) or adult sturgeon (≥1,500 mm TL) based on his notes. Note that this collection includes seven individuals below 1,500 mm TL (1,370-1,470 mm TL). Length data was not identified for an additional three individuals from the St John River.

DPS	River	Year	Size Class	Samples
Gulf of Maine	St. Lawrence	2013	Adult	30
Gulf of Maine	St. John	1991-1993	Adult*	31
Gulf of Maine	Kennebec	1980	Adult	14
Gulf of Maine	Kennebec	2010-2011	Adult	38
New York Bight	Hudson	1996	Adult	28
New York Bight	Hudson	1997	Adult	25
New York Bight	Hudson	2006	Adult	31
New York Bight	Hudson	2008	Adult	20
New York Bight	Hudson	2008	RRJ	23
New York Bight	Hudson	2009	Adult	40
New York Bight	Hudson	2010	Adult	48
New York Bight	Hudson	2014	RRJ	38
New York Bight	Hudson	2015	RRJ	31
New York Bight	Hudson	2015	Adult	53
New York Bight	Delaware	2009	RRJ	64
New York Bight	Delaware	2011	RRJ and Adult	56
New York Bight	Delaware	2014	RRJ	39
New York Bight	Delaware	2015	RRJ and Adult	22
Chesapeake	York	2013	Adult	18
Chesapeake	York	2014	Adult	54
Chesapeake	York	2015	Adult	64
Chesapeake	James	1998	RRJ	52
Chesapeake	James	2009	Adult	16
Chesapeake	James	2010	Adult	38
Chesapeake	James	2011	Adult	68
Chesapeake	James	2012	Adult	29
Chesapeake	James	2013	Adult	31
Chesapeake	James	2014	Adult	58
Chesapeake	James	2015	Adult	34
Chesapeake	James	2015	Adult	20
Carolina	Albemarle	1998	Adult	11

Table 34. *Continued*

DPS	River	Year	Size Class	Samples
Carolina	Albemarle	2007	RRJ	11
Carolina	Albemarle	2008	RRJ	15
South Atlantic	Edisto	1996	RRJ	14
South Atlantic	Edisto	1998	RRJ	18
South Atlantic	Edisto	2004	RRJ	29
South Atlantic	Edisto	2005	RRJ	48
South Atlantic	Savannah	2000	RRJ	29
South Atlantic	Savannah	2007	RRJ	11
South Atlantic	Savannah	2008	RRJ	14
South Atlantic	Savannah	2013	RRJ	44
South Atlantic	Ogeechee	2003	RRJ	10
South Atlantic	Ogeechee	2007-2009	RRJ	15
South Atlantic	Ogeechee	2014	RRJ	43
South Atlantic	Ogeechee	2015	RRJ	47
South Atlantic	Altamaha	2005	RRJ	49
South Atlantic	Altamaha	2010	RRJ	50
South Atlantic	Altamaha	2011	RRJ and Adult	24
South Atlantic	Altamaha	2011	RRJ	40
South Atlantic	Altamaha	2015	RRJ	23

Table 35. Classification confusion matrix for genetic population assignments to river using the Atlantic sturgeon baseline. Overall, 84.9% of individuals within the baseline were correctly assigned to their river of origin using GeneClass2 (shown in bold). The classification efficiency of individuals to DPSs in these assignments was even higher (95.3%; shown in italics)

	Assigned River												
Collection Location	**St Lawrence**	**St John**	**Kennebec**	**Hudson**	**Delaware**	**York**	**James**	**Albemarle**	**Edisto**	**Savannah**	**Ogeechee**	**Altamaha**	**Grand Total**
St Lawrence	***30***												30
St John		***30***	1										31
Kennebec	1	1	***49***				1						52
Hudson			7	***305***	*23*		2						337
Delaware		1	1	*22*	***149***		8						181
York				1		***125***	*8*	1		1			136
James	1			9	9		***312***		1	4	5	5	346
Albemarle								***30***		5	1	1	37
Edisto									***85***	*9*	*7*	*8*	109
Savannah							1	1	*5*	***64***	*9*	*18*	98
Ogeechee									*12*	*11*	***80***	*12*	115
Altamaha									*7*	*29*	*2*	***148***	186
Grand Total	32	32	58	337	181	125	332	32	110	123	104	192	1658

Table 36. Number of Atlantic sturgeon tags and months available for analysis in the acoustic tagging dataset. The number of tags varied by DPS. DPSs are Gulf of Maine (GM), New York Bight (NY), Chesapeake (CH), Carolina (CA), and South Atlantic (SA).

DPS	Number of tags	Number of Adults	Number of Juveniles	Range of months of data
Gulf of Maine	155	129	26	104
New York Bight	458	268	190	117
Chesapeake Bay	359	241	118	114
Carolina	120	32	88	81
South Atlantic	239	190	49	117
Total	1,331	860	471	--

Table 37. Results for the best Cormack-Jolly-Seber model for all acoustically tagged Atlantic sturgeon. The mean estimate, standard deviation, 50%, and 95 % credible intervals are presented. The best DIC selected model had a single estimate of survival (S) and monthly varying detection probability (p).

Parameter	Mean	sd	2.5 %	25 %	75%	97.5 %
Annual S	0.96	0.05	0.84	0.96	0.99	1.00
Monthly S	1.00	0.01	0.98	1.00	1.00	1.00
Jan p	0.07	0.01	0.06	0.07	0.08	0.08
Feb p	0.06	0.01	0.05	0.06	0.06	0.06
Mar p	0.10	0.01	0.09	0.11	0.11	0.11
Apr p	0.30	0.01	0.28	0.30	0.31	0.32
May p	0.50	0.01	0.49	0.51	0.52	0.52
Jun p	0.51	0.01	0.49	0.50	0.51	0.52
Jul p	0.40	0.01	0.38	0.38	0.39	0.41
Aug p	0.41	0.01	0.39	0.39	0.40	0.42
Sep p	0.48	0.01	0.46	0.46	0.47	0.50
Oct p	0.47	0.01	0.45	0.46	0.47	0.48
Nov p	0.25	0.01	0.24	0.24	0.25	0.26
Dec p	0.09	0.01	0.08	0.09	0.10	0.10

Table 38. Survival estimates for the best Cormack-Jolly-Seber model for all acoustically tagged Atlantic sturgeon in each DPS. The mean estimate, standard deviation, 50% and 95% credible interval are presented. The best DIC selected model had a single estimate of survival and monthly varying detection probability.

DPS	N	TL Range (cm)	Mean	sd	2.5%	25%	50%	75%	97.5%	Monthly p
GM	155	29-237	0.74	0.21	0.15	0.64	0.79	0.90	0.99	0.01-0.39
NY	458	26-268	0.91	0.08	0.71	0.88	0.93	0.96	0.99	0.06-0.58
CH	359	19-240	0.88	0.14	0.46	0.85	0.92	0.96	0.99	0.03-0.56
CA	120	72-204	0.78	0.16	0.39	0.70	0.81	0.90	0.99	0.04-0.53
SA	239	28-267	0.86	0.13	0.54	0.82	0.90	0.95	0.99	0.09-0.62

Table 39. Survival estimates for the best Cormack-Jolly-Seber model for adult acoustically tagged Atlantic sturgeon in each DPS. The mean estimate, standard deviation, 50% and 95 % credible interval are presented. The best DIC selected model had a single estimate of survival and monthly varying detection probability.

DPS	N	TL Range (cm)	Mean	sd	2.5%	25%	50%	75%	97.5%	Monthly p
GM	129	130-237	0.72	0.21	0.16	0.60	0.76	0.88	0.98	0.01-0.36
NY	268	130-268	0.85	0.14	0.49	0.79	0.88	0.94	0.99	0.04-0.65
CH	241	134-240	0.82	0.16	0.42	0.77	0.87	0.93	0.99	0.02-0.53
CA	32	133-204	0.33	0.24	0.02	0.13	0.28	0.48	0.87	0.04-0.77
SA	190	132-267	0.83	0.18	0.29	0.78	0.88	0.94	0.99	0.09-0.62

Table 40. Survival estimates for the best Cormack-Jolly-Seber model for juvenile acoustically tagged Atlantic sturgeon in each DPS. The mean estimate, standard deviation, 50% and 95% credible interval are presented. The best DIC selected model had a single estimate of survival and monthly varying detection probability.

DPS	N	TL Range (cm)	Mean	sd	2.5%	25%	50%	75%	97.5%	Monthly p
GM	26	29-129	0.35	0.26	0.02	0.11	0.29	0.54	0.91	0.05-0.62
NY	190	26-129	0.80	0.19	0.21	0.74	0.86	0.93	0.99	0.01-0.55
CH	118	19-127	0.71	0.20	0.26	0.58	0.75	0.88	0.98	0.17-0.79
CA	88	72-129	0.72	0.20	0.20	0.61	0.76	0.87	0.98	0.05-0.48
SA	49	28-124	0.59	0.24	0.11	0.41	0.62	0.79	0.97	0.10-0.66

Table 41. Total removals (mt) and CV used as input to stock reduction analyses.

Year	Removals	CV
1887	3,094.0	0.3
1888	3,294.0	0.3
1889	2,626.0	0.3
1890	3,270.0	0.3
1891	3,044.0	0.3
1892	2,540.0	0.3
1893	2,104.8	0.3
1894	1,870.8	0.3
1895	1,617.6	0.3
1896	1,369.6	0.3
1897	2,101.0	0.3
1898	1,314.0	0.3
1899	425.9	0.3
1900	308.4	0.3
1901	294.0	0.3
1902	269.0	0.3
1903	146.7	0.3
1904	307.0	0.3
1905	9.0	0.3
1906	76.2	0.3
1907	56.8	0.3
1908	101.0	0.3
1909	3.0	0.3
1910	4.0	0.3
1911	9.0	0.3
1912	9.0	0.3
1913	4.0	0.3
1914	1.0	0.3
1915	0.0	0.3
1916	0.0	0.3
1917	0.0	0.3
1918	78.0	0.3
1919	0.0	0.3
1920	10.0	0.3
1921	41.0	0.3
1922	0.0	0.3
1923	50.0	0.3
1924	4.0	0.3
1925	39.0	0.3

Year	Removals	CV
1926	10.0	0.3
1927	23.0	0.3
1928	23.0	0.3
1929	34.0	0.3
1930	30.0	0.3
1931	33.0	0.3
1932	26.0	0.3
1933	20.0	0.3
1934	33.0	0.3
1935	13.0	0.3
1936	60.0	0.3
1937	43.0	0.3
1938	48.0	0.3
1939	22.0	0.3
1940	19.0	0.3
1941	6.0	0.3
1942	22.0	0.3
1943	11.0	0.3
1944	12.0	0.3
1945	41.0	0.3
1946	27.0	0.3
1947	21.0	0.3
1948	41.0	0.3
1949	23.0	0.1
1950	42.1	0.1
1951	30.5	0.1
1952	50.6	0.1
1953	58.6	0.1
1954	54.3	0.1
1955	63.0	0.1
1956	85.7	0.1
1957	68.2	0.1
1958	62.6	0.1
1959	52.3	0.1
1960	64.7	0.1
1961	79.0	0.1
1962	75.8	0.1
1963	79.9	0.1
1964	83.1	0.1

Year	Removals	CV
1965	102.7	0.1
1966	87.9	0.1
1967	58.1	0.1
1968	88.1	0.1
1969	108.7	0.1
1970	96.9	0.1
1971	105.5	0.1
1972	122.4	0.1
1973	73.9	0.1
1974	83.5	0.1
1975	69.2	0.1
1976	75.2	0.1
1977	93.9	0.1
1978	81.3	0.1
1979	79.1	0.1
1980	102.2	0.1
1981	82.9	0.1
1982	88.0	0.1
1983	45.1	0.1
1984	81.2	0.1
1985	65.2	0.1
1986	51.6	0.1
1987	42.3	0.1
1988	46.8	0.1
1989	57.8	0.1
1990	92.9	0.1
1991	98.4	0.1
1992	58.8	0.1
1993	31.4	0.1
1994	43.5	0.1
1995	17.4	0.1
1996	3.0	0.2
1997	0.4	0.2
1998	0.2	0.2
1999	0.1	0.2
2000	4.0	0.2
2001	6.7	0.2
2002	15.8	0.2
2003	3.6	0.2

Year	Removals	CV
2004	12.5	0.2
2005	8.6	0.2
2006	9.6	0.2
2007	8.1	0.2
2008	6.4	0.2
2009	4.6	0.2
2010	3.3	0.2
2011	4.8	0.2
2012	3.7	0.2
2013	17.6	0.2
2014	5.7	0.2
2015	3.5	0.2

Table 42. Drawn parameters and their distributions for the DBSRA model

Parameter	Base Distribution	Sensitivity Runs
Natural mortality	Lognormal(0.07, 0.1)	
F_{MSY}/M	Lognormal(0.8, 0.1)	Lognormal(0.45, 0.1)
B_{MSY}/K	Beta(0.4, 0.1)	Beta(0.6, 0.1)
B_{2015}/K	Uniform(0.05, 0.20)	Uniform(0.20, 0.50)
B_{1887}/K	Constant=1	Uniform(0.85, 1.0)
K scalar	Constant=1	Uniform(0.30, 0.75)

Table 43. Estimated von Bertalanffy parameters used in the various analyses of eggs-per-recruit. Length is in centimeters and standard errors are in parentheses.

Region	L_∞		K		t_0	
Coast	286	(2.08)	0.0622	(0.00140)	-0.340	(0.129)
New York Bight DPS (northern)	299	(2.37)	0.0511	(0.00104)	-1.82	(0.102)
Carolina DPS (southern)	182	(1.29)	0.169	(0.00473)	-0.759	(0.0719)

Table 44. Parameters of the length (centimeters)-weight (grams) relationship used in the various analyses of eggs-per-recruit. Standard errors are in parentheses.

Region	a		b	
Coast	0.00513	(0.000286)	3.05	(0.0107)
New York Bight DPS (northern)	0.0235	(0.00428)	2.76	(0.0345)
Carolina DPS (southern)	0.00186	(0.000119)	3.25	(0.0129)

Table 45. Estimates of the fecundity relationship for Atlantic sturgeon from the literature.

Area	Relation	Equation	a	b	c	Source
South Carolina	weight (kg)-fecundity, linear	$F = a + b * W$	233,064	13,307		Smith et al. 1982
Hudson	length (cm)-fecundity, linear	$F = a + b * L$	-5,888,552	35,560		van Eenannaan et al. 1996
Hudson	length (cm)-fecundity, linear	$F = a + b * L$	-4,678,387	29,182		van Eenannaam and Doroshov 1998
Hudson	age-fecundity, non-linear	$F = a + b * \exp(c * A)$	3,598,025	-6,926,305	-0.05	van Eenannaam and Doroshov 1998

Table 46. Estimated values of $Z_{50\%EPR}$ for the coast-wide model for different age groups at various rates of bycatch and ship strike mortality.

F			**N-weighted $Z_{50\%EPR}$**		
Ship Strike	**Bycatch**	**Total**	**All fish**	**Adults**	**Ages 4-21**
0.000	0.030	0.030	0.12	0.072	0.085
0.00042	0.030	0.030	0.12	0.072	0.085
0.010	0.025	0.035	0.12	0.071	0.087
0.020	0.021	0.041	0.12	0.071	0.088
0.022	0.020	0.042	0.12	0.071	0.088
0.030	0.016	0.046	0.12	0.070	0.089
0.040	0.011	0.051	0.12	0.069	0.091
0.043	0.010	0.053	0.12	0.069	0.091
0.050	0.0068	0.057	0.12	0.069	0.092
0.060	0.0021	0.062	0.12	0.068	0.094
0.065	0.000	0.065	0.13	0.068	0.094

Atlantic States Marine Fisheries Commission

2017 Atlantic Sturgeon Benchmark Stock Assessment Supplemental Report

Prepared By:
Atlantic Sturgeon Stock Assessment Subcommittee and
Technical Committee

Draft for Management Board Review

Atlantic States Marine Fisheries Commission
Vision: Sustainably Managing Atlantic Coastal Fisheries

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1 OVERVIEW

This report serves as supplemental material to the Atlantic Sturgeon 2017 Benchmark Stock Assessment and the Terms of Reference and Advisory Report of the Atlantic Sturgeon Benchmark Stock Assessment Peer Review Reports (ASMFC 2017). During the Peer Review Workshop in August 2017, the Peer Review Panel (Review Panel) requested additional information and configurations of the analyses to support or revise portions of the stock assessment draft report for peer review. A description of the additional information, analysis, and conclusions follows, but refer to ASMFC 2017 for a more thorough discussion of the life history, habitat use, available data sources, analysis background, and stock status discussions for the Atlantic sturgeon.

2 METHODS AND RESULTS

2.1 Indices of Relative Abundance Standardization

The Review Panel requested additional information during the Review Workshop regarding the size frequency of Atlantic sturgeon encountered, annual number of deployments, annual number of positive deployments, and annual number of Atlantic sturgeon captured by each survey. After reviewing the supporting data from the surveys, the Review Panel recommended that the following be re-standardized using the binomial error structure for the generalized linear model (GLM) framework: Maine-New Hampshire Inshore Groundfish Trawl Survey (ME-NH Trawl), Connecticut Long Island Sound Trawl Survey (CT LIST), New Jersey Ocean Trawl Survey (NJ OT), Northeast Area Monitoring and Assessment Program Trawl Survey (NEAMAP), Virginia Institute of Marine Science Shad and River Herring Monitoring Survey (VIMS Shad), and the US Fish and Wildlife Cooperative Tagging Cruise (USFWS Coop). Index standardization for the New York State Department of Environmental Conservation's (NYDEC) Juvenile Atlantic Sturgeon Abundance Monitoring Program (JASAMP), North Carolina Program 135 (NC p135), and South Carolina Edisto Sturgeon Monitoring Program (SC Edisto) was unchanged from ASMFC 2017 and these surveys were used in the analyses in this report. A description of the revised indices with the binomial error structure follows. For a full description of surveys that were used in analyses, see Section 5 of ASMFC 2017.

2.1.1 Maine-New Hampshire Inshore Trawl Survey

An index of relative abundance was previously developed from a subset of regions, strata, and months as described in ASMFC 2017. A full model that predicted catch as a linear function of year, month, region, depth, and stratum was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial with year, region, and stratum and was used in ASMFC 2017. This survey had a low percentage of positive tows annually (Table 1) and the Review Panel suggested a binomial error structure be used during the GLM standardization. The covariates in the model with the lowest AIC was unchanged (Table 2) although the index of relative abundance developed did exhibit some differences in the beginning of the time series from the previous index (Figure 1 and Table 3). Both fall and spring seasons caught large juveniles, but adults were also present in the survey (Appendix R1 Figure 1).

2.1.2 Connecticut Long Island Sound Trawl Survey

Both a nominal and a GLM standardized index with a negative binomial error structure were explored for ASMFC 2017. Since the nominal index provided a longer time series (1984-2014) because environmental covariates were only collected from 1992-2014 and not continuously, the nominal index was the preferred index for ASMFC 2017. This survey had a low percentage of positive tows annually (Table 1) and the Review Panel suggested a binomial error structure. A full model that predicted catch as a function of year, temperature, salinity, depth, site number, latitude, longitude, and bottom type was compared with nested submodels using AIC. The model including year and depth with a negative binomial error structure was selected for ASMFC 2017 because it produced the lowest AIC out of the models tested. When standardized with a binomial error structure, the model including year, depth, and temperature was selected (Table 5). A comparison of the nominal, negative binomial, and binomial indices can be found in Figure 2 and Table 6. A few high points due to large tows in 1993, 1994, and 2006 were decreased by using the binomial error structure but otherwise the pattern was similar to the previous index. Based on the length frequency, both spring and fall seasons primarily caught juveniles (Appendix R1 Figure 2).

2.1.3 New Jersey Ocean Trawl Survey

A standardized index of relative abundance was developed from a subset of years (1990-2015), months (April, June, October, and January), and strata (mid-shore and inshore) for ASMFC 2017. A full model that predicted catch as a linear function of year, stratum, depth, cruise, bottom salinity, bottom temperature, and bottom dissolved oxygen was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year, stratum, and bottom temperature and was used in ASMFC 2017. Due to the low proportion of positive tows (Table 7), the Review Panel suggested the use of the binomial error structure and the index was re-standardized for this report. When standardized with a binomial error structure, the model including year, stratum, depth, and bottom temperature was selected (Table 9). The binomial and negative binomial indices were very similar, with some decreased values in the early part of the time series and increased values in the late 2000s in the binomial index (Figure 3 and Table 8). On average this survey captured juveniles during the months used in the index, but adults were also captured (Appendix R1 Figure 4).

2.1.4 Northeast Area Monitoring and Assessment Program Trawl Survey

The fall portion of the NEAMAP survey was standardized using a GLM approach and negative binomial error structure for ASMFC 2017. The survey had a low proportion of positive tows (Table 7) and was re-standardized for this report using a binomial error structure. A full model that predicted catch as a function of year, dissolved oxygen, salinity, water temperature, air temperature, strata, wind speed, barometric pressure, and depth was compared with nested submodels using AIC. The model including year and water temperature with a negative binomial error structure was selected for ASMFC 2017 because it produced the lowest AIC out of the models tested. When standardized with a binomial error structure, the model including year, depth, dissolved oxygen, and water temperature was selected (Table 11). The revised index of abundance has peaks in 2008 and 2012 and low abundance in 2010 and 2013-2015 (Figure 4 and Table 12). The large peak in 2014 for the previous index that was developed was due to one large tow that year which was decreased by using the binomial. Both spring and fall seasons of the survey caught large juveniles on average, but adults were present in the sampling based on the length distribution (Appendix R1 Figure 5).

2.1.5 Virginia Institute of Marine Science Shad and River Herring Monitoring Survey

A standardized index of relative abundance of Atlantic sturgeon was developed from this survey using only the months of March and April. The survey had a low proportion of positive tows (Table 13) and was re-standardized for this report using a binomial error structure. A full model that predicted catch as a linear function of year, river, salinity, water temperature, and air temperature was compared with nested submodels using AIC. The model with a negative binomial error structure that included year, river, and water temperature was selected for ASMFC 2017 because it produced the lowest AIC out of the models tested. When standardized with a binomial error structure, the model including year, river, and water temperature was selected (Table 14). The relative abundance from the revised index is very similar to the previous index but the large peak in 2006 from one tow that caught several sturgeon was reduced and there was a slight decrease in abundance in the terminal year that was not present in the negative binomial model (Figure 5 and Table 13). The survey predominantly caught juveniles in all of the rivers sampled in the spring (Appendix R1 Figure 6).

2.1.6 US Fish and Wildlife Cooperative Tagging Cruise

A standardized index of relative abundance from this survey was developed for and used in ASMFC 2017. A full model that predicted catch as a linear function of year, depth, air temperature, water temperature, salinity (although not complete throughout the time series), and latitude and longitude was compared with nested submodels using AIC. The model with the lowest AIC value was a negative binomial that included year and depth and was used in ASMFC 2017. After reviewing the low proportion of positive tows from this survey (Table 16), the Review Panel suggested that the survey be re-standardized using the GLM approach with a binomial error structure. Year and depth were still the significant covariates (Table 17) and while the revised index had a similar pattern as the previous index (Figure 6 and Table 18) there were some differences in magnitude in some index values in the early 1990s and mid to late 2000s. The survey caught juveniles on average, but there were adults captured as well (Appendix R1 Figure 9).

2.1.7 Summary of Indices

The SAS supported the recommendations of the Review Panel to use the binomial error structure for the surveys described in this section. Due to the small proportion of positive tows in these surveys, a presence-absence approach was likely more appropriate for these surveys. With time, if the surveys begin to more consistently capture Atlantic sturgeon on an annual basis, the SAS recommends re-exploring the error structure of the GLM models to find the most appropriate standardization during the next update or benchmark stock assessment process.

NYDEC JASAMP, NC p135, and SC Edisto indices were unchanged from ASMFC 2017 for this supplemental report. The revised indices for ME-NH Trawl, CT LIST, NJ OT, NEAMAP, VIMS Shad and River Herring Monitoring, and USFWS Coop were used in this supplemental report in analyses that follow.

2.2 Conn Method

For a detailed description of the Conn method, refer to Section 6.6 of ASFMC 2017. The coast-wide Conn index was recalculated using the same methods but with revised indices as described in this supplemental report. In addition to the indices used in ASMFC 2017 (USFWS Coop, ME-NH Trawl, CT LIST, NJ Ocean Trawl, VIMS Shad and River Herring Monitoring, and NC p135), three additional indices were included in the Conn index: SC Edisto, NYDEC JASAMP, and NEAMAP. These surveys were not previously included in the Conn method due to their short time series (<15 years of data). The inclusion of these surveys was recommended by the Review Panel since these three surveys primarily capture juveniles and therefore <15 years of data may reflect juvenile abundance in those regions. Additionally, the Review Panel noted that two of these surveys – NYDEC JASAMP and SC Edisto – should be used because they specifically target Atlantic sturgeon. The inclusion of these surveys was discussed with the TC and SAS for their approval.

The hierarchical model developed from all the available abundance indices showed varying abundance with time (Figure 7). Using the revised abundance indices resulted in shorter time series and thus the revised Conn index was for 1990-2015, not 1984-2015 as previously presented. The overall pattern of the revised Conn index was similar to the Conn index calculated for ASMFC 2017 but using the revised indices appeared to smooth some of the higher and lower values.

2.3 Power Analysis

For a detailed description of the power analysis, refer to Section 6.4 of ASMFC 2017. The power analysis was replicated for this supplemental report to evaluate the revised abundance indices and associated standard errors. All fishery-independent surveys that were developed into abundance indices and used in the revised Conn index were tested in the power analysis.

Median CVs, or proportional standard error, ranged from 0.202–1.146 for the surveys analyzed and power values ranged from 0.89 to 0.98 (Table 19). In general, using the binomial error structure for standardizing select surveys did decrease the median CV associated with the abundance estimates, therefore increasing the power of the surveys.

2.4 Autoregressive Integrated Moving Average (ARIMA)

For a detailed description of the ARIMA analysis, refer to Section 6.9.2 of ASMFC 2017. Per the Review Panel's request, the ARIMA methods were replicated for each of the revised indices, as well as indices not used as part of ASMFC 2017. Unlike ASMFC 2017, ARIMAs on data subset to a common set of years were not re-run due to the very short length of some time series (e.g., 9 years; Table 21). An arithmetic average of the probabilities of all available indices within a given DPS were used to judge whether a DPS was credibly above the 25th percentile or index value from 1998 (or first year of survey; average probabilities from Table 21, by DPS, are reported in Table 22). The significance of trends in each fitted index was evaluated by following the Mann-Kendall methods described in Section 6.3 of ASMFC 2017.

The original, revised, and new indices are provided in Figure 8 and Figure 9. Descriptive statistics from all model runs are provided in Table 20 and Table 21. When adjusted for multiple tests (Holm 1979; RCT 2017), residuals from all model fits were normally distributed (Table 20). Correlations among all indices are provided in Figure 11.

2.4.1 ARIMA Model Results

Overall, terminal year indices from all revised and new fitted indices were credibly above the 25th percentile of their respective time series, with the exception of NEAMAP (mean from Table 22), though the probability of NEAMAP being below the 25th percentile was 0.49. In ASMFC 2017, indices from the SA or combined New York Bight-Chesapeake Bay-Carolina DPSs were not used, but for all other DPSs the probability that a DPS was above the 25th percentile were all > 0.50 (Table 30 from ASMFC 2017).

The situation with respect to terminal year index values compared to the respective 1998 (or surrogate) index is more mixed. The Conn Index (coast-wide index), Gulf of Maine (GOM), New York Bight (NYB), and Carolina DPSs are credibly above the respective 1998 (or start year of survey if survey starts after 1998) index values (mean from Table 22). The Chesapeake Bay (CB), South Atlantic (SA), and multi-DPS region (NEAMAP) are not credibly above the 1998 index values. In ASMFC 2017, indices from the SA or combined NYB-CB-Carolina DPSs were not used. The conclusions are unchanged from ASMFC 2017 for all DPSs, save GOM (where this DPS changed from not credibly above the reference year to credibly above the reference year; mean from Table 22); the SA and the combined NYB-CB-C DPSs were not used in ASMFC 2017.

In some cases the revised index model fit was very similar to the original index model fit (Figure 10). For example, the revised indices for the CT LIST spring trawl, NJ OT, VIMS Shad, and the Conn Index are all very strongly[1] correlated with the original indices (all Spearman correlation ≥ 0.74; most ≥ 0.93). In the remaining cases, the revised indices were either modestly correlated with the original index (e.g., USFWS Coop, Spearman correlation = 0.50) or uncorrelated with the original index (e.g., ME-NH Trawl, Spearman correlation = -0.02). Discussion below focuses on these remaining cases where trends and correlations between the original and revised indices are considerably different than those reported in ASMFC 2017.

2.4.1.1 Coast-wide Index (Conn Index)

The revised fitted Conn index is very similar to the original Conn index (Figure 10) and trends are similar (Figure 8 and Figure 9). Not surprisingly, the Conn index is strongly positively correlated with most indices, though there are exceptions (Figure 11). One notable exception is the strong negative correlation with NEAMAP (Figure 11). There was a significant (α=0.05) strong negative trend in the fitted NEAMAP index, while there was a significant positive trend in

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[1] Consistent with ASMFC (2017), strong positive correlations were arbitrarily defined as ≥ +0.60; strong negative correlations were arbitrarily defined as ≤ -0.60.

the Conn index (Table 21). The Conn index is credibly above both the 25th percentile of the time series and the index value in 1998 (Table 21).

2.4.1.2 Maine-New Hampshire Inshore Groundfish Trawl Survey

The ME-NH Trawl revised index is not correlated with the original index (Figure 10), nor is it strongly correlated (positively or negatively) with any other index (Figure 11). This index tends to be weakly negatively correlated with most indices (Figure 11). The revised index oscillates with a downward, though not significant, trend (Figure 9). The terminal year of the revised index is credibly above the 25th percentile of the time series, as was the case with the original index. The terminal year of the revised index is credibly above the index value in 2000; this was not the case with the original index.

2.4.1.3 Connecticut Long Island Sound Trawl Survey (spring, fall and combined indices)

The revised fitted spring CT LIST index is strongly correlated with the original fitted index, though of considerably shorter duration (Figure 10). The fitted terminal year index is credibly above the 25th percentile of the time series, and not credibly above the 2000 index value.

The revised fitted fall CT LIST index is weakly negatively correlated with the original fitted index (Figure 10). The revised fitted terminal year index is credibly above both the 25th percentile of the time series and 2000 index value.

The revised combined (spring and fall) CT LIST index is strongly positively correlated with the CT LIST fall index, and so trends are very similar. However, the revised fitted index is weakly correlated with the original index, and of substantially shorter duration (Figure 8 and Figure 10). Of note, the revised fitted combined spring and fall index has a significant ($\alpha = 0.05$) negative trend (Table 21). Nevertheless, the revised fitted index is credibly above both the 25th percentile of the time series and the 2000 index value.

2.4.1.4 New York State Department of Environmental Conservation's Juvenile Atlantic Sturgeon Abundance Monitoring Program

The NYDEC JASAMP fitted index started at its nadir in 2006, and has been, with one exception in 2013, increasing over its duration. This index has a significant ($\alpha = 0.05$) positive trend and is credibly above both the 25th percentile of the time series and the 2006 index value.

2.4.1.5 South Carolina Edisto Sturgeon Monitoring Program

The fitted index started at its peak in 2004 and generally declined through 2011 before rising through 2014, and declining slightly in 2015 (Figure 8). The SC Edisto fitted index tended to be negatively correlated with Carolina DPS juvenile indices, but positively correlated with Carolina DPS young-of-year indices (Figure 11). In the NYB DPS, the SC Edisto fitted index tended to be positively correlated with fall indices and negatively correlated with spring indices (Figure 11).

The fitted index in the terminal year is credibly above the 25th percentile of the time series, but not credibly above the 2004 index value (Table 21).

2.4.1.6 Northeast Area Monitoring and Assessment Program (NEAMAP)

The NEAMAP samples nearshore coastal waters from Rhode Island/Massachusetts to Cape Hatteras, North Carolina. The Review Panel encouraged use of this index for the assessment of trends in Atlantic sturgeon abundance.

The fitted index started in 2007, rose in 2008, and has been declining since. The downward trend in this index is significant (α = 0.05; Table 21). The terminal year index is not credibly above either the 25th percentile of the time series or the 2007 index value (Table 21).The fitted index tended to be strongly negatively correlated with several coastal estuary surveys in the Carolina and NYB DPSs (Figure 11). The fitted index is strongly positively correlated with the combined spring and summer CT LIST, and marginally positively correlated with the NJ trawl survey (Figure 11).

2.5 Egg-per-Recruit Analysis

The Review Panel was concerned that the deterministic EPR analysis conducted for the benchmark stock assessment did not fully represent the scale of the uncertainty in Atlantic sturgeon biological data. Sensitivity analyses during the benchmark and at the review workshop only included point estimates of alternative inputs (e.g., growth curves, M, selectivity, etc.), rather than incorporating the uncertainty in those inputs.

The panel recommended a resampling approach to more fully explore the effects of data uncertainty on the $Z_{50\%EPR}$ estimates and to better characterize the uncertainty of that reference point.

For this analysis, a stochastic EPR model was developed in R. The underlying population model was the same as used in the benchmark; for a detailed description of model configuration, refer to Section 6.14.2 of the 2017 Atlantic Sturgeon Benchmark Assessment Report.

To calculate EPR for Atlantic sturgeon, a number of different inputs are required (Table 23). To carry through the uncertainty in these inputs, distributions of the parameters were developed and sets of parameters were drawn (Figure 12 and Figure 13). Von Bertalanffy growth parameters were sampled as sets from literature values with error, including ASMFC (2017) for females or pooled sex data (Table 24); L_∞ was converted to total length where necessary using the equation derived for the benchmark (ASMFC 2017). Length-weight parameters were drawn from lognormal distributions with the mean and standard deviation as estimated in ASMFC (2017). The age of 50% maturity was drawn from a Poisson distribution with a mean of 15, based on the curve presented in Kahnle and Hattala (2007). Distributions for fecundity parameters were based on van Eenannaam and Doroshov (1998); when the associated length-at-age for a given draw was too small (resulting in negative estimates of fecundity), Smith et al.'s (1982) parameters were used. Lorenzen's parameters to describe M as a function of weight were used to calculate natural mortality, which was then scaled to ensure a specific proportion of the population remained alive at Amax. This proportion was also drawn from a lognormal distribution with a mean of 0.015 (Hewitt and Hoenig, 2005). Bycatch selectivity was described as a double-logistic curve, with the age of 50% selection for the ascending limb drawn from a Poisson distribution with a mean of 3 and for the descending limb from a Poisson distribution with a mean of 25, based on the age-distribution of measured bycatch fish in ASMFC (2017). Ship strike selectivity was described as knife-edged with the age of first vulnerability being drawn from a Poisson distribution with a mean of 3 (following Brown and Murphy (2010)); 1 was added to this distribution to prevent the age of first vulnerability being 0.

Life history parameters were drawn independently, without regards to potential correlations between parameters (e.g., maximum age and L_∞). This likely a conservative approach which increases the range of parameter combinations examined and therefore widens the final distribution of $Z_{50\%EPR}$ values.

For each set of life history parameters, the estimate of $Z_{50\%EPR}$ for differing levels of bycatch and ship strike mortalities was calculated and a distribution of $Z_{50\%EPR}$ was created. The value of $Z_{50\%EPR}$ was reported as the N-weighted average Z over ages 4-21 to be most comparable to the estimate of Z from the tagging model.

The posterior distributions of Z estimates from the tagging model were compared to the median $Z_{50\%EPR}$ and the 80th and 90th percentiles to determine what the probability was that Z was above the $Z_{50\%EPR}$ threshold.

Separate analyses were not conducted for different DPSs, and instead uncertainty in life history trajectories due to DPS-level effects were incorporated into the distributions for the parameters, particularly in terms of maximum age, growth parameters, and fecundity parameters.

2.5.1 Egg-per-Recruit Model Results

The median estimate of $Z_{50\%EPR}$ was 0.123, with 95% confidence interval of 0.096 – 0.155 (Figure 14).

For the coast, only 7% of the tagging model estimates of Z were above the median $Z_{50\%EPR}$ estimate, indicating there is a very low probability that the coast-wide meta-population is exceeding the Z threshold. The New York Bight, Chesapeake Bay, and South Atlantic DPSs had a less than 50% chance of being above the median $Z_{50\%EPR}$ threshold (34.6% for the New York Bight, 33.6% for the Chesapeake Bay, and 44.0% for the South Atlantic). The Gulf of Maine and Carolina DPSs had much higher probabilities of being above the median estimate of $Z_{50\%EPR}$ (75.4% for the Gulf of Maine and 78.2% for the Carolina DPS). The percent of posterior estimates of Z that are above the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution are shown in Table 25 and Figure 15 - Figure 20.

3 DISCUSSION AND STOCK STATUS DETERMINATION

For ASMFC 2017, quantitative stock status was determined via the probability that the terminal year of the indices for a given DPS was greater than the index values from the start of the moratorium in 1998 (as evaluated by the ARIMA analysis), and by comparing estimates of total mortality from the tagging model to estimates of $Z_{50\%EPR}$. However, the stock status evaluations were presented as simply "above" or "below" the reference points. The Review Panel recommended modifications to how some indices were calculated (discussed above) and to how the stock status was presented.

The Review Panel recommended that stock status be presented in a more quantitative manner. Mortality status was determined based on the probability of the mortality from the tagging model being greater than the estimates of $Z_{50\%EPR}$. For this supplemental report, the probability of being above or below a reference point and the associated statistical level of confidence (i.e., 80%) was specified (Table 26). The coast-wide meta-population had a very low probability of exceeding the Z threshold, while at the DPS-level the probabilities were greater. New York Bight, Chesapeake Bay, and South Atlantic DPSs had a less than 50% chance of being above the 80th percentile of $Z_{50\%EPR}$ threshold, but the Gulf of Maine and the Carolina DPS had a greater than 70% chance of being above the 80th percentile of the Z threshold. These higher levels at the DPS reflect both low sample sizes – the greater the sample size, the lower the probability of being above the threshold, as the estimates become more precise – and potentially differences in mortality rates due to DPS-specific factors.

Biomass and abundance status for the coast-wide population and each DPS relative to historical levels remains the same as ASMFC 2017 at depleted. Instead of assigning an "above" or "below" status to the regions relative to the start of the moratorium in 1998, the average probability that the terminal year of the indices in that region are greater than their 1998 values (or equivalent reference year) from the ARIMA was supplied. Based on the average probabilities, the results indicate that the conclusions of ASMFC 2017 are unchanged except for the Gulf of Maine DPS which improved from below to above the reference year using the revised index. While the South Atlantic DPS does have one survey in the region, the SAS did not base stock status on that survey due to concerns about survey design and the limited time series.

Given the limited data available to establish quantitative metrics to determine stock status, the SAS also considered more qualitative criteria such as the appearance of Atlantic sturgeon in rivers where they had not been documented in recent years, discovery of spawning adults in rivers they had not been documented before, and increases in anecdotal interactions such as reports of jumping Atlantic sturgeon by recreational angler and ship strikes. These qualitative metrics come with the caveat that these increases in documented Atlantic sturgeon abundance may in some cases be the result of increased research and attention, not a true increase in abundance. However, this kind of qualitative information is still important in describing the current status of Atlantic sturgeon. Please refer to the main assessment report (ASMFC 2017) for this supporting material as it is not discussed here.

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5 TABLES

Table 1. Number of positive, number of total, and percent positive tows annually for the ME-NH Trawl survey for 2000-2015.

Year	Number of positive tows	Total number of tows	% Positive
2000	1	29	3.4
2001	1	45	2.2
2002	3	66	4.5
2003	2	48	4.2
2004	1	58	1.7
2005	1	52	1.9
2006	2	66	3.0
2007	1	58	1.7
2008	2	54	3.7
2009	3	62	4.8
2010	1	60	1.7
2011	1	57	1.8
2012	2	49	4.1
2013	1	52	1.9
2014	1	54	1.9
2015	4	54	7.4

Table 2. Model selection results for the GLM standardized indices for the fall portion of the ME-NH Trawl survey.

Available Covariates	Model Selected	Error structure	AIC	% Deviance	Dispersion
Year, Month, Depth, Region, Stratum	Year, Region, Stratum	NB	310.5	38.28	1.05
	Year, Region, Stratum	Binomial	241.86	15.37	0.99

Table 3. Comparison between the GLM standardized indices and standard errors using a negative binomial and binomial error structure for the ME-NH Trawl survey.

	Negative Binomial		Binomial	
Year	**Index**	**SE**	**Index**	**SE**
2000	0.0375	0.0463	0.0175	0.0204
2001	0.0666	0.0654	0.0080	0.0096
2002	0.0452	0.0392	0.0231	0.0186
2003	0.0364	0.0370	0.0225	0.0204
2004	0.0061	0.0086	0.0081	0.0094
2005	0.0074	0.0107	0.0102	0.0119
2006	0.0329	0.0310	0.0178	0.0160
2007	0.0073	0.0102	0.0095	0.0109
2008	0.0243	0.0265	0.0224	0.0202
2009	0.0278	0.0273	0.0267	0.0214
2010	0.0112	0.0133	0.0080	0.0092
2011	0.0096	0.0121	0.0089	0.0102
2012	0.0240	0.0271	0.0205	0.0193
2013	0.0072	0.0102	0.0093	0.0109
2014	0.0295	0.0299	0.0098	0.0113
2015	0.0503	0.0475	0.0421	0.0318

Table 4. Number of positive, number of total, and percent positive tows annually for the fall portion of the CT LIST survey for 1992-2014. The survey did not operate in the fall of 2010.

Year	Number of positive tows	Total number of tows	% Positive
1992	5	80	6.3
1993	6	120	5.0
1994	3	120	2.5
1995	2	80	2.5
1996	1	80	1.3
1997	2	80	2.5
1998	1	80	1.3
1999	5	80	6.3
2000	3	80	3.8
2001	5	80	6.3
2002	4	80	5.0
2003	6	75	8.0
2004	2	80	2.5
2005	3	80	3.8
2006	2	40	5.0
2007	2	80	2.5
2008	2	40	5.0
2009	6	80	7.5
2010			
2011	2	80	2.5
2012	2	80	2.5
2013	1	80	1.3
2014	2	79	2.5

Table 5. Model selection results for the GLM standardized indices for the fall portion of the CT LIST survey.

Available Covariates	Model Selected	Error structure	AIC	% Deviance	Dispersion
Year, Bottom Temp, Bottom Salinity, Depth, Site Number, Lat, Long, Bottom Type	Year, Depth	NB	774.593	24.643	0.727
	Year, Temp, Depth	Binomial	530.133	6.476	0.945

Table 6. Comparison of the nominal abundance index and the GLM standardized indices and standard errors using a negative binomial and binomial error structure for the fall portion of the CT LIST data set.

Year	Negative Binomial		Nominal		Binomial	
	Index	SE	Index	SE	Index	SE
1992	0.1014	0.0568	0.2750	0.1940	0.0567	0.0232
1993	0.3516	0.2100	0.4750	0.3932	0.0429	0.0168
1994	0.2600	0.2031	0.4417	0.3851	0.0182	0.0106
1995	0.0158	0.0114	0.0375	0.0278	0.0274	0.0179
1996	0.0175	0.0251	0.0125	0.0125	0.0114	0.0119
1997	0.0296	0.0234	0.0375	0.0278	0.0211	0.0147
1998	0.0000	0.0000	0.0375	0.0375	0.0000	0.0000
1999	No environmental data		0.1500	0.0855	No environmental data	
2000	0.0335	0.0244	0.0375	0.0214	0.0328	0.0187
2001	0.1872	0.1063	0.1875	0.1039	0.0637	0.0284
2002	0.0851	0.0557	0.1000	0.0579	0.0463	0.0238
2003	0.1922	0.1399	0.3867	0.2959	0.0520	0.0235
2004	0.0797	0.0623	0.1000	0.0882	0.0194	0.0133
2005	0.0270	0.0152	0.0375	0.0214	0.0320	0.0173
2006	0.5631	0.5983	0.3225	0.2429	0.0546	0.0402
2007	0.0932	0.0642	0.1625	0.1145	0.0278	0.0185
2008	0.1013	0.0783	0.1250	0.0891	0.0338	0.0266
2009	0.1357	0.0732	0.2125	0.0969	0.0593	0.0225
2010	No fall data		No fall data		No fall data	
2011	0.0128	0.0095	0.0250	0.0176	0.0248	0.0160
2012	0.0307	0.0216	0.0375	0.0278	0.0243	0.0169
2013	0.0086	0.0092	0.0125	0.0125	0.0122	0.0125
2014	0.1578	0.1182	0.1646	0.1412	0.0246	0.0172

Table 7. Number of positive, number of total, and percent positive tows annually for the NJ OT survey for 1990-2015.

Year	Number of positive tows	Total number of tows	% Positive
1990	9	79	11.4
1991	7	89	7.9
1992	6	91	6.6
1993	2	86	2.3
1994	0	87	0.0
1995	2	87	2.3
1996	3	88	3.4
1997	3	88	3.4
1998	1	89	1.1
1999	6	87	6.9
2000	1	87	1.1
2001	3	87	3.4
2002	5	89	5.6
2003	10	89	11.2
2004	7	87	8.0
2005	10	87	11.5
2006	9	87	10.3
2007	12	87	13.8
2008	9	87	10.3
2009	7	87	8.0
2010	8	87	9.2
2011	3	85	3.5
2012	2	85	2.4
2013	7	84	8.3
2014	5	84	6.0
2015	9	83	10.8

Table 8. Model selection results for the GLM standardized indices for the NJ OT survey.

Available Covariates	Model Selected	Error structure	AIC	% Deviance	Dispersion
Year, Stratum, Depth, Bottom Salinity, Bottom DO, Cruise, Month, Bottom Temperature	Year, Stratum, Bottom Temp	NB	1365.9	35.42	0.87
	Year, Stratum, Depth, Bottom Temp	Binomial	979.4	16.31	0.90

Table 9. Comparison between the GLM standardized indices and standard errors using a negative binomial and binomial error structure for the NJ OT survey.

Year	Negative Binomial		Binomial	
	Index	SE	Index	SE
1990	1.8658	0.8904	0.1288	0.0534
1991	1.0721	0.5180	0.0895	0.0401
1992	0.9730	0.4775	0.0744	0.0355
1993	0.3850	0.2522	0.0265	0.0201
1994	0.0000	0.0000	0.0000	0.0000
1995	0.1628	0.1257	0.0212	0.0163
1996	0.2605	0.1822	0.0356	0.0229
1997	0.5043	0.2893	0.0317	0.0209
1998	0.0725	0.0785	0.0133	0.0138
1999	0.9752	0.4851	0.0820	0.0382
2000	0.0752	0.0785	0.0140	0.0144
2001	0.3680	0.2287	0.0465	0.0285
2002	0.3986	0.2316	0.0794	0.0382
2003	1.3698	0.6576	0.1692	0.0600
2004	1.0986	0.5530	0.1240	0.0515
2005	1.8252	0.8496	0.1884	0.0642
2006	1.5350	0.7161	0.1750	0.0614
2007	1.5662	0.7278	0.2309	0.0692
2008	1.3874	0.6605	0.1745	0.0611
2009	0.7775	0.4098	0.1387	0.0547
2010	0.9820	0.4996	0.1518	0.0569
2011	0.2641	0.1820	0.0571	0.0344
2012	0.1594	0.1271	0.0374	0.0273
2013	1.0456	0.5253	0.1346	0.0536
2014	0.6278	0.3549	0.0567	0.0332
2015	1.9230	0.8934	0.1616	0.0599

Table 10. Number of positive, number of total, and percent positive tows annually for the fall portion of the NEAMAP survey for 2007-2015.

Year	Number of positive tows	Total number of tows	% Positive
2007	2	122	1.6
2008	10	140	7.1
2009	10	142	7.0
2010	6	120	5.0
2011	7	134	5.2
2012	10	125	8.0
2013	4	138	2.9
2014	4	135	3.0
2015	5	112	4.5

Table 11. Model selection results for the GLM standardized indices for the fall portion of the NEAMAP survey.

<table>
<tr><th>Available Covariates</th><th>Model Selected</th><th>Error structure</th><th>AIC</th><th>% Deviance</th><th>Dispersion</th></tr>
<tr><td rowspan="2">Year, DO, Salinity, Water temp, Air temp, Strata, Windspeed, BaroPres, Depth</td><td>Year, Water Temp</td><td>NB</td><td>521.12</td><td>11.96616</td><td>1.159451</td></tr>
<tr><td>Year, Depth, DO, Water Temp</td><td>Binomial</td><td>416.279</td><td>4.832445</td><td>0.9602982</td></tr>
</table>

Table 12. Comparison between the GLM standardized indices and standard errors using a negative binomial and binomial error structure for the fall portion of the NEAMAP survey.

Year	Negative Binomial		Binomial	
	Index	SE	Index	SE
2007	0.0332	0.0250	0.0448	0.0330
2008	0.0858	0.0296	0.0691	0.0194
2009	0.0681	0.0288	0.0488	0.0172
2010	0.1228	0.0737	0.0251	0.0127
2011	0.0536	0.0213	0.0577	0.0222
2012	0.0818	0.0342	0.0851	0.0354
2013	0.0231	0.0123	0.0168	0.0088
2014	0.3075	0.2750	0.0314	0.0149
2015	0.0276	0.0155	0.0202	0.0108

Table 13. Number of positive, number of total, and percent positive tows annually for the spring portion of the VIMS Shad and River Herring Monitoring survey for 1998-2015.

Year	Number of positive tows	Total number of tows	% Positive
1998	13	40	32.5
1999	10	47	21.3
2000	8	54	14.8
2001	2	49	4.1
2002	1	54	1.9
2003	3	54	5.6
2004	2	46	4.3
2005	9	50	18.0
2006	17	52	32.7
2007	16	54	29.6
2008	7	52	13.5
2009	4	52	7.7
2010	8	66	12.1
2011	4	46	8.7
2012	3	43	7.0
2013	10	54	18.5
2014	14	50	28.0
2015	5	21	23.8

Table 14. Model selection results for the GLM standardized indices for the spring portion of the VIMS Shad and River Herring Monitoring survey.

Available Covariates	Model Selected	Error structure	AIC	% Deviance	Dispersion
Year, River, Salinity, Water temp, Air temp	Year, River, Water Temp	NB	693.6300	44.4480	1.1835
	Year, River, Water Temp	Binomial	474.2500	28.3812	1.0614

Table 15. Comparison between the GLM standardized indices and standard errors using a negative binomial and binomial error structure for the spring portion of the VIMS Shad and River Herring Monitoring survey.

Year	Negative Binomial		Binomial	
	Index	SE	Index	SE
1998	1.4772	0.3995	0.8429	0.1644
1999	0.9316	0.4007	0.4715	0.1918
2000	1.1127	0.6786	0.7977	0.5414
2001	0.1390	0.1164	0.1449	0.1195
2002	0.0588	0.0425	0.0588	0.0425
2003	0.1515	0.0736	0.1589	0.0759
2004	0.1317	0.0982	0.1344	0.0843
2005	1.1565	0.3541	0.5179	0.1253
2006	1.7627	0.3469	0.6875	0.1139
2007	1.4030	0.3529	0.6443	0.1211
2008	0.4405	0.1951	0.3371	0.1123
2009	0.1774	0.0811	0.1837	0.0750
2010	0.1779	0.0623	0.1783	0.0609
2011	0.3497	0.1548	0.1767	0.0713
2012	0.1573	0.0840	0.1631	0.0777
2013	0.5419	0.1688	0.4607	0.1199
2014	0.9026	0.2012	0.6178	0.1324
2015	1.2113	0.5407	0.5676	0.1883

Table 16. Number of positive, number of total, and percent positive tows annually for the USFWS Coop survey for 1988-2010.

Year	Number of positive tows	Total number of tows	% Positive
1988	22	141	15.6
1989	2	174	1.1
1990	8	72	11.1
1991	3	161	1.9
1992	3	53	5.7
1993	0	55	0.0
1994	6	96	6.3
1995	0	57	0.0
1996	13	204	6.4
1997	5	131	3.8
1998	1	64	1.6
1999	2	146	1.4
2000	6	141	4.3
2001	4	161	2.5
2002	17	226	7.5
2003	8	227	3.5
2004	1	244	0.4
2005	1	141	0.7
2006	17	291	5.8
2007	10	184	5.4
2008	31	330	9.4
2009	22	206	10.7
2010	1	200	0.5

Table 17. Model selection results for the GLM standardized indices for the USFWS Coop survey.

Available Covariates	Model Selected	Error structure	AIC	% Deviance	Dispersion
Year, Depth, Water Temperature, Salinity	Year, Depth	NB	1194.3	16.36	1.02
	Year, Depth	Binomial	1299.22	15.37	1.04

Table 18. Comparison between the GLM standardized indices and standard errors using a negative binomial and binomial error structure for the USFWS Coop survey.

	Negative Binomial		Binomial	
Year	**Index**	**SE**	**Index**	**SE**
1988	0.0659	0.0175	0.0649	0.0160
1989	0.0072	0.0051	0.0067	0.0048
1990	0.0365	0.0182	0.0339	0.0162
1991	0.0112	0.0067	0.0102	0.0060
1992	0.0116	0.0118	0.0318	0.0186
1993	0.0000	0.0000	0.0000	0.0000
1994	0.0160	0.0116	0.0423	0.0176
1995	0.0000	0.0000	0.0000	0.0000
1996	0.0542	0.0173	0.0629	0.0173
1997	0.0388	0.0179	0.0388	0.0171
1998	0.0173	0.0175	0.0172	0.0171
1999	0.0132	0.0094	0.0126	0.0089
2000	0.0285	0.0145	0.0413	0.0166
2001	0.0265	0.0135	0.0261	0.0129
2002	0.0526	0.0146	0.0554	0.0138
2003	0.0305	0.0127	0.0345	0.0129
2004	0.0043	0.0043	0.0042	0.0042
2005	0.0095	0.0095	0.0098	0.0097
2006	0.0823	0.0171	0.0485	0.0119
2007	0.0459	0.0169	0.0558	0.0175
2008	0.0521	0.0141	0.1021	0.0176
2009	0.0574	0.0159	0.0776	0.0173
2010	0.0062	0.0062	0.0063	0.0063

Table 19. Results of the power analysis by survey for linear and exponential trends in Atlantic sturgeon abundance indices over a twenty-year period. Power was calculated as the probability of detecting a 50% change.

Survey	Years	Season	Life Stage	Median CV	Linear Trend		Exponential Trend	
					+50%	-50%	+50%	-50%
ME-NH Trawl	2000-2015	Year-round	Juvenile & Adult	1.146	0.13	0.16	0.15	0.22
CT LIST	1992-2014	Fall	Juvenile	0.644	0.23	0.32	0.25	0.37
NYSDEC	2006-2015	Spring	Juvenile	0.204	0.89	0.98	0.89	0.98
NJ Ocean Trawl	1990-2015	Year-round	Juvenile & Adults	0.472	0.34	0.48	0.36	0.53
VIMS Shad Monitoring	1998-2015	Spring	Juvenile	0.372	0.47	0.65	0.49	0.68
NEAMAP	2007-2015	Fall	Adult	0.476	0.34	0.48	0.36	0.52
USFW Coop	1988-2010	Winter	Juvenile & Adult	0.478	0.34	0.47	0.36	0.52
NC p135	1990-2015	Fall	YOY & Juveniles	0.211	0.87	0.97	0.87	0.98
SC Edisto	2004-2015	May-Nov	Juvenile	0.202	0.89	0.98	0.90	0.98

Table 20. Summary statistics for ARIMA model results. N = number of years in time series, W = Shapiro-Wilk statistics for normality, adj p = Holm-adjusted probability of rejecting the null hypothesis regarding normality of model residuals, r1, r2, and r3 = the first three sample autocorrelations for the first differenced logged series, (θ) = moving average parameter, SE = standard error of theta, and σ^2 = variance of index. VIMS Shad Monitoring (binomial) = James, York, and Rappahannock rivers. SAW = Stock Assessment Review Workshop.

post SAW

DPS	Survey	Years avail.	n	W	adj p	r_1	r_2	r_3	θ	SE	σ^2_c
GOM	ME-NH Trawl (w/ May) binomial	2000-2015	16	0.90	0.86	-0.25	-0.49	0.53	1.00	0.19	0.11
NYB	CT LIS spring (binomial)	2000-2014	15	0.94	1.00	-0.23	-0.29	-0.03	1.00	0.21	0.32
NYB	CT LIS fall (binomial)	2000-2009	10	0.96	1.00	-0.33	-0.22	0.10	1.00	0.33	0.09
NYB	CT LIS spring & fall (binomial)	2000-2009	10	0.95	1.00	-0.22	-0.67	0.43	1.00	0.31	0.08
NYB	NYDEC JASAMP	2006-2015	10	0.89	1.00	-0.53	0.02	0.12	0.24	0.28	0.39
NYB	NJ Ocean Trawl (binomial)	1990-2015	26	0.98	1.00	-0.37	0.09	-0.02	0.37	0.19	0.46
CB	VIMS Shad Montoring (binomial)	1998-2015	18	0.96	1.00	0.01	0.00	-0.07	0.01	0.24	0.49
CB	Shad James River only (binomial)	1998-2015	18	0.98	1.00	-0.10	0.07	-0.03	0.09	0.23	0.68
C	USFWS Coop (binomial)	1988-2010	23	0.94	1.00	-0.54	0.31	-0.37	1.00	1.60	0.50
C	NC p135 (spring YOY + Juv)	1990-2015	25	0.94	1.00	-0.17	-0.26	-0.12	0.51	0.31	0.21
C	NCp135 (spring YOY)	1990-2015	25	0.91	0.44	-0.39	-0.17	0.15	1.00	0.15	0.08
C	NC p135 (spring Juv)	1990-2015	25	0.88	0.08	-0.29	-0.21	-0.09	0.55	0.17	0.15
C	NC p135 (fall YOY + Juv)	1990-2015	26	0.95	1.00	-0.26	-0.26	0.11	0.97	0.30	0.20
C	NC p135 (fall YOY)	1990-2015	26	0.89	0.11	-0.32	-0.26	0.16	1.00	0.12	0.14
C	NC p135 (fall Juv)	1990-2015	26	0.98	1.00	-0.23	-0.24	0.00	0.87	0.12	0.10
SA	SC Edisto (Neg Binom)	2004-2015	12	0.88	0.95	-0.61	0.02	0.37	1.00	0.25	0.28
NYB-CB-C	NEAMAP	2007-2015	9	0.98	1.00	-0.43	-0.32	0.36	0.72	0.35	0.23
Coast	Conn Index	1990-2015	26	0.93	0.76	-0.31	-0.09	0.19	0.73	0.17	0.11

Table 21. ARIMA and trend analysis results for Atlantic sturgeon indices of abundance. Shown are the probability that the terminal year of an index is greater than the 25th percentile of a time series and the probability that the terminal year of an index is greater than the index value in 1998 (or surrogate reference year; green shading indicates >50% probability); the Mann-Kendall tau (τ) statistics, the Holm-adjusted probability of the Mann-Kendall time series trend being significant, and whether the trend is increasing (+), decreasing (-), or not significant (n.s.). Terminal years other than 2015 and yrAsRefPoint other than 1998 are highlighted in yellow. Light grey font indicates a strong within-survey correlation (e.g., CT LIST spring and fall binomial index is strongly correlated with CT LIST fall binomial index). VIMS 3R = VIMS Shad Monitoring (binomial) = James, York, and Rappahannock rivers. SAW = Stock Assessment Review Workshop.

All years available (post SAW)

DPS	Survey	Months	Ages	P(terminal yr > 25th Pctl)	P(terminal yr > yrAsRefPt index)	n	First year	Terminal yr	yrAsRefPt	Trend analysis results M-K τ	M-K p_adj	Trend
GOM	ME-NH Trawl (binomial)	5,10,11	Juvenile & Adult	0.61	0.51	16	2000	2015	2000	-0.12	1.0000	n.s.
NYB	CT LIS spring (binomial)	5-6	Juvenile	0.58	0.37	15	2000	2014	2000	-0.12	1.0000	n.s.
NYB	CT LIS fall (binomial)	9-11	Juvenile	0.65	0.66	10	2000	2009	2000	-0.24	1.0000	n.s.
NYB	CT LIS spring & fall (binomial)	5-6,9-11	Juvenile	0.66	0.60	10	2000	2009	2000	-0.81	0.0005	-
	NYDEC JASAMP	3, 4	YOY & Juvenile	1.00	1.00	10	2006	2015	2006	0.91	0.0045	+
NYB	NJ Ocean Trawl (binomial)	1, 4, 6, 10	Juvenile & Adult	0.95	0.96	26	1990	2015	1998	0.38	0.0717	n.s.
CB	VIMS 3 R	3-4	YOY & Juvenile	0.95	0.34	18	1998	2015	1998	-0.03	1.0000	n.s.
CB	VIMS James River only	3-4	YOY & Juvenile	0.96	0.36	18	1998	2015	1998	0.01	1.0000	n.s.
C	USFWS Coop (binomial)	1-2	Juvenile & Adult	0.53	0.43	23	1988	2010	1998	0.09	1.0000	n.s.
C	NCp135 (spring YOY + Juv)	Spring	YOY & Juvenile	1.00	0.98	25	1991	2015	1998	0.69	0.0000	+
C	NCp135 (spring YOY)	Spring	YOY	0.81	0.78	25	1991	2015	1998	0.35	0.1453	n.s.
C	NCp135 (spring Juv)	Spring	Juvenile	1.00	1.00	25	1991	2015	1998	0.88	0.0000	+
C	NCp135 (fall YOY + Juv)	Fall (11-2)	YOY & Juvenile	0.57	0.51	26	1990	2015	1998	0.50	0.0045	+
C	NCp135 (fall YOY)	Fall (11-2)	YOY	0.54	0.44	26	1990	2015	1998	-0.03	1.0000	n.s.
C	NCp135 (fall Juv)	Fall (11-2)	Juvenile	0.73	0.71	26	1990	2015	1998	0.61	0.0002	+
SA	SC Edisto (Neg Binom)	5-9	YOY, Juvenile, & Adult	0.51	0.28	12	2004	2015	2004	-0.36	0.9181	n.s.
NYB-CB-C	NEAMAP	9-11	YOY, Juvenile, & Adult	0.49	0.33	9	2007	2015	2007	-0.89	0.0135	-
Coast	Conn Index	Year round	YOY, Juvenile, & Adult	0.95	0.95	26	1990	2015	1998	0.74	0.0000	+

Table 22. Summary of tally and percentage of surveys, by DPS, where terminal year index is greater than the reference value , either the 25th percentile of a given time series or the index value in 1998 (or start year of survey, whichever is later) for a given index. Mean probabilities from ASMFC (2017) are provided in parentheses for comparative purposes.

Summary

	DPS	P(terminal year index > 25th Pctl)	P(terminal year index > 1998* index)
Tally	GOM	1 of 1	1 of 1
	NYB	4 of 4	3 of 4
	CB	1 of 1	0 of 1
	C	5 of 5	3 of 5
	SA	1 of 1	0 of 1
	NYB-CB-C	0 of 1	0 of 1
	Coast	1 of 1	1 of 1

	DPS	P(terminal year index > 25th Pctl)	P(terminal year index > 1998* index)
Pct	GOM	100%	100%
	NYB	100%	75%
	CB	100%	0%
	C	100%	60%
	SA	100%	0%
	NYB-CB-C	0%	0%
	Coast	100%	100%

	DPS	P(terminal year index > 25th Pctl)	P(terminal year index > 1998* index)
Mean	GOM	(0.73) 0.61	(0.28) 0.51
	NYB	(0.85) 0.80	(0.80) 0.75
	CB	(0.95) 0.96	(0.39) 0.36
	C	(0.76) 0.72	(0.72) 0.67
	SA	(NA) 0.51	(NA) 0.28
	NYB-CB-C	(NA) 0.49	(NA) 0.33)
	Coast	(0.62) 0.95	(0.55) 0.95

* If survey started after 1998, then 1st year of survey
See report for first and last years of each survey

Table 23. Life history parameters and relationships necessary to calculate $Z_{50\%EPR}$.

Input	Formula	Parameters
Maximum age	A_{max}	A_{max}
Length-at-age	$L_a = L_\infty (1-e^{-(K(a-t0))})$	L_∞, K, t_0
Length-weight relationship	$W_L = \alpha \cdot L^\beta$	α, β
Natural mortality at age	$M_a = M_u \cdot W_a^b$	M_u, b, proportion left alive at A_{max}
Maturity at age	$pMature_a = \frac{1}{1+e^{-(a-a50)/b}}$	a_{50}, b
Fecundity at age	$Fecundity_a = \alpha + \beta \cdot L_a$	α, β
Bycatch selectivity	$selectivity_a = \left(\frac{1}{1+e^{-(a-\alpha 1)/b1}}\right) \cdot \left(1-\frac{1}{1+e^{-(a-a2)/b2}}\right)$	$a1_{50}$, $a2_{50}$, b1, b2
Ship strike selectivity	$selectivity_a = 0$ when $a < A_{sel}$ and 1 when $a \geq A_{sel}$	A_{sel}

Table 24. Literature von Bertalanffy parameters sampled for stochastic EPR analysis.

Source	Location	Sex	Length Type	Linf	K	t0
Stevenson and Secor (2000)	Hudson River & New York Bight (NY)	female	Total	256	0.07	-3.23
Johnson et al. (2005)	Atlantic Ocean (NJ coast)	female	Total (converted)	225	0.12	0.00
Dunton et al. (2016)	Atlantic Ocean, Hudson River (NY), Delaware River and Bay (DE)	pooled	Total	279	0.06	-1.28
Stewart et al. (2015)	Saint John River (Canada)	female	Total	264	0.04	-0.94
Armstrong (1999)	Albemarle Sound (NC)	pooled	Total (converted)	304	0.09	-0.15
ASMFC 2017	Coast	pooled	Total	286	0.06	-0.34
ASMFC 2017	NYB	pooled	Total	299	0.05	-1.82
ASMFC 2017	CAR	pooled	Total	181.9	0.17	-0.76

Table 25. Estimates of Z from tagging model relative to $Z_{50\%EPR}$ at the coast-wide and DPS-level. Estimates of Z are the median of the posterior distribution for all tagged fish from each region/DPS, and $Z_{50\%EPR}$ values are N-weighted values for ages 4-21. (Revised Table 49 from ASMFC 2017)

Region	Z (95% credible interval)	$Z_{50\%EPR}$ (95% CIs)	$P(Z)>Z_{50\%EPR}$ 50%	$P(Z)>Z_{50\%EPR}$ 80%	$P(Z)>Z_{50\%EPR}$ 90%
Coast	0.03 (0.003 - 0.33)	0.12 (0.10 – 0.15)	7.2%	6.5%	6.1%
Gulf of Maine	0.31 (0.01 - 2.07)		75.4%	73.5%	72.5%
New York Bight	0.08 (0.004 - 0.53)		34.6%	31.2%	29.4%
Chesapeake Bay	0.08 (0.01 - 0.46)		33.6%	30.0%	28.0%
Carolina	0.26 (0.01 - 1.25)		78.2%	75.4%	73.9%
South Atlantic	0.10 (0.01 - 0.76)		43.9%	40.2%	38.1%

Table 26. Stock status determination for the coast-wide stock and DPSs based on mortality estimates and biomass/abundance status relative to historic levels, and the terminal year of indices relative to the start of the moratorium as determined by the ARIMA analysis. Refer to ASMFC 2017 section 7.2 for a more thorough discussion of stock status in each DPS which includes this quantitative evaluation as well as some qualitative evidence (Revised Table 50 from ASMFC 2017).

	Mortality Status	Biomass/Abundance Status	
Population	$P(Z)>Z_{50\%EPR}$ 80%	Relative to Historical Levels	Average probability of terminal year of indices > 1998 value*
Coast-wide	7%	Depleted	95%
Gulf of Maine	74%	Depleted	51%
New York Bight	31%	Depleted	75%
Chesapeake Bay	30%	Depleted	36%
Carolina	75%	Depleted	67%
South Atlantic	40%	Depleted	Unknown (no suitable indices)

*: For indices that started after 1998, the probability included in the average is the probability that the index in the terminal year is greater than the start year of the index.

6 FIGURES

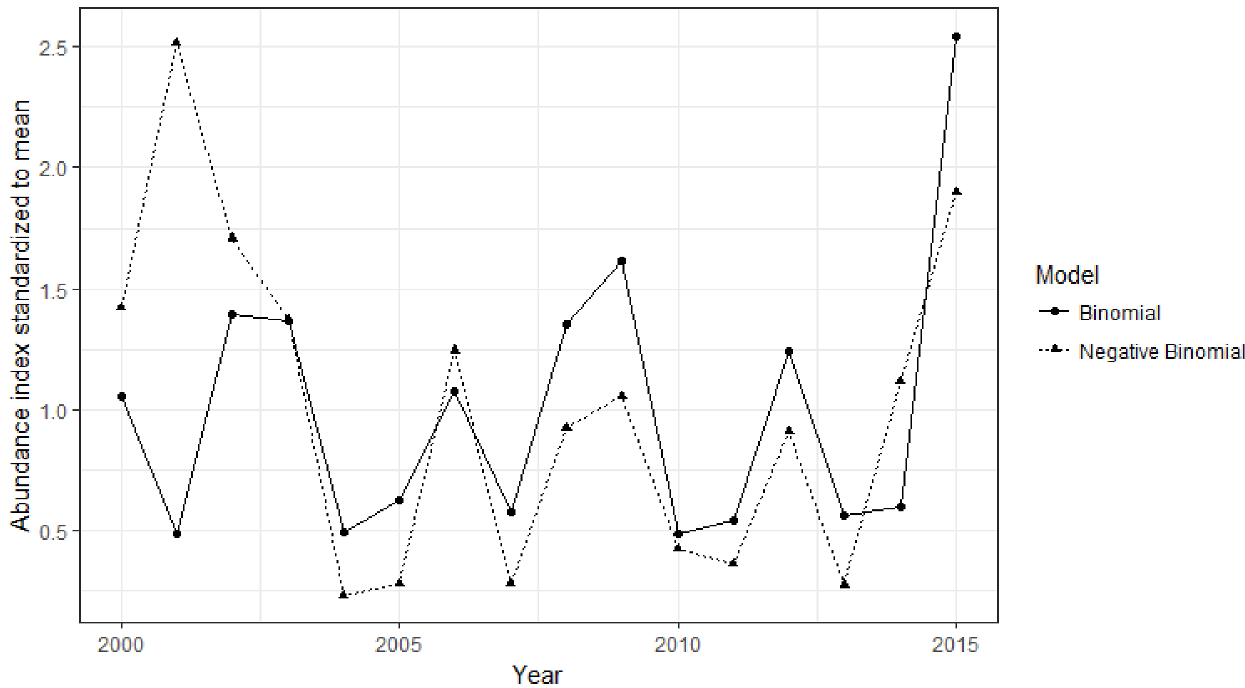

Figure 1. Comparison between the GLM standardized indices using the negative binomial and binomial error structure for the ME-NH Trawl survey for 2000-2015.

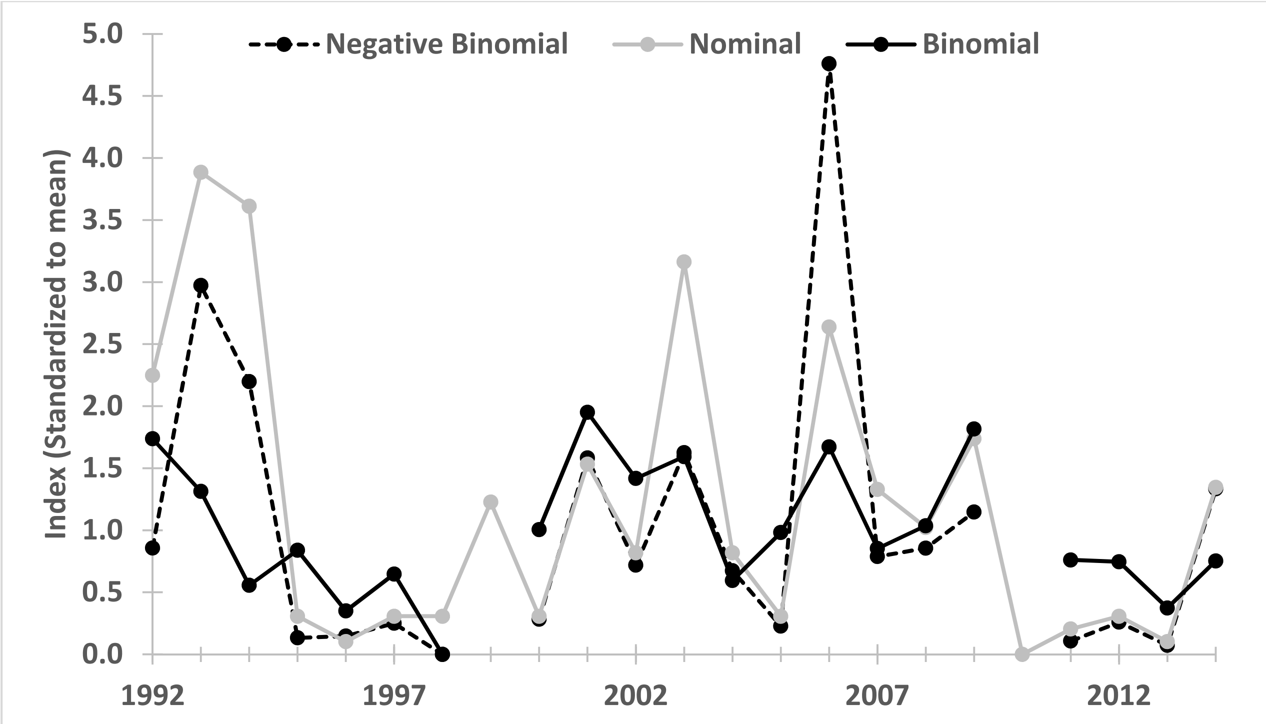

Figure 2. Comparison of the nominal abundance index and the GLM standardized indices using the negative binomial and binomial error structure for the fall portion of the CT LIST survey for 1992-2014.

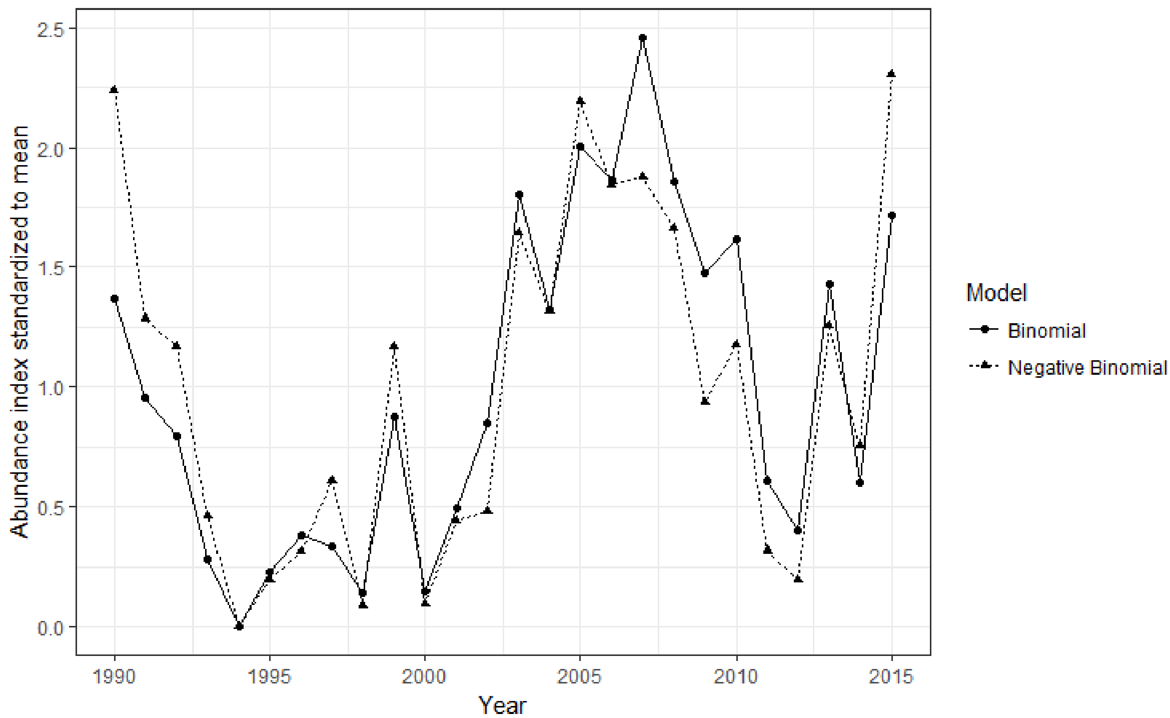

Figure 3. Comparison between the GLM standardized indices using the negative binomial and binomial error structure for the NJ OT survey for 1990-2015.

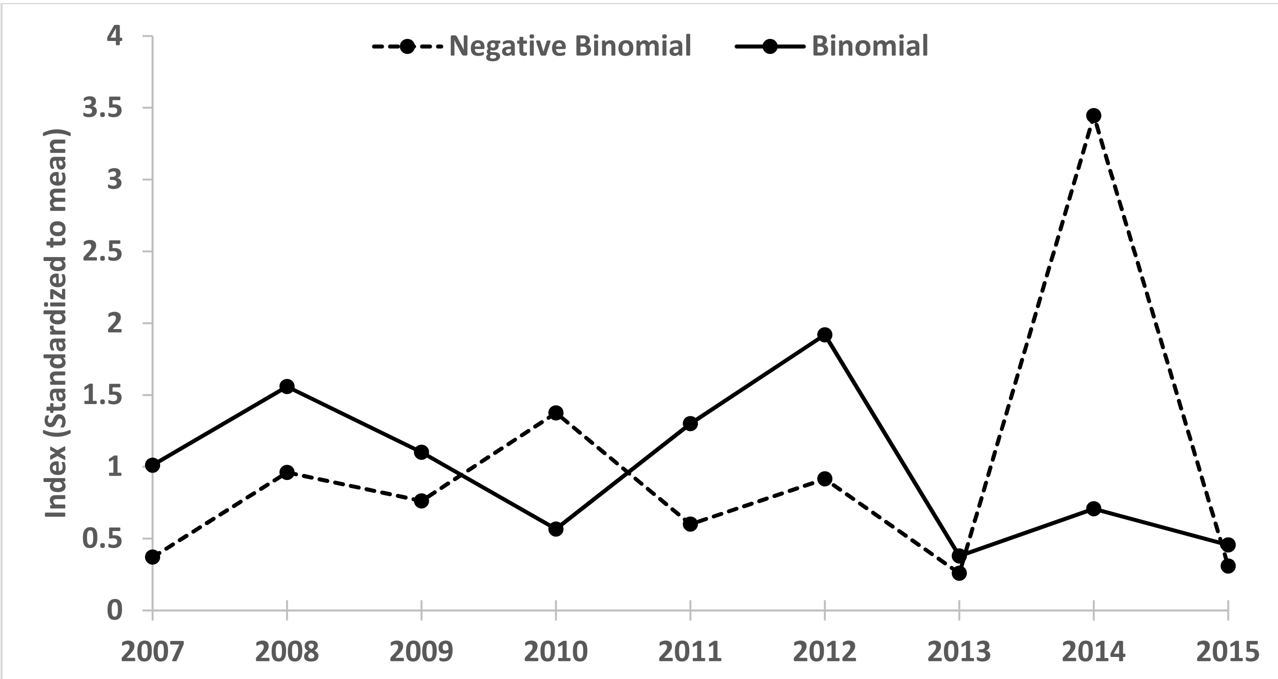

Figure 4. Comparison between the GLM standardized indices using the negative binomial and binomial error structure for the fall portion of the NEAMAP survey for 2004-2015.

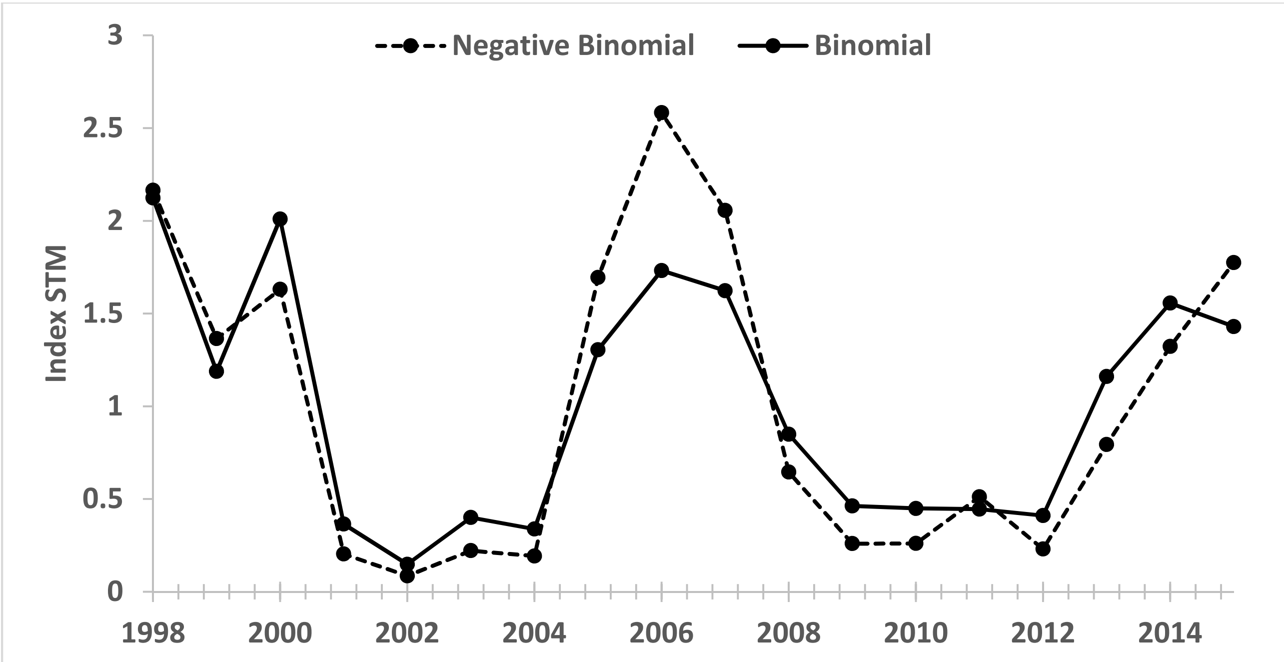

Figure 5. Comparison between the GLM standardized indices using the negative binomial and binomial error structure for the spring portion of the VIMS Shad and River Herring Monitoring survey for 1998-2015.

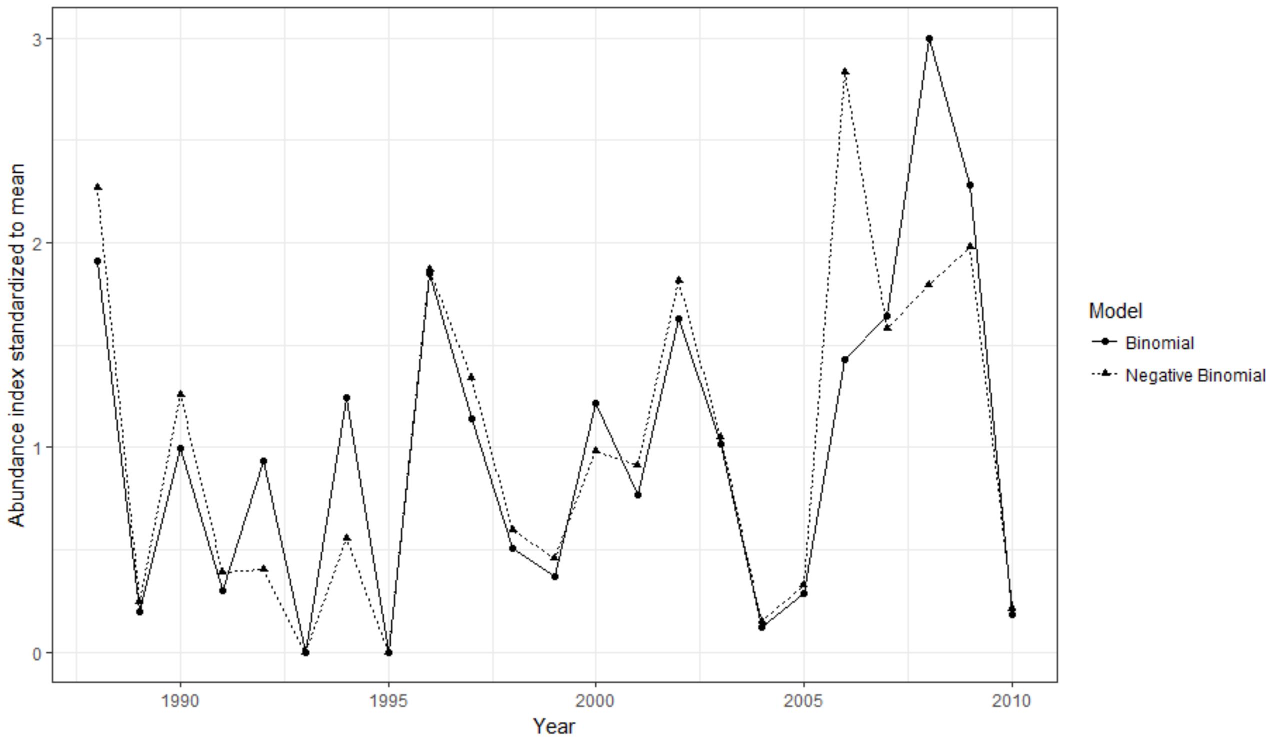

Figure 6. Comparison between the GLM standardized indices using the negative binomial and binomial error structure for the USFWS Coop survey for 1988-2010.

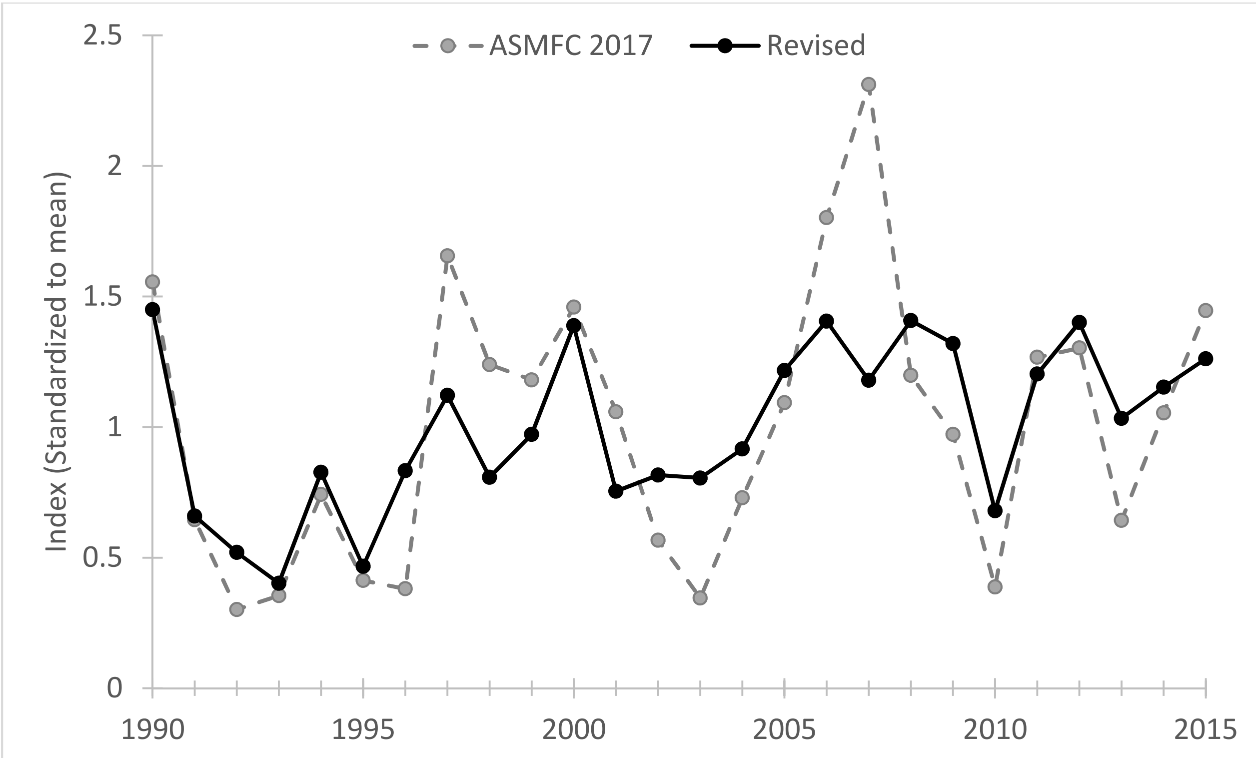

Figure 7. Time series of coast-wide Atlantic sturgeon relative abundance as estimated from Conn (2010) hierarchical analysis using the revised indices for this supplemental report. The previous Conn index calculated for ASMFC 2017 is also shown for comparison.

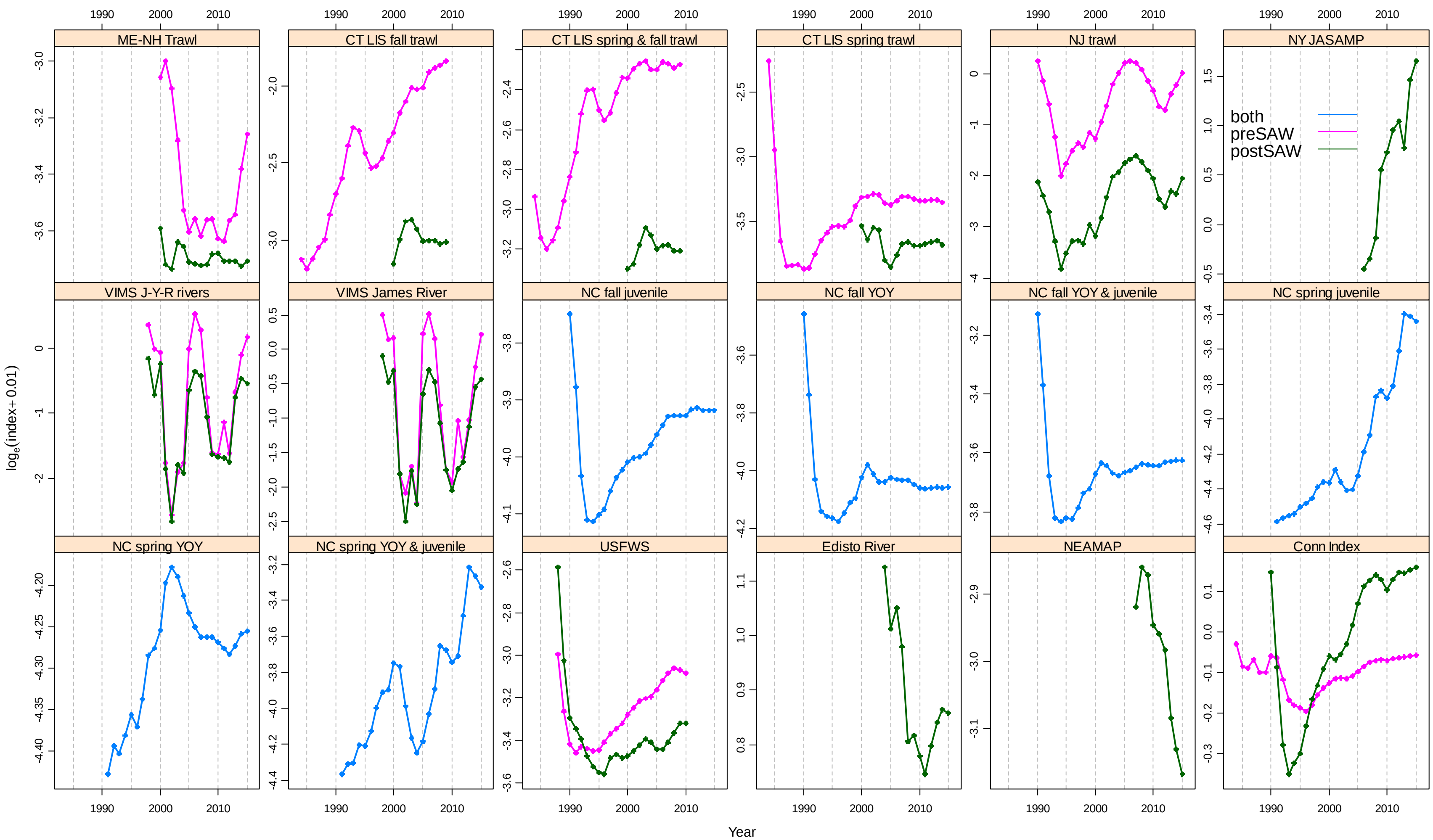

Figure 8. ARIMA fitted indices, pre- and post-SAW indices plotted together. Note that y-axes differ among plots (all share a common x-axis). preSAW = index used prior to August 2017 stock assessment review workshop (SAW); postSAW = index as used after August 2017 SAW. Both = no change in index after SAW.

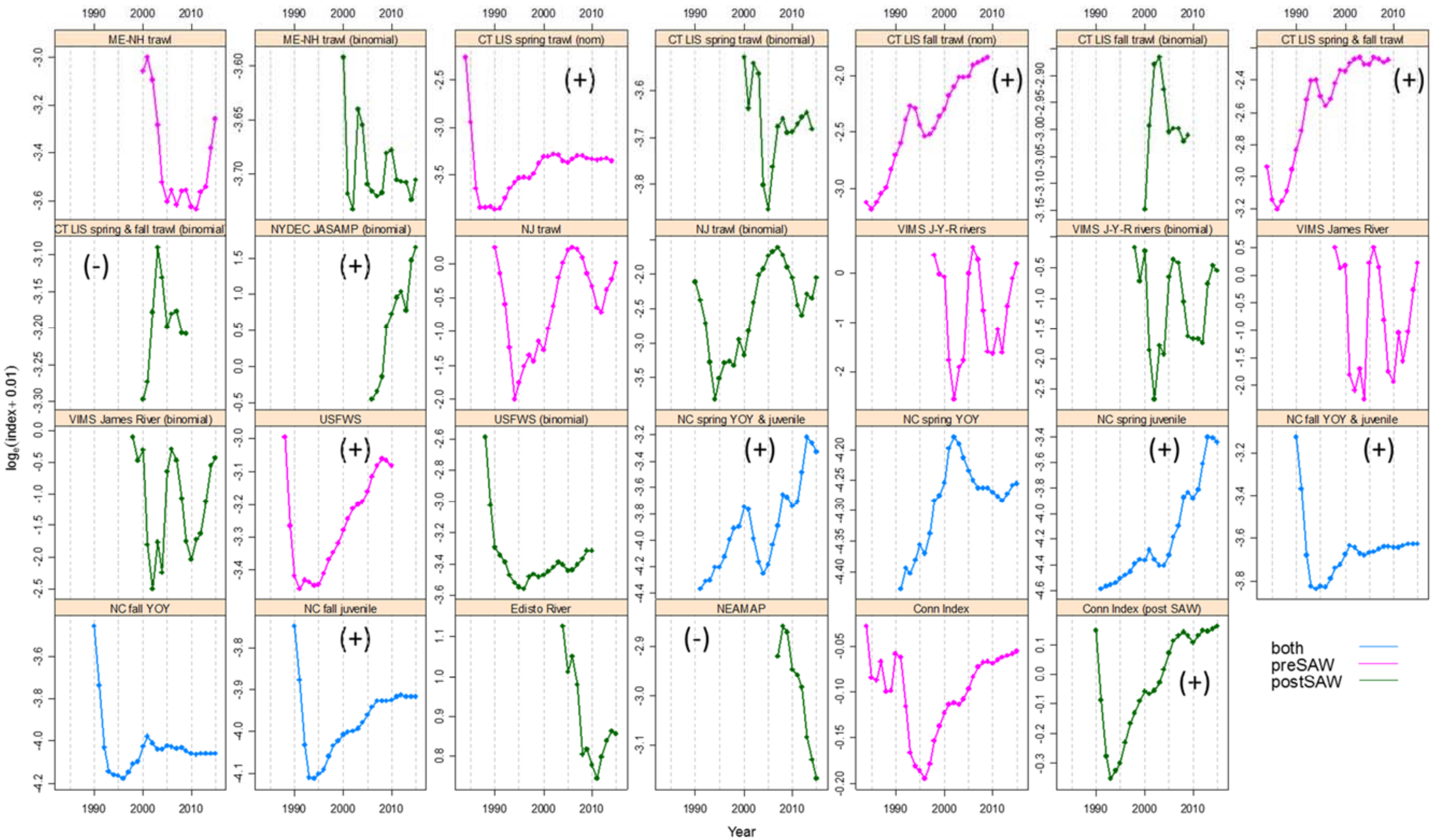

Figure 9. ARIMA fitted indices, pre- and post-SAW indices plotted separately. Note that y-axes differ among plots (all share a common x-axis). Plus/minus signs have been added to indices with significant increasing or decreasing trends (alpha = 0.05, Mann-Kendall test), respectively. preSAW = index used prior to August 2017 stock assessment review workshop (SAW); postSAW = index as used after August 2017 SAW. Both = no change in index after SAW.

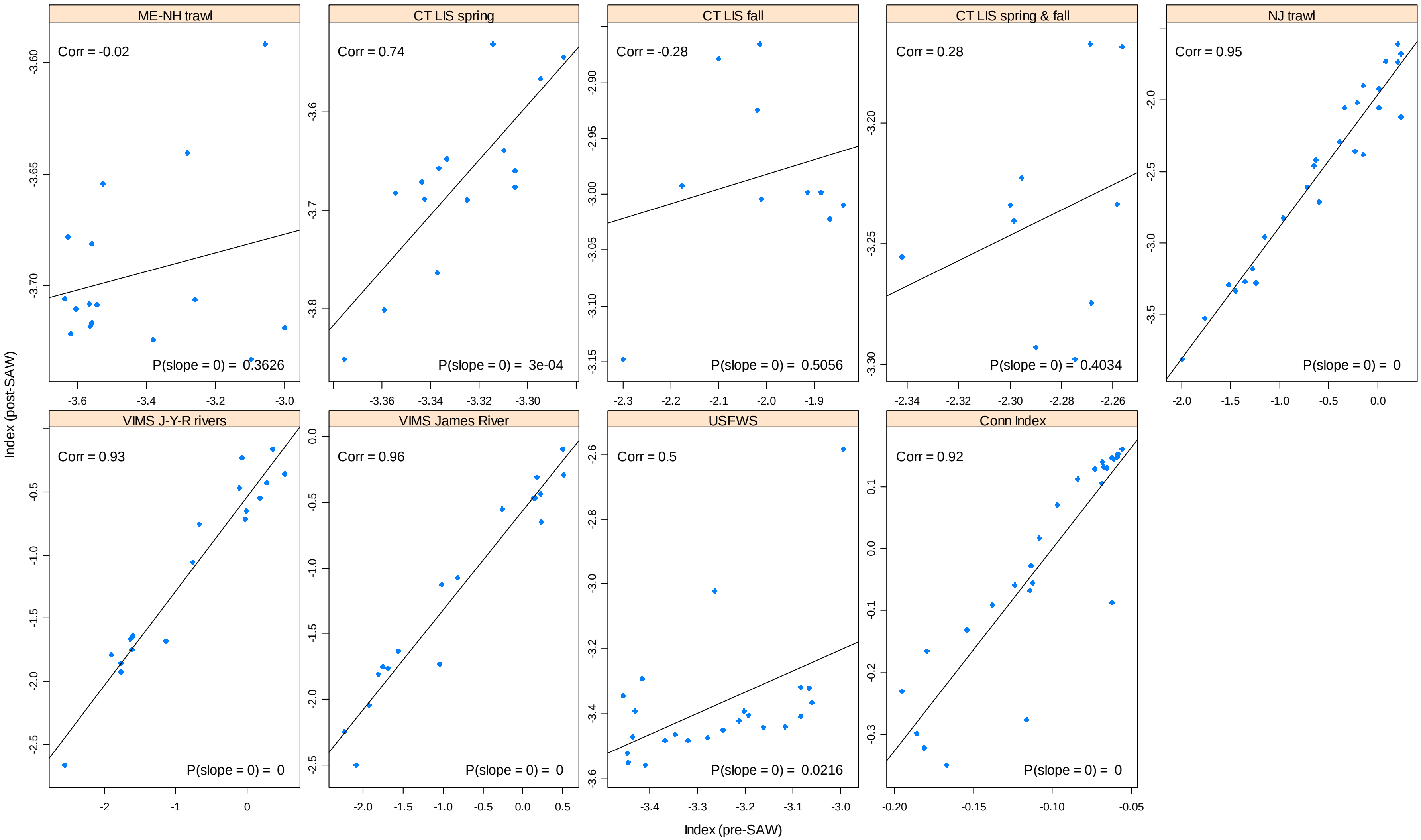

Figure 10. Scatter plots of indices revised after August 2017 stock assessment review workshop. Spearman rank correlation is provided in upper left of each scatterplot; Pr(least squares regression slope = 0) is provided at bottom right; linear regression line is fit through scatterplot.

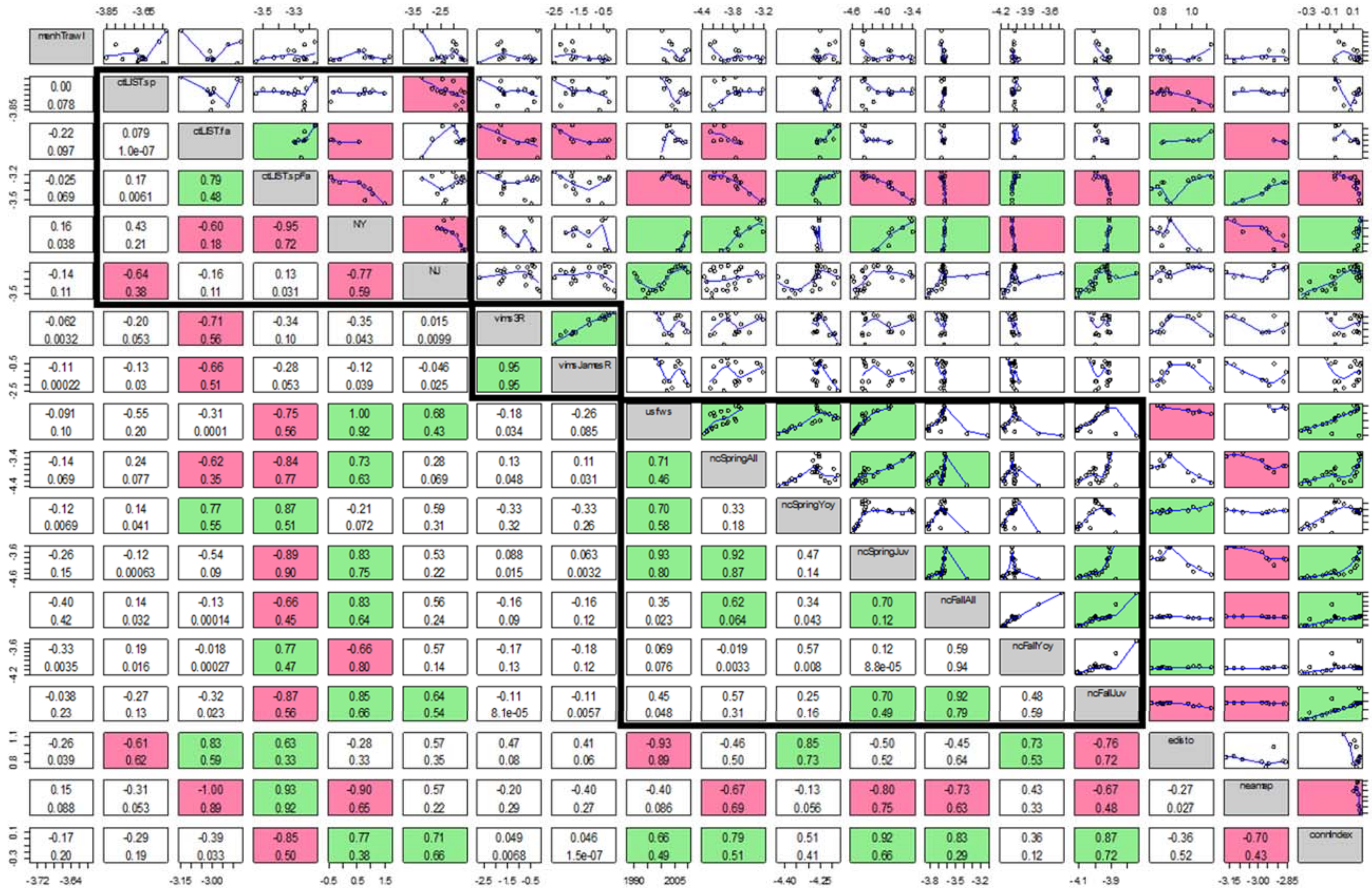

Figure 11. Correlation matrix of surveys. Spearman correlations (top) and coefficients of determination (r^2; bottom) below diagonal, notable correlations (>=0.60 or <=-0.60) are indicated in green or red, respectively. Lowess smoother added to scatterplots above diagonal. Abbreviated index names are along the diagonal. Black boxes drawn around surveys within DPSs (save ME-NH Trawl, Edisto, NEAMAP, Conn index, where each are in their own DPS).

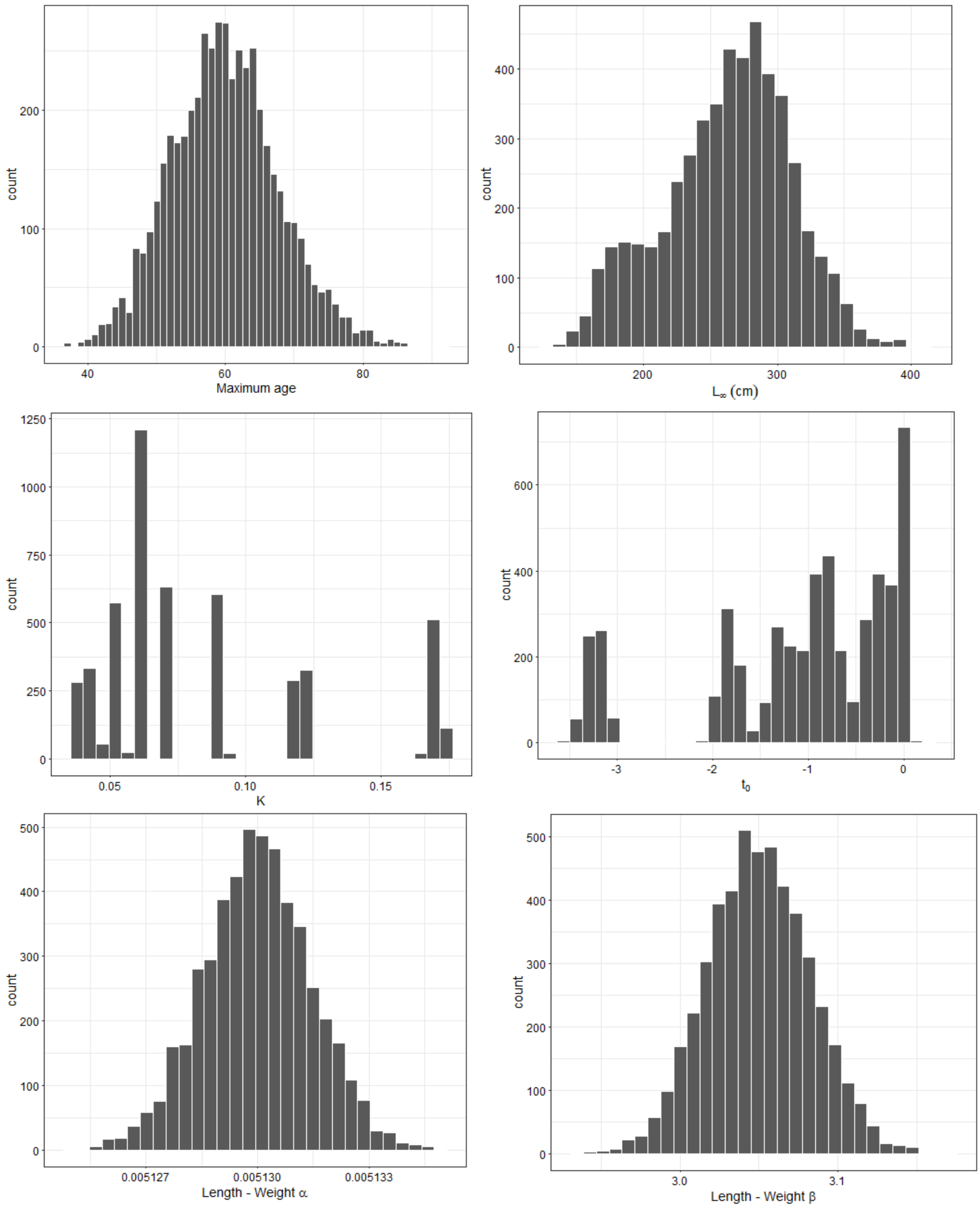

Figure 12. Histograms of drawn life history parameters for stochastic EPR.

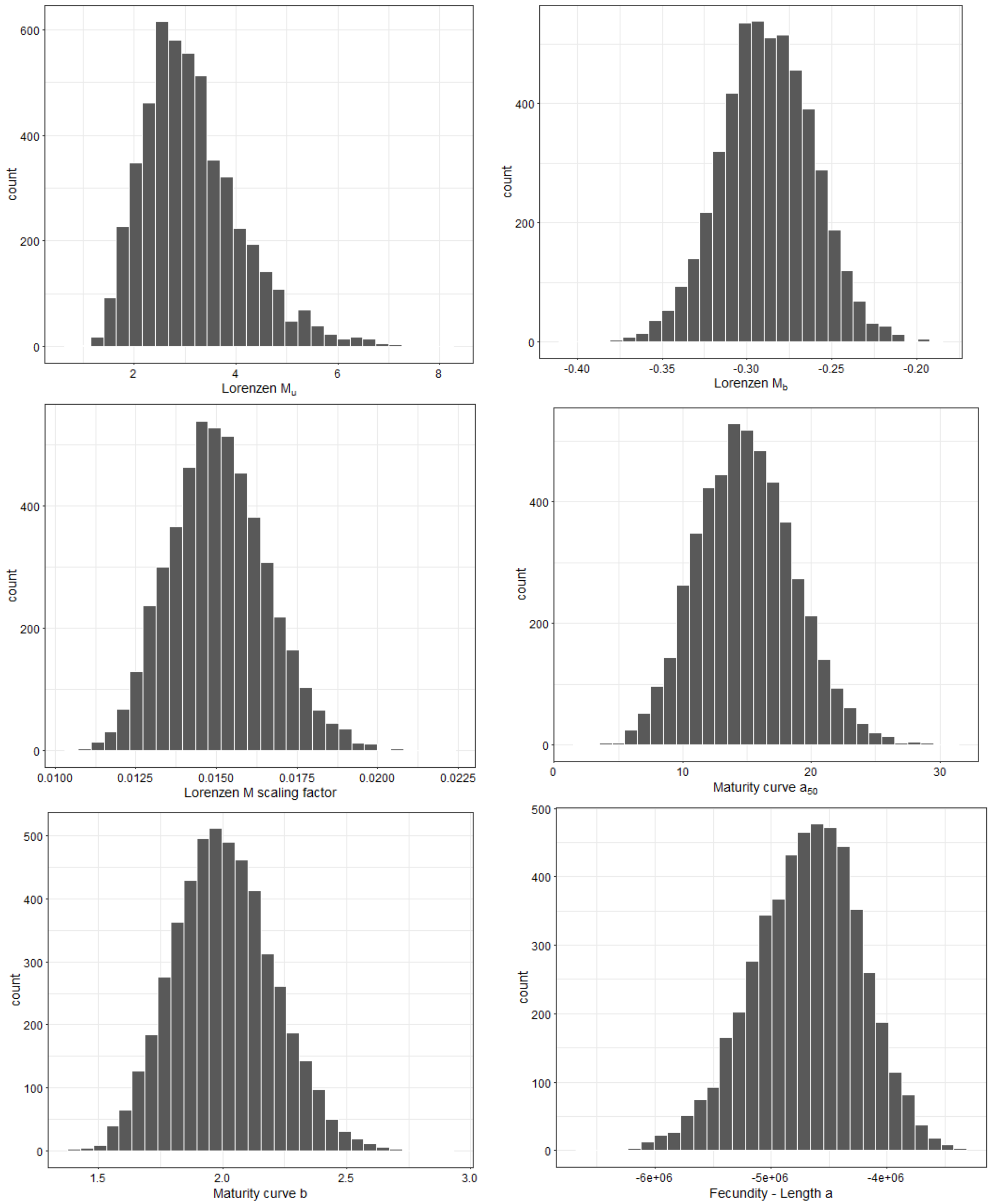

Figure 12 (cont.)

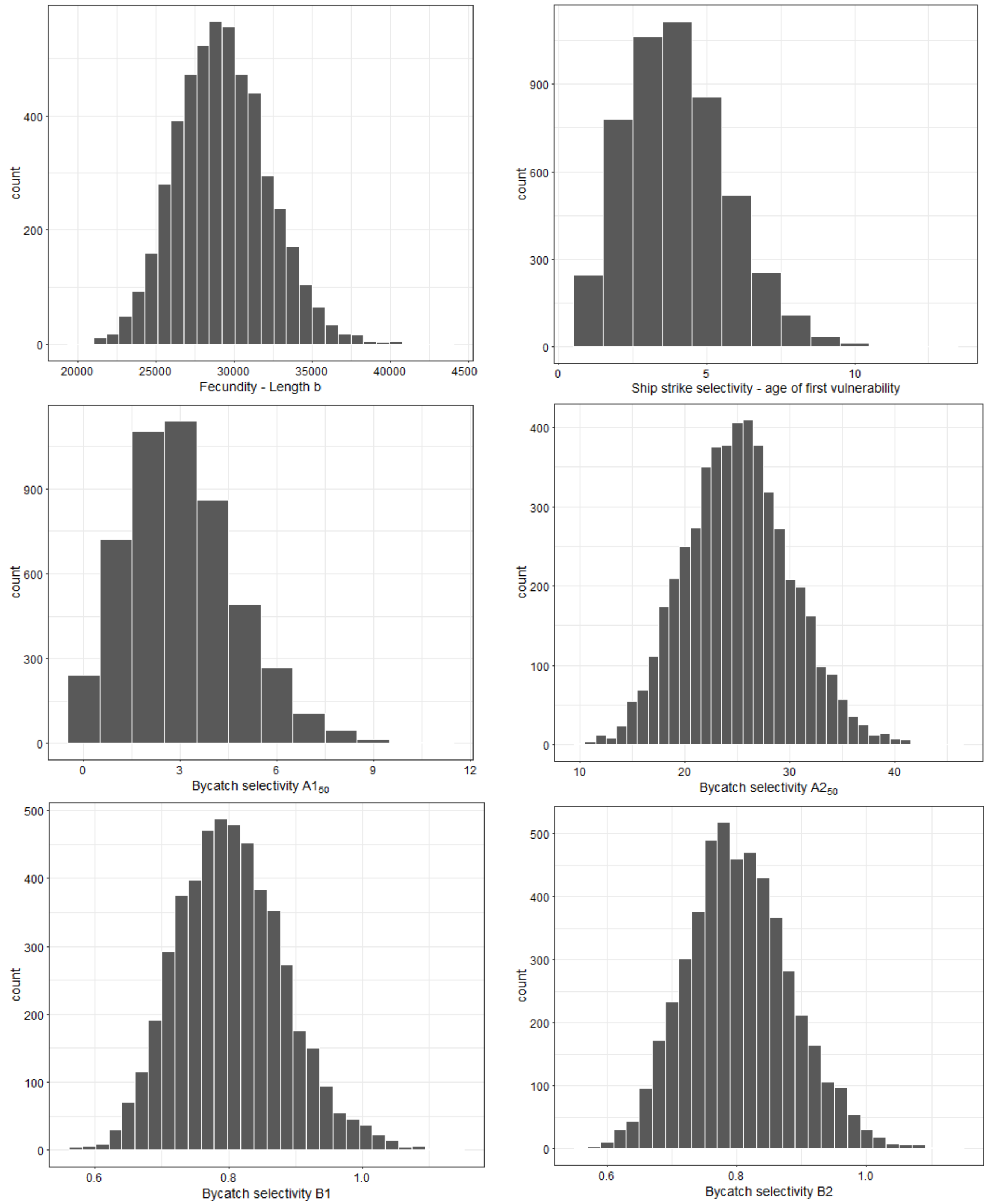

Figure 12 (cont.)

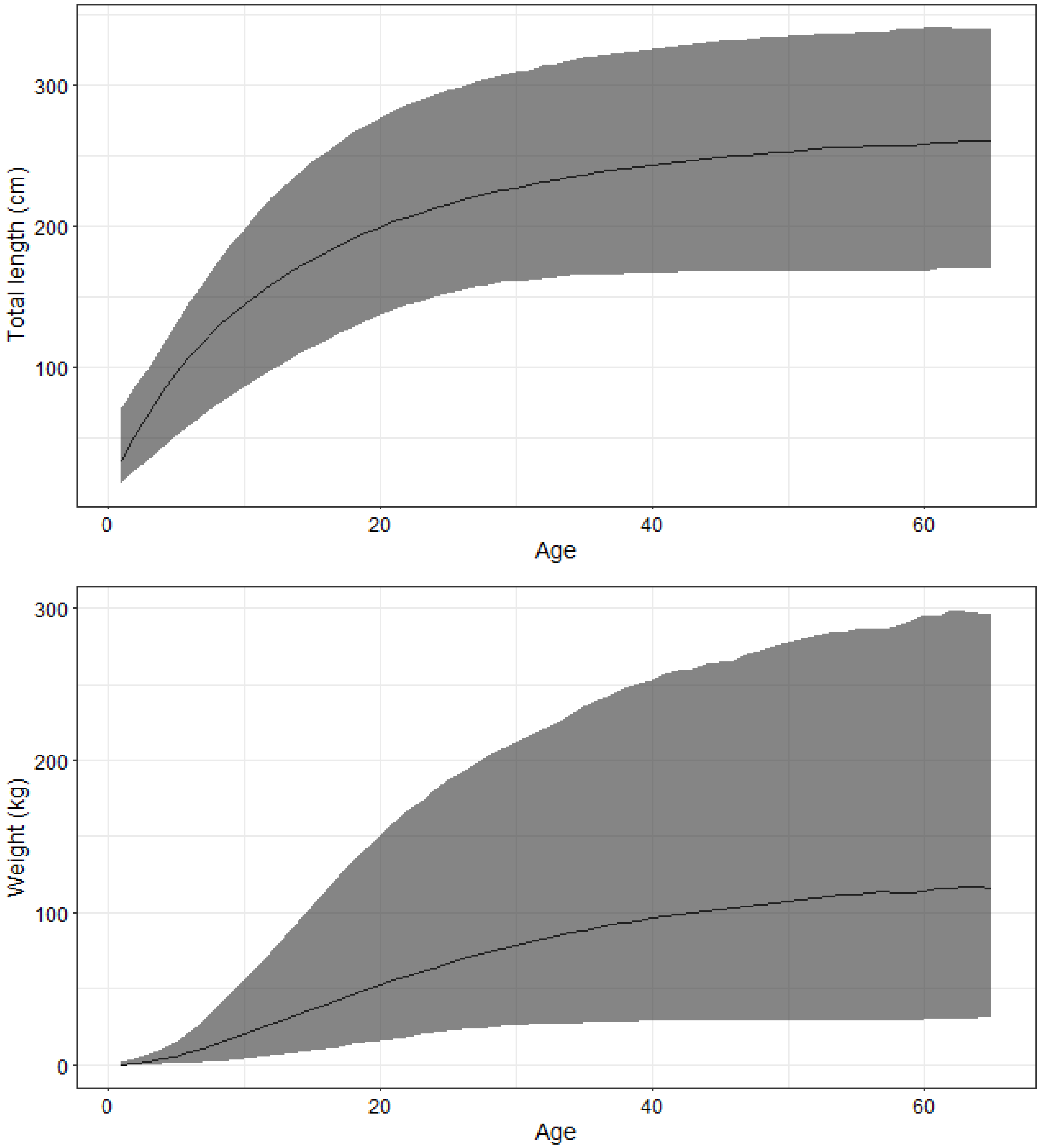

Figure 13. Median life history quantities at age for the stochastic EPR. Shaded area indicates 5th and 95th percentiles of calculated parameters.

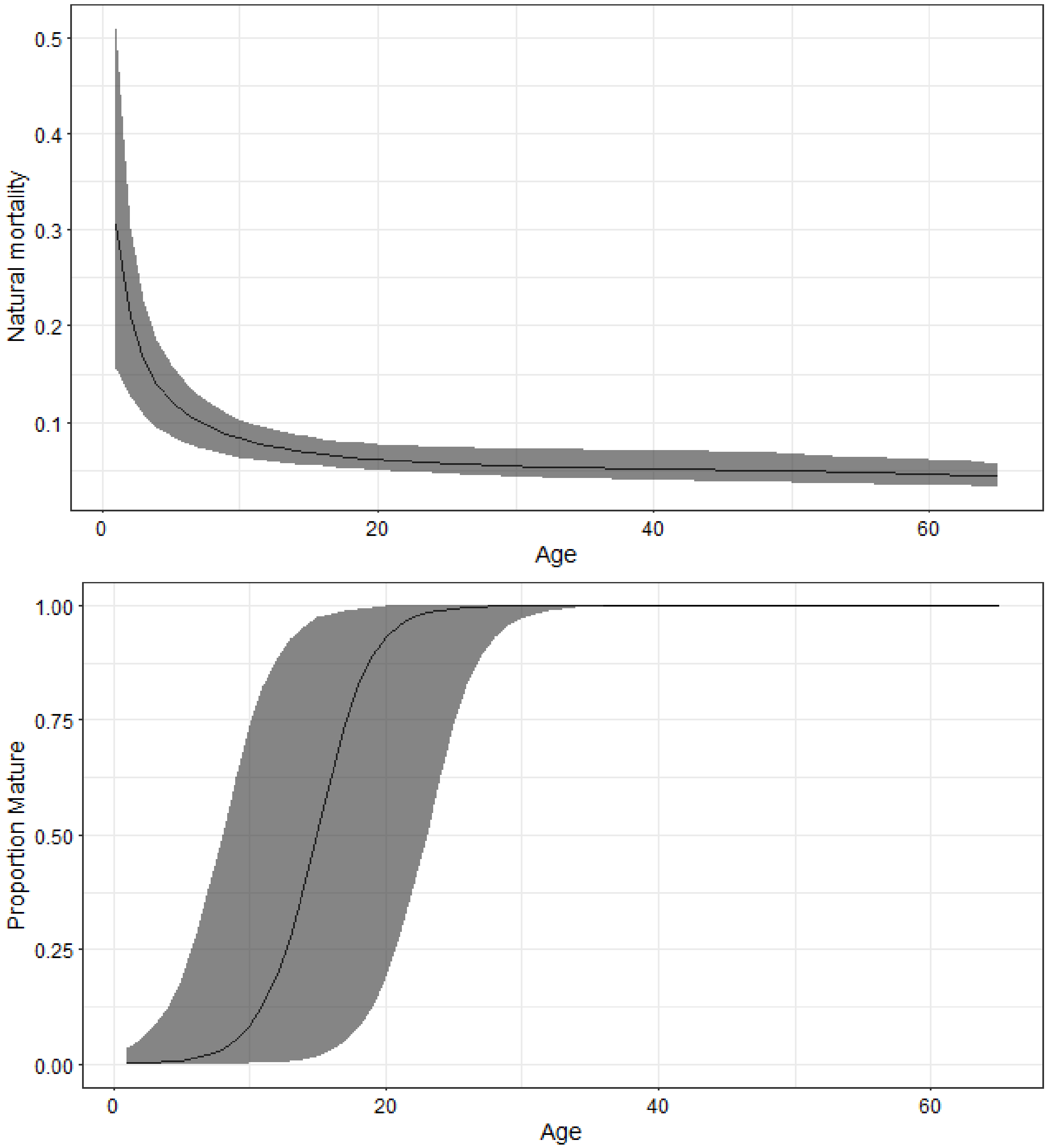

Figure 13 (cont.)

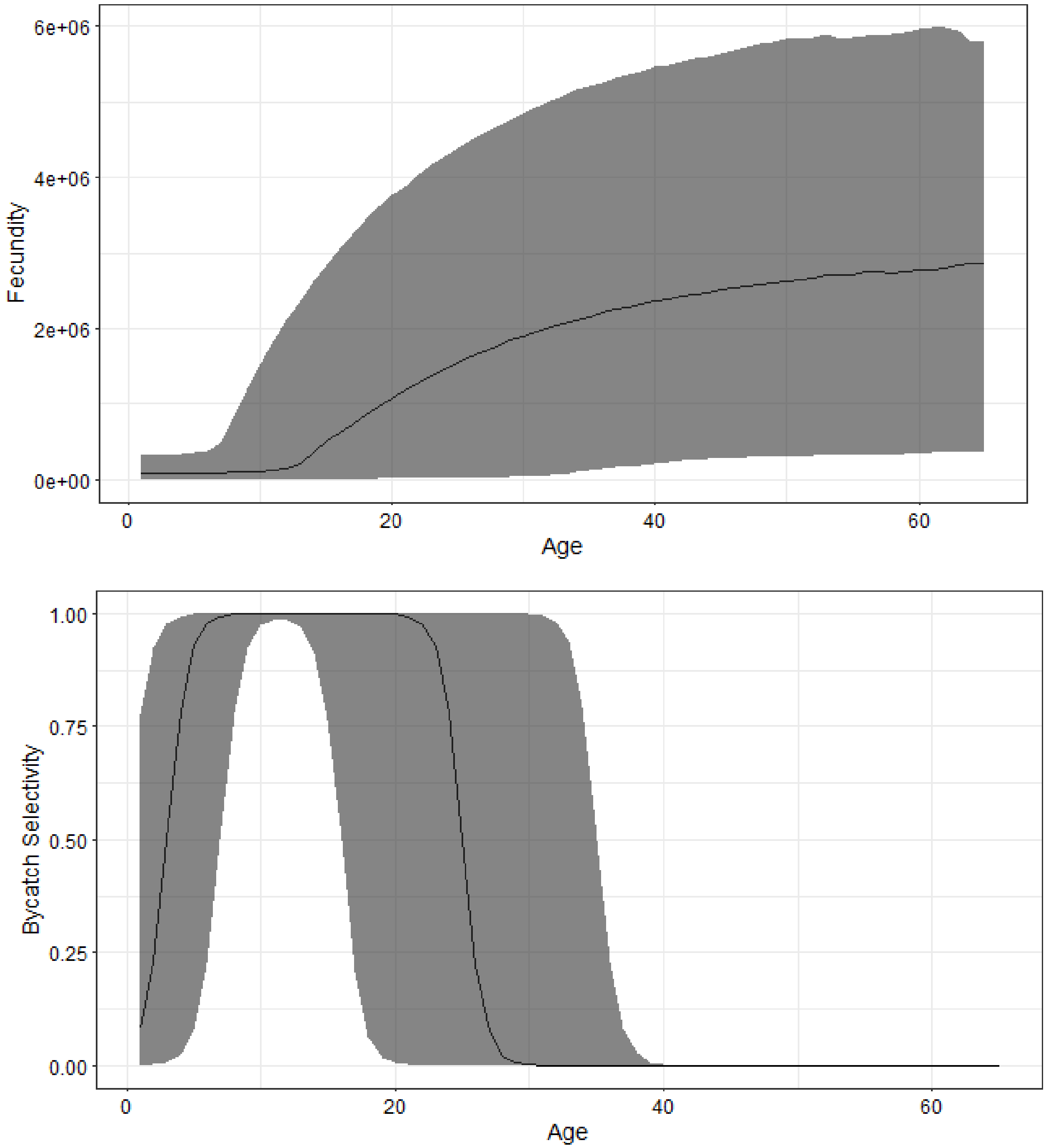

Figure 13 (cont.)

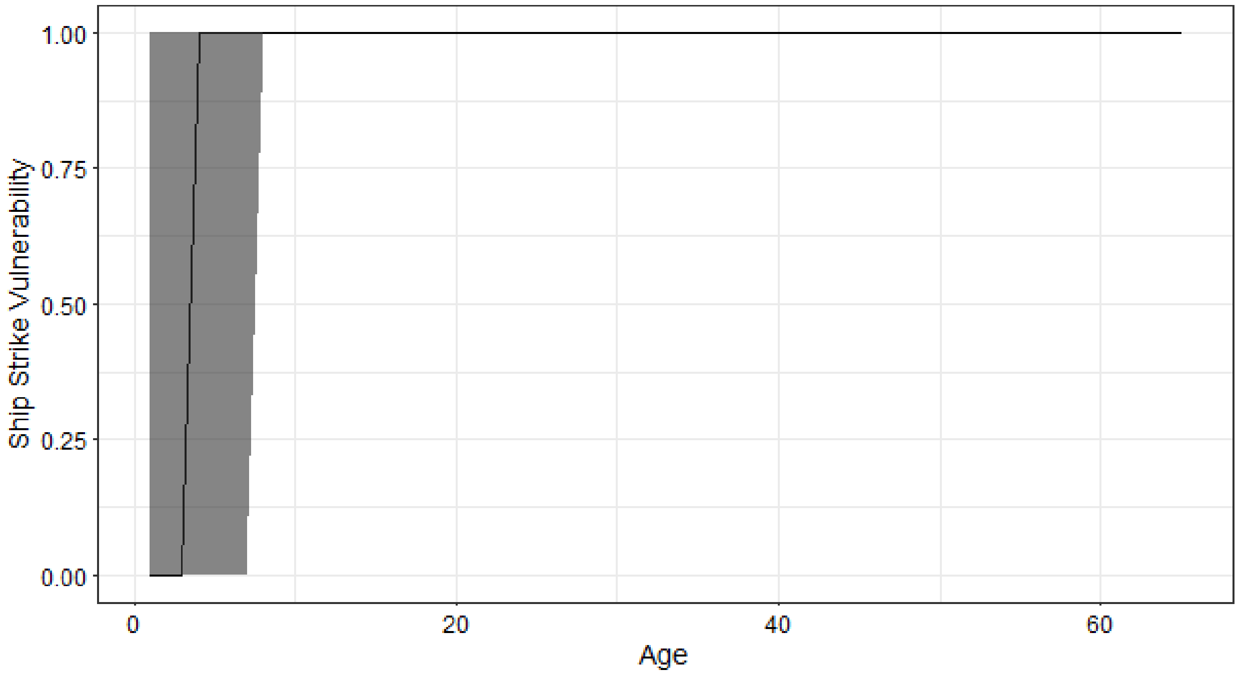

Figure 13 (cont.)

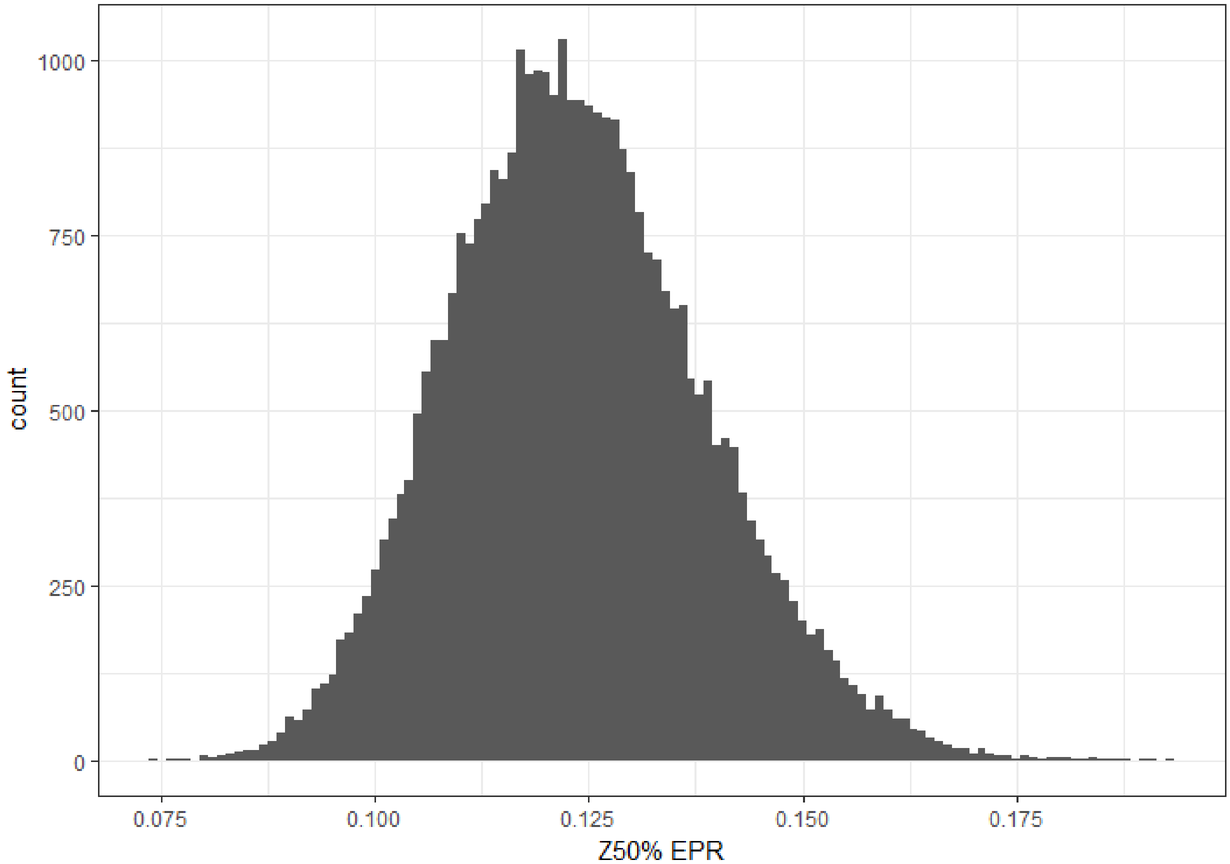

Figure 14. Histogram of $Z_{50\%EPR}$ estimates from the stochastic EPR analysis.

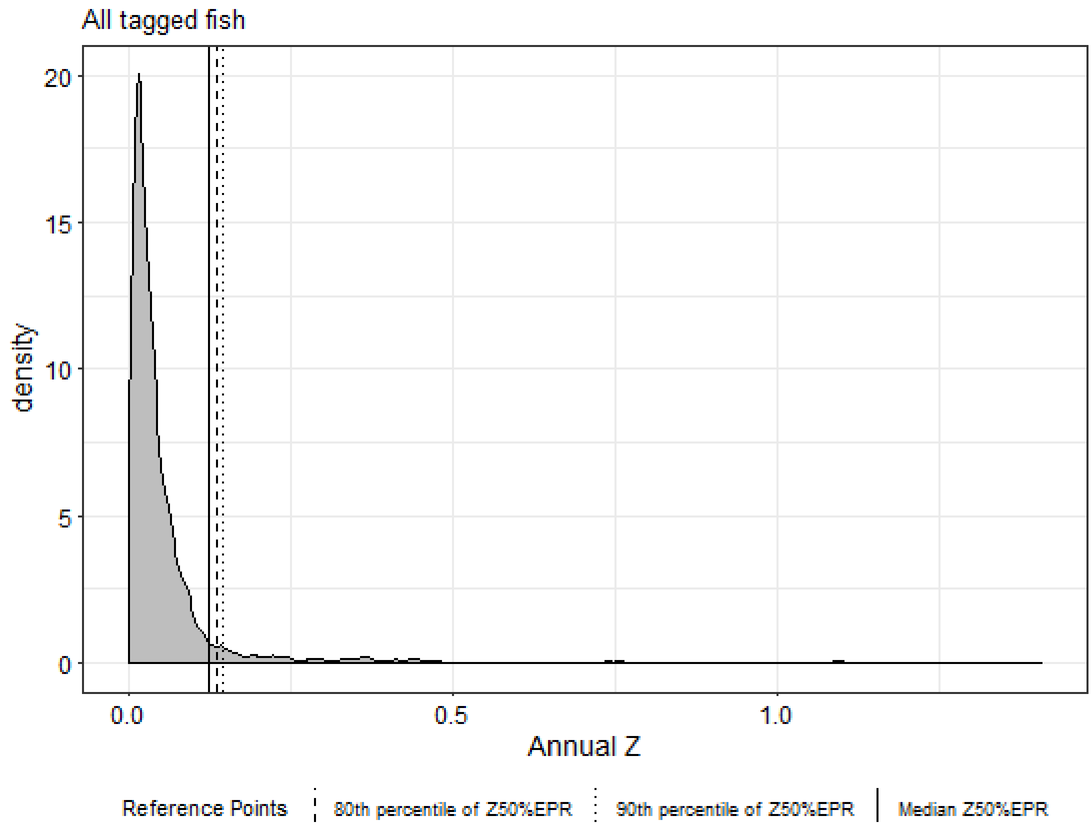

Figure 15. Posterior distribution of Z estimates for the acoustic tagging model for all tagged fish, plotted with the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution.

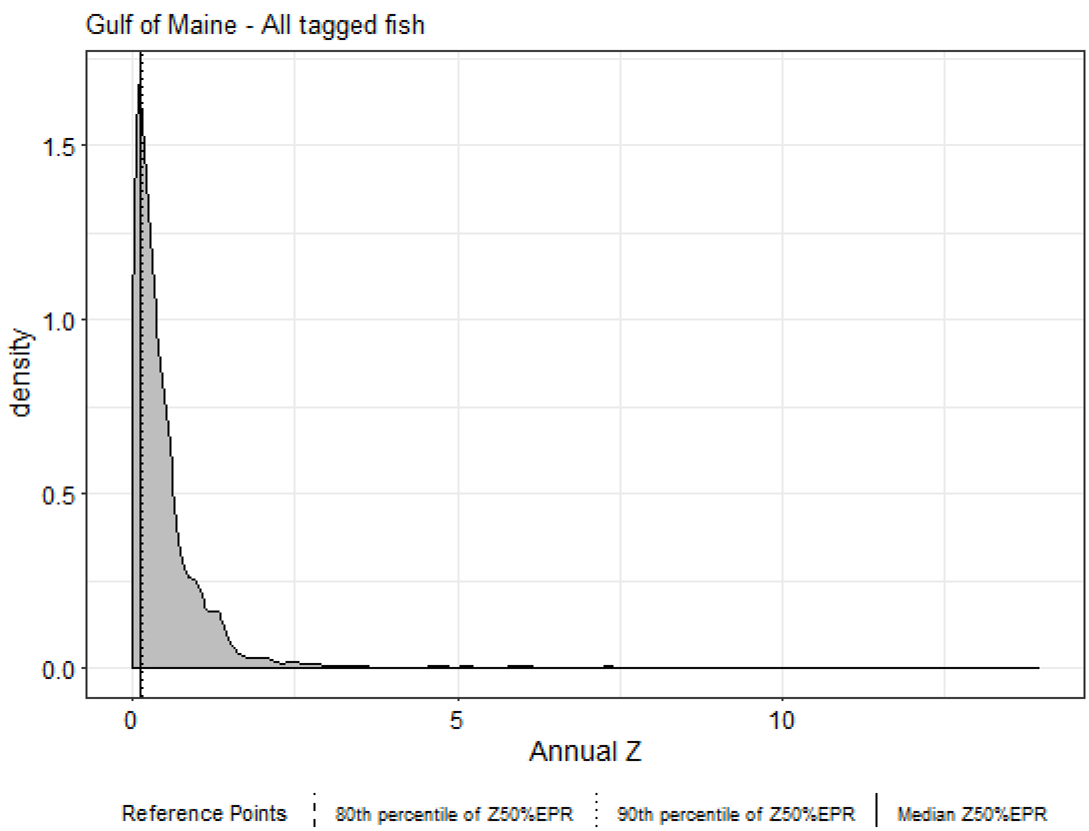

Figure 16. Posterior distribution of Z estimates for the acoustic tagging model for all tagged fish from the Gulf of Maine DPS, plotted with the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution.

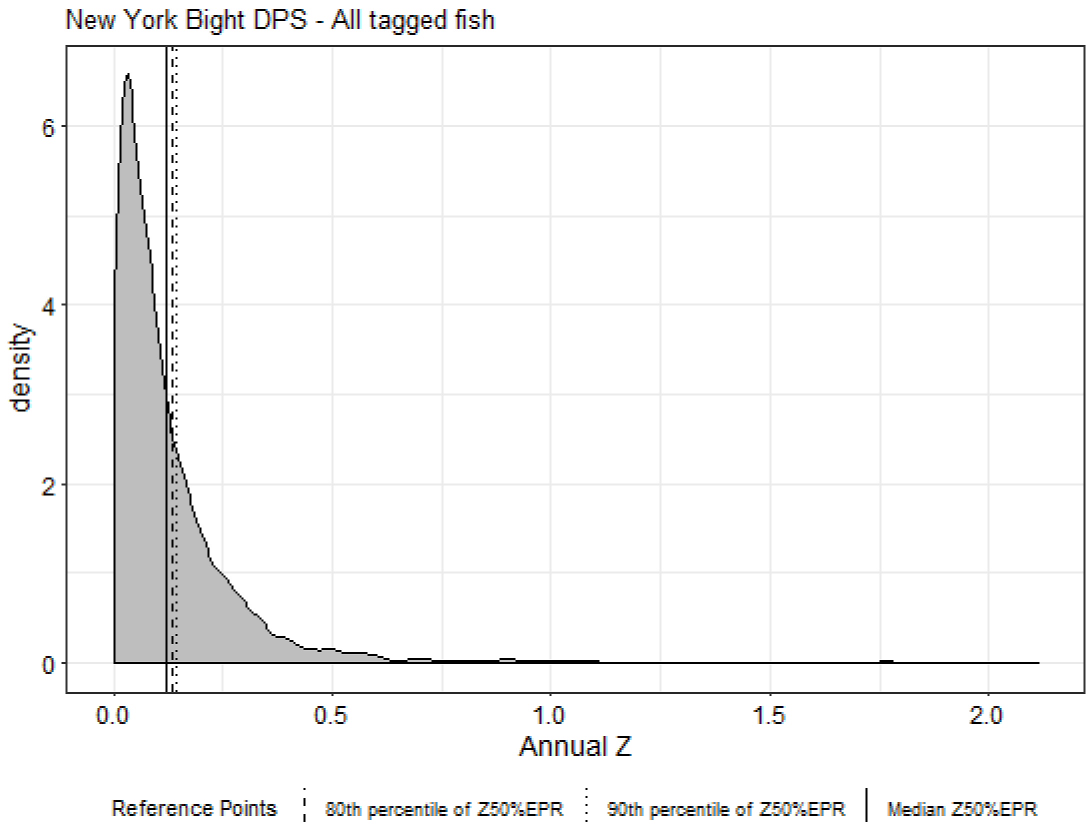

Figure 17. Posterior distribution of Z estimates for the acoustic tagging model for all tagged fish from the New York Bight DPS, plotted with the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution.

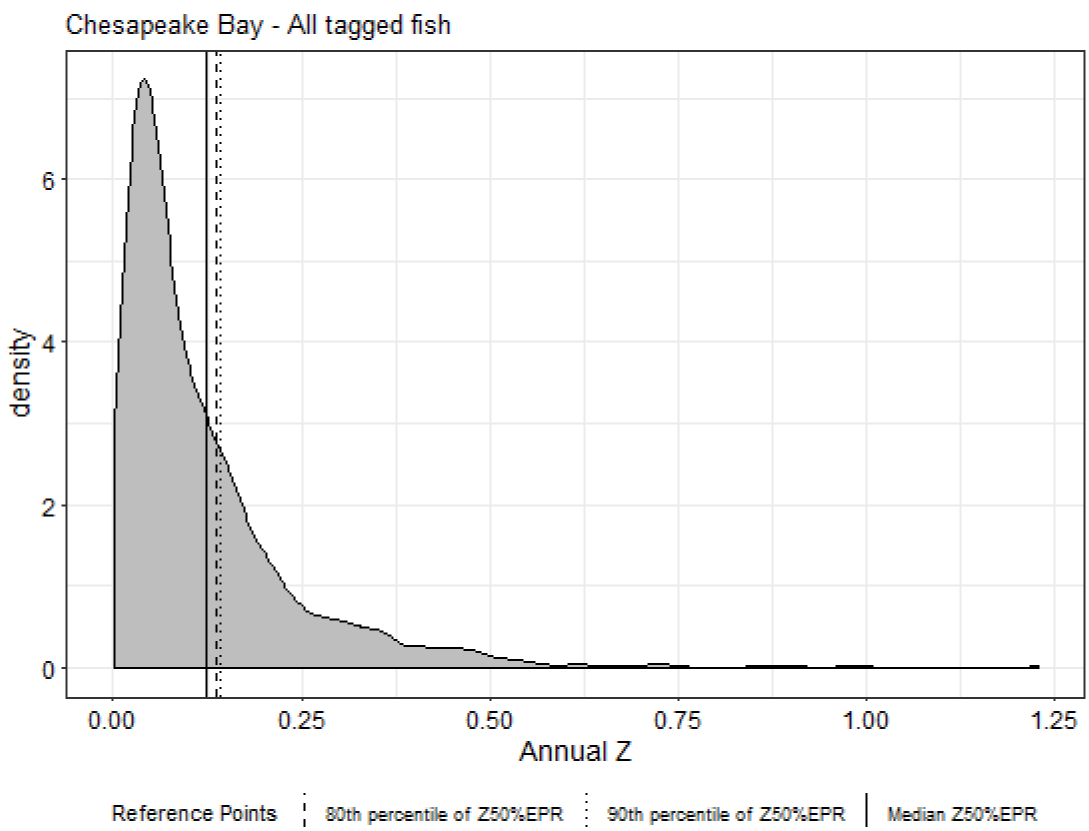

Figure 18. Posterior distribution of Z estimates for the acoustic tagging model for all tagged fish from the Chesapeake Bay DPS, plotted with the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution.

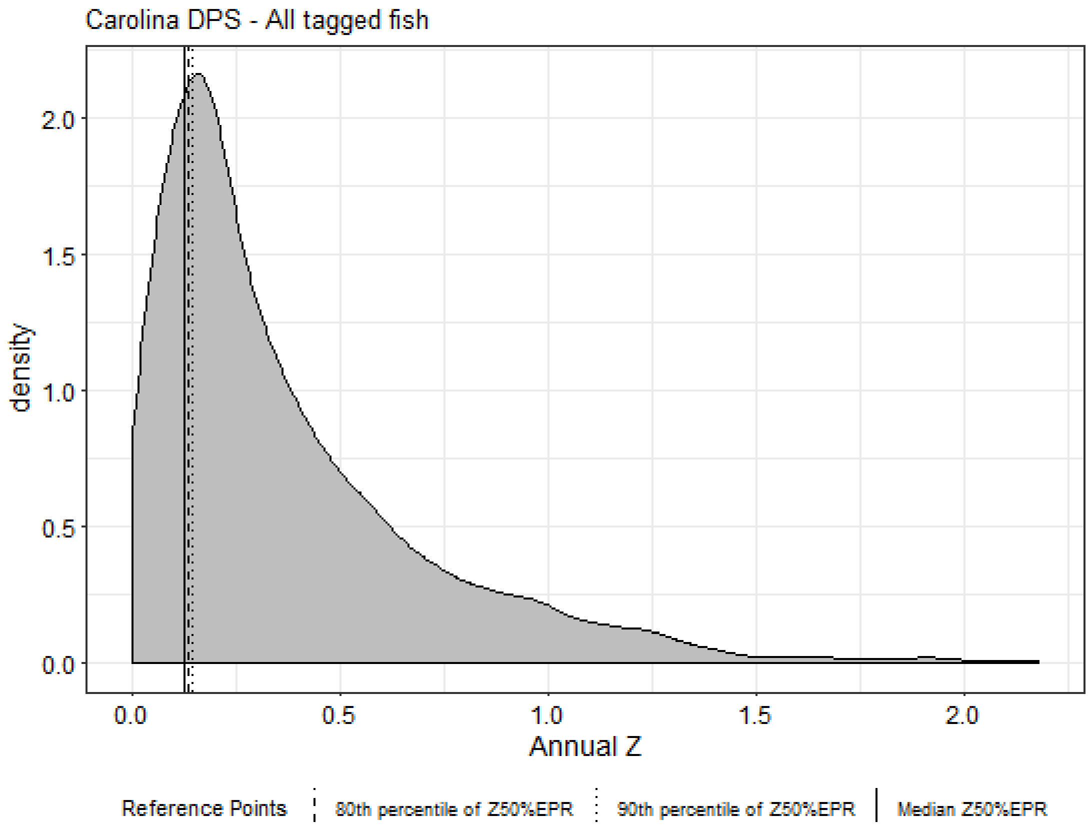

Figure 19. Posterior distribution of Z estimates for the acoustic tagging model for all tagged fish from the Carolina DPS, plotted with the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution.

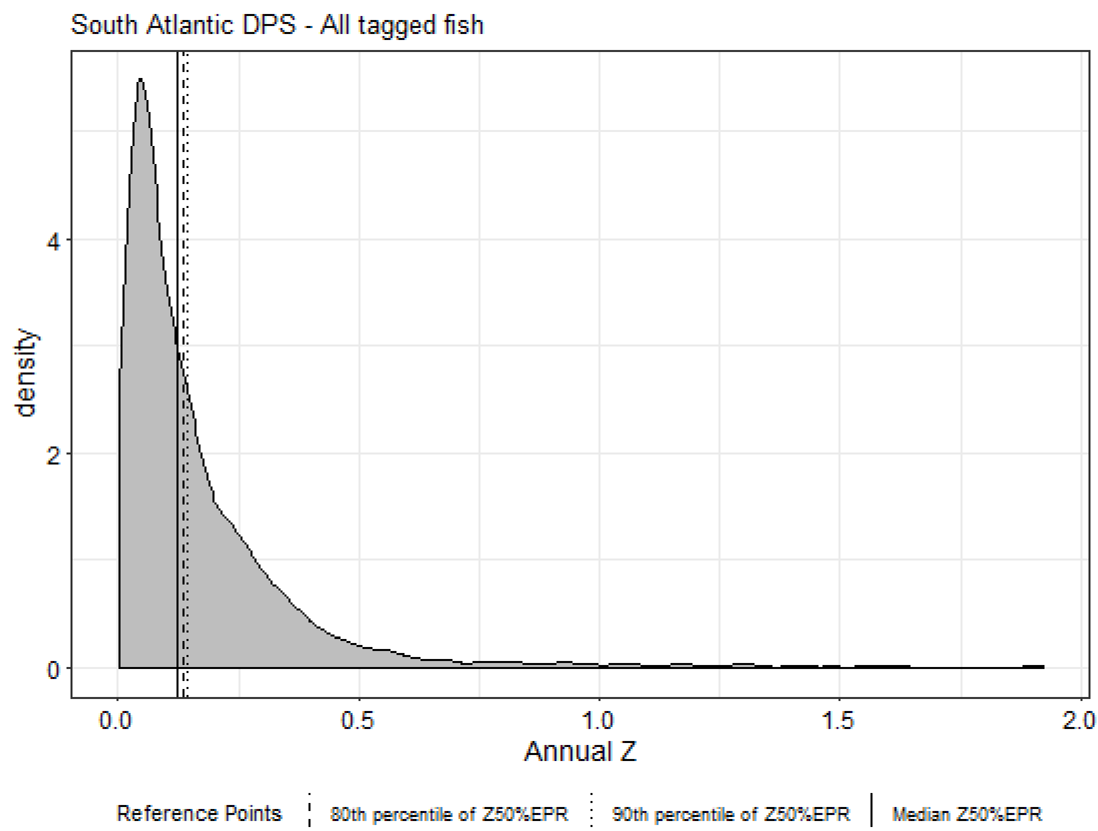

Figure 20. Posterior distribution of Z estimates for the acoustic tagging model for all tagged fish from the South Atlantic DPS, plotted with the 50th, 80th, and 90th percentile of the $Z_{50\%EPR}$ distribution.

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Atlantic States Marine Fisheries Commission

Appendix A-B to the

Atlantic Sturgeon 2017 Stock Assessment Report

Draft for Management Board Review

Atlantic States Marine Fisheries Commission
Vision: Sustainably Managing Atlantic Coastal Fisheries

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APPENDICES

1.0 APPENDIX A – HABITAT

1.1 Brief Overview of Habitat Requirements

The Atlantic sturgeon is an anadromous species found in Atlantic Coastal waters of the United States, and major river basins from Labrador (Churchill River, George River, and Ungava Bay), to Port Canaveral and Hutchinson Island, Florida (Van den Avyle 1984). Historically, Atlantic sturgeon once inhabited northern Europe as well, but since have become extinct (ASSRT 2007). According to historical records, important sturgeon fisheries existed in nearly all Piedmont river basins on the Atlantic Coast at some point in time (Goode 1887). Early accounts of sturgeon fishery landings did not distinguish between Atlantic sturgeon and the smaller shortnose sturgeon (*Acipenser brevirostrum*). However, it is likely that the accounts referred to the larger and more valuable Atlantic sturgeon. Following intense exploitation for food, and construction of mainstem river dams during the 19th and early 20th centuries, sturgeon populations were drastically reduced throughout their range and extirpated in some rivers (ASMFC 1998; USFWS-NMFS 1998; ASSRT 2007). Scientists believe that spawning populations of Atlantic sturgeon were extirpated from the St. Marys River in Georgia, the Housatonic River in Connecticut, the Connecticut River, the Taunton River in Massachusetts and Rhode Island, and all Maryland and Pennsylvania tributaries of the Chesapeake Bay (Burkett and Kynard 1993; Rogers and Weber 1995; ASMFC 1998; USFWS-NMFS 1998; ASSRT 2007).

Atlantic sturgeon are motile, long lived, and use a wide variety of habitats. Atlantic sturgeon require freshwater habitats for reproduction and early life stages, in addition to hard bottom substrate for spawning (Vladykov and Greeley 1963; Huff 1975; Smith 1985b). Coastal migrations and frequent movements between the estuarine and upstream riverine habitats are characteristic of this species (ASMFC 1998). In some systems, Atlantic sturgeon may prefer extensive reaches of silt-free higher gradient boulder, bedrock, cobble-gravel, and coarse sand substrates for spawning habitat (Brownell et al. 2001). Juvenile and adult Atlantic sturgeon frequently congregate in upper estuary habitats around the saltwater interface, and may travel upstream and downstream throughout the summer and fall, and during late winter and spring spawning periods. Adult Atlantic sturgeon may spend many years between spawning periods in marine waters (Brundage and Meadows 1982; Bain 1997; ASMFC 1998; USFWS-NMFS 1998; Savoy and Pacileo 2003; ASSRT 2007).

Much of the habitat information on Atlantic sturgeon remains incomplete. Due to the relatively low numbers of fish in many river basins, habitat utilization patterns have been difficult to establish with certainty (Collins et al. 2000a). Below is a discussion of some of the general habitat requirements for the Atlantic sturgeon. More detailed habitat-related information on the river and estuarine systems contained in each DPS is included within the pertinent DPS section of this report.

1.2 Spawning habitat

Since adult Atlantic sturgeon migrate through rivers and estuaries during their spawning migration, the discussion of adult Atlantic sturgeon estuarine and spawning habitat utilization patterns will be combined in this section. For the purposes of this report, female spawning adults are at least 15 years of age and are a minimum of 1800 mm fork length (FL) or 2000 mm TL. Male adult Atlantic sturgeon are 12 to 20 years of age and between 1350 and 1900 mm FL or 1500 and 2100 mm TL (Bain 1997). See Table 1 for information on length-at-age.

Spawning location (ecological)

A study by Collins et al. (2000b) indicated that adult Atlantic sturgeon in South Carolina use a wide variety of habitats during the summer. They found sturgeon in the upper fresh/brackish interface zone, the lower interface zone, and in the high salinity portions of the estuary in the Edisto River, South Carolina. Atlantic sturgeon were present in this river from March to October. During the winter, southern Atlantic sturgeon resided in the ocean (Collins et al. 2000b). Adult Atlantic sturgeon in southern rivers exhibit behavior much like gulf sturgeon (*Acipenser oxyrinxhus desotoi*) in that they spend nine months within the river system and three winter months in marine waters (Post et al. 2014).

Most studies indicate that after spawning, Atlantic sturgeon migrate to salt water (Vladykov and Greeley 1963); these down-estuary migrations may occur over several months (Bain 1997) or several weeks (Smith et al. 2015, Ingram and Peterson 2016). In the St. Lawrence River, migrations downstream have been reported from September through November (Scott and Crossman 1973). Hatin et al. (2002) found that many Atlantic sturgeon were gone from the upper St. Lawrence River by late September in some years, while in other years, the sturgeon remained in the upper river through early December. In the Hudson River, females migrate back to salt water immediately following spawning, while males remain until the onset of cold temperatures in the fall (Smith 1985a). Additionally, Bain et al. (2000) reported post-spawn adult sturgeon and older juveniles congregating in deep-water habitat during the summer in the Hudson River, New York.

Spawning and the saltwater interface

Atlantic sturgeon generally spawn in tidal freshwater regions of estuaries but may spawn in nontidal freshwater rivers in the southeastern part of their range. Most studies report that Atlantic sturgeon spawn in freshwater above the salt wedge in estuaries (Dovel 1978, 1979; Smith 1985b; Van Eenennaam et al. 1996; Bain et al. 2000). For instance, Dovel (1978, 1979) reported that Atlantic sturgeon in the Hudson River, New York, spawn in freshwater above the salt wedge. Smith (1985a) suggested that spawning fish may migrate seasonally, following the salt front upriver as the season progresses. Dovel and Berggren (1983) reported that most spawning occurred between rkm 56 and 132 in the Hudson River. However, Van Eenennaam et al. (1996) suggest that these results might be questionable because the salt wedge extends to rkm 98. Atlantic sturgeon eggs cannot tolerate high salinity; thus it is more likely that sturgeon spawn above the salt wedge and not in brackish waters (Van Eenennaam et al. 1996). In addition, Van Eenennaam et al. (1996) found ovulating sturgeon around rkm 136 in the Hudson River system.

Spawning substrate associations

Substrate is a key habitat parameter for Atlantic sturgeon because a hard bottom substrate is required for successful egg attachment and incubation (Vladykov and Greeley 1963; Huff 1975; Smith 1985b; Gilbert 1989; Smith and Clugston 1997; Secor et al. 2002; Bushnoe et al. 2005). Within rivers, the areas of cobble-gravel, coarse sand, and bedrock outcrops, which occur in the rapids complex, may be considered prime habitat (Table 2). In northern rivers, these areas are nearer to the salt-wedge than in southern rivers. South of the Chesapeake Bay, nearly all rivers have extensive rapid-complex habitats in and/or near the fall line zone; these areas are generally at least 100 km upstream from the saltwater interface (P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication). This habitat provides Atlantic sturgeon with well-oxygenated water, clean substrates for egg adhesion, crevices that serve as shelter for post-hatch larvae, and macroinvertebrates for food (P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication).

Some researchers have attempted to identify likely spawning areas for Atlantic sturgeon using modeling techniques. Brownell et al. (2001) developed a Habitat Suitability Index (HSI) model for spawning Atlantic sturgeon and early egg development, and found that cobble/gravel (64 mm to 250 mm) was the optimal spawning substrate for Atlantic sturgeon. Boulder (250 mm to 4000 mm) scored the second highest in the model, and silt/sand (<2.0mm) and mud/soft clay/fines scored the lowest. The curve and the data values were based on the shortnose sturgeon model, and factors such as oxygenation, substrate embeddedness, available egg attachment sites, protection of eggs from predators, light intensity, and solar warming were all hypothesized to be available in cobble/gravel and boulder substrates (Brownell et al. 2001).

Bushnoe et al. (2005) identified potential spawning areas for Atlantic sturgeon in Virginia based on the location of suitable hard substrate and a variety of other water quality parameters, including temperature, dissolved oxygen, pH, salinity, hardness, and conductivity. They concluded that Turkey Island oxbow and the James Neck oxbow in the James River, the Appomattox River, the Mattaponi, and Pamunkey River in the York River system, and the Rappahannock River all represented potential spawning habitat (Bushnoe et al. 2005).

Smith et al. 2015 identified spawning locations in the Roanoke River by deploying artificial spawning substrate and collecting eggs. The locations were just below the rapids in Weldon, NC where the substrate is bedrock outcrops and gravel.

Spawning depth associations

Atlantic sturgeon have been documented spawning in water from 2.4-60 meters in depth (Table 3) (Borodin 1925; Dees 1961; Scott and Crossman 1973; Shirey et al. 1999; Bain et al. 2000; Collins et al. 2000b; Caron et al. 2002; Hatin et al. 2002). Spawning depth seems to vary greatly depending upon the available depth range.

A recent HSI model developed by Brownell et al. (2001) showed that the optimal depth range in the south for spawning Atlantic sturgeon and egg incubation ranged from 2.4-8 meters. It should be noted that depth in this model had a maximum range of eight meters because areas where spawning is likely to occur (areas above the fall zone) in the South are not much deeper than eight meters (P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication). Smith et al. described water depths at their artificial substrate locations as less than five meters during low flow.

Spawning water temperature

Atlantic sturgeon reportedly spawn in waters where temperatures range from 13-26°C (Table 4; Borodin 1925; Huff 1975; Smith 1985b; Bain et al. 2000; Caron et al. 2002; Hatin et al. 2002). Temperature appears to be a universal determining factor in spawning migration times. Migration temperatures seem to be uniform across the Atlantic Coast, with southern fish migrating earlier in the spring and northern fish following a few weeks later once the waters reach the appropriate temperature. Generally, for spring migrations, male Atlantic sturgeon commence upstream migration when waters reach around 6°C (Smith et al. 1982; Dovel and Berggren 1983; Smith 1985a). Females usually follow a few weeks later when temperatures are closer to 12-13°C (Dovel and Berggren 1983; Smith 1985a, 1985b; Collins et al. 2000b). Spawning has been found to occur most often in waters 13-21°C (Ryder 1888; Scott and Crossman 1973; Bain et al. 2000; Caron et al. 2002). In addition, Mohler (2003) stated in the "Culture Manual for Atlantic sturgeon" that the preferred temperature for induced spawning in cultured sturgeons is between 20°C and 21°C. However, with respect to fall spawn fish, recent work in the Roanoke River show spawning occurring when water temperatures were 24-25°C and the onset of spawning migrations beginning at water temperatures were near 28°C. Once spawning was complete outgoing migrations occurred when water temperatures were near 20°C (Smith et al. 2015)

Spawning water velocity/flow

Atlantic sturgeon lay their eggs in flowing water (Vladykov and Greeley 1963; Van den Avyle 1983). Modeling studies suggest that the optimal water velocities for Atlantic sturgeon spawning range from 0.46-0.76 meters per second. Furthermore, velocities lower than 0.06 meters per second and higher than 1.07 centimeters per second are unsuitable for spawning (Crance 1987). Eggs from fall spawn Roanoke River fish were collected during discharge flows of 55-297 cubic meters per second (Smith et al. 2015). A recent HSI developed for spawning Atlantic sturgeon showed that optimal water velocity for spawning and egg incubation ranged from 0.2-0.76 meters per second (Brownell et al. 2001).

Spawning and other water parameters

Reports of gulf sturgeon (*Acipenser oxyrinchus desotoi*) indicate that other important habitat factors include hardness and conductivity. Sulak and Clugston (1999) and Fox et al. (2000) describe the spawning sites of gulf sturgeon on the Suwannee River, Florida, as having a moderate Ca++ ion concentration and conductivity ranging from 10 µS to 110µS. Bushnoe et al. (2005) used these criteria to identify Atlantic sturgeon spawning habitat in rivers in Virginia. More research will be needed to clarify the importance of these parameters.

1.3 Egg and larval habitat

Geographical and temporal movement patterns

Due to a low tolerance for saline environments, Atlantic sturgeon eggs must be spawned upstream of the salt front (Van Eenennaam et al. 1996). On the other hand, research on the conspecific *A. o. desotoi* (Gulf sturgeon) indicates that Atlantic sturgeon probably select regions with high conductivity, above the salt wedge, but below fall line regions containing freshwater with low conductivity (Sulak and Clugston 1999; Fox et al. 2000).

Eggs are deposited into flowing water and disperse following fertilization. After approximately twenty minutes, the demersal eggs become strongly adhesive and attach to hard substrates (Murawski and Pacheco 1977; Van den Avyle 1983). The eggs hatch after 94 to 140 hours; after a pelagic yolksac larval period of about 10 days, late-stage larvae settle in the demersal habitat. This will be the principal type of habitat for the remainder of the sturgeon's life (USFWS-NMFS 1998).

Little is known about the habitat of larval Atlantic sturgeon. Larval Atlantic sturgeon are less than 4 weeks old, with lengths less than 30 mm TL (Van Eenennaam et al. 1996); they are assumed to inhabit the same riverine or estuarine areas where they were spawned (Bain et al. 2000; Kynard and Horgan 2002). Newly hatched larvae are active swimmers and leave the bottom to swim in the water column. Once the yolk sac is absorbed, the larvae exhibit benthic behavior (Smith et al. 1980, 1981). Bath et al. (1981) caught free embryos by actively netting the bottom near the spawning area, demonstrating that early life stages are benthic.

For a more controlled experiment, Kynard and Horgan (2002) raised captive Atlantic sturgeon in chambers. They found that upon hatching, the embryos sought cover where they remained for a few days. The fish left cover and began to migrate around day 8. Following the passage of a few more days, the larvae stopped migrating and exhibited foraging behavior. Downstream migration resumed during the juvenile period when the temperature dropped. Atlantic sturgeon larvae are capable of dispersing long distances. Movement occurs at night during the first half of the larval migration; eventually, the fish become active during both the day and night (Kynard and Horgan 2002). Kynard and Horgan (2002) hypothesize that this foraging behavior is a way to reduce daytime predation while the larvae are still developing, yet still enable them to forage when there is daylight to aid in the visual detection of prey.

Mohler (2003) found similar results. Cultured Atlantic sturgeon were mostly pelagic after hatching and exhibited a "swim up and drift down" behavior. After three to four days, fry began to exhibit benthic clumping behavior and swam against the direction of water flow in the tank. Fry remained benthic for approximately four days, before moving around the tank in search of food. At this stage, the larval Atlantic sturgeon were noted to be pelagic, until live brine shrimp were thrown into the tank and the fry moved to the bottom of the tank to feed. Atlantic sturgeon fry did not actively seek out a food source, but rather waited until the currents brought food to them (Mohler 2003).

The ASSRT (2007) notes that downstream dispersal patterns may be different among watersheds:

> Differences in the innate dispersal patterns of sturgeon species in early life stages also suggest that there are markedly separated differences in behavior between subpopulations of sturgeon (B. Kynard, USGS Conte Anadromous Fish Research Center, personal communication). Boyd Kynard, a researcher at the USGS Conte Anadromous Fish Research Center (Turner Falls, Massachusetts), has noted major differences in innate dispersal patterns of early life stage sturgeon species including *Acipenser fulvescens* (Wolf and Menominee rivers), *A. brevirostrum* (Connecticut and Savannah rivers), *A. transmontanus* (Sacremento and Kootenai rivers), and Atlantic/Gulf sturgeon subpopulations (Hudson and Suwannee rivers). This research suggests that Atlantic sturgeon are likely adapted to unique features of their watershed, considering their genetic discreteness and differing migration behaviors. These findings are similar to research conducted on striped bass (*Morone saxatilis*), an anadromous fish like Atlantic sturgeon, which correlated egg characteristics (e.g., egg diameter, egg density, etc.) with watershed type (e.g., low, medium, high energy) (Bergey et al. 2003). Differences in egg characteristics likely are the result of subpopulation adaptations to the watershed, but the manner in which these adaptations were produced was not determined. The ASSRT concluded that unique behavioral and physiological traits likely exist for each extant subpopulation of Atlantic sturgeon – except those that share a drainage basin (similar adaptations) (from ASSRT 2007).

Eggs, larvae, and the saltwater interface

Salinity is very important to the survival of sturgeon eggs (McEnroe and Chech 1985; Jenkins et al. 1993; Van Eenennaam et al. 1996). Eggs are spawned in regions between the salt front and the fall-line of large rivers or estuarine tributaries (Borodin 1925; Leland 1968; Scott and Crossman 1973; Crance 1987; Bain et al. 2000). Bath et al. (1981) collected larval sturgeon in salinities of 0-22 parts per thousand (ppt) in the Hudson River, New York. Dovel and Berggren (1983) recorded sturgeon embryos from river kilometer (rkm) 60 to rkm 148, which includes some brackish water. However, Van Eenennaam et al. (1996) report that Atlantic sturgeon embryo habitat must be well above the salt wedge, due to their low tolerance to salinity. Other species of sturgeon show this same salt intolerance. For example, free embryos, larvae, and age-0 juveniles of white sturgeon and shortnose sturgeon also exhibit low salt tolerance. Mortality has been documented at salinities as low as 5-10 ppt (McEnroe and Chech 1985; Jenkins et al. 1993).

Egg and larval substrate associations

Atlantic sturgeon deposit their eggs on benthic hard substrate (Gilbert 1989; Smith and Clugston 1997). The eggs contain adhesive strings that attach to stones, shells, sticks, and weeds (Vladykov and Greeley 1963; Colette and MacPhee 2002). Hard substrate is also important to larval Atlantic sturgeon, as it provides refuge from predators (Kieffer and Kynard 1996; Fox et al. 2000). A study by Kynard and Horgan (2002) showed that after hatching, embryos immediately sought cover. Some scientists hypothesize that rapid-complex habitats might serve as hatcheries for Atlantic sturgeon because they provide cover, well-oxygenated hiding places, and a food source of microinvertebrates (P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication).

Egg and larval depth associations
The importance of depth to embryonic and larval Atlantic sturgeon has not been thoroughly discussed in the literature, but it is likely not as important to this species as benthic substrate characteristics (P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication). However, depth of migrating larvae would be an important issue to address for a project inserting intake structures into a river near nursery grounds (W. Patrick, NOAA Fisheries Service, personal communication). Additionally, Bain (1997) found that embryos remain on the bottom of deep channel habitats, and Bath et al. (1981) collected larval samples from 9.1-19.8 meters.

Egg and larval water temperature
Smith et al. (1980) found that Atlantic sturgeon eggs optimally hatch at temperatures ranging from 18°C to 20°C. Hatching occurs approximately 94 to 140 hours after egg deposition at temperatures of 20°C and 18°C, respectively, and larvae assume a demersal existence (Smith et al. 1980). Similarly, Mohler (2003) states that in a culture setting, a temperature range of 20°C to 21°C is favorable for the incubation of Atlantic sturgeon eggs. Temperatures below 18°C prolong hatching and increase the risk of fungal infestation to dead eggs, which in turn can kill the viable individuals. Hatching occurs in 60 hours at this temperature range (Mohler 2003). Bath et al. (1981) collected larval sturgeon in the Hudson Bay, New York, in temperatures of 15.0°C to 24.5°C. Researchers recommend that first-feeding cultured Atlantic sturgeon fry be kept in water temperatures of 15°C to 19°C, and that a temperature of 19°C yields higher growth rates (Kelly and Arnold 1999; Mohler 2003).

1.4 Juvenile habitats
Geographical and temporal movement patterns
For the purposes of this report, a sturgeon will be considered juvenile according to the guidelines found in the ASSRT (2007), which broke juveniles down as such:

1) Young-of-the-year (YOY; age-0): Thought to be natal to the river they were captured in and used as evidence in identifying extant populations
2) Juveniles or subadults (age-1 to age-15): Considered possible migrants from other systems though the older individuals could be reproducing (maybe in more northern waters)
3) Mature adults (age-15) or 150 cm TL: Generally considered mature, and if they were captured in a river during the spawning season it was assumed that they were going to spawn in that river (used to identify extant populations) (ASSRT 2007)

Most researchers have found that growth rates and sizes of Atlantic sturgeon vary by latitude, with rapid growth occurring in the southern latitudes and larger maximum sizes occurring in the north (Vladykov and Greeley 1963; Dovel and Berggren 1983; Smith 1985a, 1985b; Collins et al. 1996; Stevenson and Secor 1999). However, Johnson et al. (2005), working off the New Jersey coast, found that their data did not fit this pattern. They suggested that this might have been due to a mixed sample composed of Atlantic sturgeon from different populations that had different growth rates (Johnson et al. 2005). These findings are partially supported by genetic studies performed by Waldman et al. (1996a) who showed that approximately 90% of the Atlantic sturgeon catch in the New York Bight was of Hudson River origin.

The ASSRT (2007) notes the following information on juvenile Atlantic sturgeon migrations:

> Upon reaching a size of approximately 76 to 92 cm, the sub-adults may move to coastal waters (Murawski and Pacheco 1977; Smith 1985b), where populations may undertake long-range migrations (Dovel and Berggren 1983; Bain 1997; T. King, USGS Leetown Science Center, Aquatic Ecology Laboratory, Kearneysville, West Virginia, supplemental data). Tagging and genetic data indicate that sub-adult and adult Atlantic sturgeon may travel widely once they emigrate from rivers. Sub-adult Atlantic sturgeon wander among coastal and estuarine habitats, undergoing rapid growth (Dovel and Berggren 1983; Stevenson 1997). These migratory sub-adults, as well as adult sturgeon, are normally captured in shallow (10 to 50m) near shore areas dominated by gravel and sand substrate (Stein et al. 2004; from ASSRT 2007).

Juvenile Atlantic sturgeon are thought to remain close to their natal habitats within the freshwater portion of the estuary for at least one year before commencing migration out to sea (Secor et al. 2000b). Migrations out to coastal areas occur between two and six years of age (Smith 1985b), and are seasonal, with movement occurring north in the late winter, and south in fall and early winter (Dovel 1978; Smith 1985b; USFWS-NMFS 1998). Seasonal migrations of juveniles are regulated by changes in temperature gradients between fresh and brackish waters (Van Den Avyle 1984). For example, hatchery-reared juveniles released in the Chesapeake Bay used brackish waters close to the estuary mouth during colder months, and moved upriver during warmer months (Secor et al. 2000b).

Similar behavior has been seen in several river systems, including the Delaware River, Hudson River, and the Winyah Bay system (South Carolina; Brundage and Meadows 1982; Smith et al. 1982; Dovel and Berggren 1983; Gilbert 1989). Dovel and Berggren (1983) reported a mass down-estuary migration of juvenile Atlantic sturgeon in the Hudson Estuary, New York, when the temperature dropped below 20°C. Down-river/down-estuary migrations peak at the end of October in the Hudson system. At this time, many juveniles overwinter in deep holes, while others leave the Hudson River and move south along the Atlantic coast (Dovel and Berggren 1983). In contrast, Moser and Ross (1995) found that juvenile sturgeon in the Cape Fear River, North Carolina, kept the same center of distribution near the saltwater-freshwater interface year round. However, these fish were unable to move upriver because of the location of the Cape Fear Lock and Dam No. 1, just above the estuary (0.5 ppt interface; P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication).

Coastal features or shorelines where migratory Atlantic sturgeon commonly aggregate include the Bay of Fundy, Massachusetts Bay, Rhode Island, New Jersey, Delaware, Delaware Bay, Chesapeake Bay, and North Carolina, which presumably provide better foraging opportunities (Dovel and Berggren 1983; Johnson et al. 1997; Rochard et al. 1997; Kynard et al. 2000; Eyler et al. 2004; Stein et al. 2004; Dadswell 2006). Smith (1985b) stated that fish tagged off South Carolina migrated as far north as Pamlico Sound and Chesapeake Bay. Most data indicate that Atlantic sturgeon in the northern rivers travel more extensively than those in the southern rivers (ASMFC 1998). However, fish from the southern region have been observed to travel from Florida to New York via acoustic telemetry (Post et al. 2014).

Later-stage juveniles often enter and reside in non-natal rivers that lack active spawning sites (Bain 1997). Inter-estuarine migrations have been documented extensively in the literature (Dovel and Berggren 1983; Smith 1985b; Welsh et al. 2002; Savoy and Pacileo 2003). These non-natal estuarine habitats serve as nursery areas, providing abundant foraging opportunities and thermal and salinity refuges. Therefore, these areas are very important to the Atlantic sturgeon's survival (Moser and Ross 1995).

Juveniles and the saltwater interface

There is a large amount of variation in the salinity tolerance of juvenile Atlantic sturgeon (Table 5). Some Atlantic sturgeon may occupy freshwater habitats for two or more years, while others move downstream to brackish waters when the water temperature drops (Scott and Crossman 1973; Dovel 1978; Hoff 1980; Lazzari et al. 1986). Additionally, bioenergetic studies on YOY juveniles indicate poor survival at salinities greater than 8 ppt, but euryhaline behaviors are exhibited by juveniles age-1 and 2 (Niklitschek 2001).

Juvenile substrate associations

Kynard et al. (2000) reported that juvenile Atlantic sturgeon in Massachusetts were found mostly over sand substrates, but other associated substrates included rock, cobble, and mud (Kynard et al. 2000). Savoy and Pacileo (2003) found that 85% of the juvenile Atlantic sturgeon caught in Long Island Sound were in mud or transitional bottom habitats. Correspondingly, Bain et al. (2000) found juveniles off Long Island Sound over mud substrates. In the Hudson River, Haley et al. (1996) collected juvenile Atlantic sturgeon at sites that had silt substrates. However, the researchers state that it is unclear whether this represents habitat preference or habitat use, as the majority of sites sampled was composed of this substrate (Haley et al. 1996). In the same system, Bain et al. (2000) documented juveniles over clay, silt, and sand substrates. Stein et al. (2004) found migratory subadults, as well as adult Atlantic sturgeon, generally in areas dominated by gravel and sand substrate. Armstrong 1999 captured 66.2% of fish over organic rich mud, 7.0% over sand and 26.8% over mixed organic rich mud and sand within the Albemarle Sound, North Carolina.

Juvenile depth associations

Many researchers have found that juvenile Atlantic sturgeon tend to congregate in deep waters (**Error! Reference source not found.**; Moser and Ross 1995; Bain et al. 2000; Savoy and Pacileo

2003). Moser and Ross (1995) report that juvenile Atlantic sturgeon in North Carolina use deep and cool areas as thermal refuges, particularly in the summertime.
Juvenile Atlantic sturgeon farther north also seem to prefer deeper areas. Bain et al. (2000) stated that those juveniles that did not migrate out to sea during the winter occupied deep-water habitat in the Hudson River, New York. Further north, Savoy and Pacileo (2003) found that juvenile Atlantic sturgeon in Long Island Sound preferred the deep-water areas within the central basin of the Sound. They reported that 71% of the Atlantic sturgeon were caught in areas of the deepest stratum (deeper than 27 m). This area comprised only 26% of the available habitat (Savoy and Pacileo 2003). Savoy and Pacileo (2003) also reported that Atlantic sturgeon were rarely caught in the shallow areas (5-9 meters), and that the 20 fish caught in the shallow stratum were fish migrating in and out of Long Island Sound. Contrary to this, Armstrong 1999 found juveniles in Albemarle Sound preferred depths of 3.6-5.4 meters, however sample size was limited.

While the majority of juvenile Atlantic sturgeon have been collected at the deepest depths available, some have also been collected in shallower waters (**Error! Reference source not found.**). A telemetry study on hatchery-released age-1 juveniles showed that most Atlantic sturgeon used depths less than 6 meters (Secor et al. 2000b).

Juvenile water temperature
Temperature is a key habitat parameter for the structuring of juvenile Atlantic sturgeon summer habitat (Table 7; Niklitschek and Secor 2005). Temperatures more than 28ºC are judged to have sublethal effects on Atlantic sturgeon. An increase in temperature coupled with low dissolved oxygen and high salinity can cause loss of juvenile Atlantic sturgeon nursery habitat. Their low tolerance to temperature and low oxygen is of concern during the first two summers of life when juveniles are restricted to lower saline waters and are unable to seek out thermal refuge in deeper waters (Secor and Gunderson 1998; Niklitschek 2001; Niklitschek and Secor 2005). Armstrong 1999 identified the Albemarle Sound as a relatively shallow system with a lack of cool oxygenated refugia during summer. However, the July collections occurred along the southern shore in waters less than three meters and temperatures approached 30°C. Armstrong 1999 suggests that given its long history of association with the Albemarle Sound, sturgeons may be especially adapted to withstand these summer water quality constraints.

Temperature may also be an important habitat parameter regarding migration patterns, since juvenile Atlantic sturgeon appear to migrate in response to certain temperature thresholds. Dovel and Berggren (1983) stated that downstream migrations in the Hudson River began when temperatures reached 20°C and peaked between 12°C and 18°C. By the time the temperature was 9°C, juvenile Atlantic sturgeon had congregated for the winter in deep holes (Dovel and Berggren 1983) where water temperatures can approach 0°C (Bain et al. 2000). Similar migration patterns were noted by Dovel (1979) in the Hudson River and by Brundage and Meadows (1982) in the Delaware River. However, Lazzari et al. (1986) reported that juvenile Atlantic sturgeon in the Delaware River used the tidal portion of the bay for a longer period and at lower temperatures than reported by other researchers. They found Atlantic sturgeon in these areas through December when temperatures approached 0.5°C.

During their biotelemetry studies, Kieffer and Kynard (1993) found that juvenile Atlantic sturgeon in the Connecticut and Merrimack Rivers, Massachusetts, did not enter the river until mid-May when the temperatures were 14.8°C to 19.0°C. The fish left the river by September or October when river temperatures were 13°C to 18.4°C (Kieffer and Kynard 1993).

Temperature may also affect juvenile Atlantic sturgeon feeding behavior. Mohler (2003) found that in cultured juvenile Atlantic sturgeons, a noticeable decrease in feeding occurred when temperatures dropped to 10°C. However, minimum weight gains were noticed at temperatures as low as 5.4°C, with weight loss occurring at lower water temperatures (Mohler 2003).

Juvenile dissolved oxygen associations
Dissolved oxygen is a very important habitat parameter for juvenile Atlantic sturgeon. A large proportion of Atlantic sturgeon nursery habitat has been degraded because of persistent low levels of dissolved oxygen. Secor and Niklitschek (2001) report that in habitats with less than 60% oxygen saturation (4.3 mg/L to 4.7 mg/L at 22°C to 27°C), YOY fish aged 30 to 200 days, will experience a loss in growth. Mortality of juvenile Atlantic sturgeon has been observed for summer temperatures at levels of less than or equal to 3.3 mg/L (Secor and Niklitschek 2001). Recently, the Chesapeake Bay Program adopted dissolved oxygen guidelines based upon levels that would protect Atlantic and shortnose sturgeon, which show unusually high sensitivity to low oxygen concentrations among estuarine living resources (Secor and Niklitschek 2002; EPA 2003).

1.5 Late Stage Juvenile and Adult Marine Habitat
All estuarine habitats for adult and juvenile Atlantic sturgeon are discussed under previous sections. This section focuses entirely on juvenile and adult Atlantic sturgeon habitat in marine waters.

Geographical and temporal patterns at sea
Juvenile Atlantic sturgeon are known to emigrate out of their natal estuarine habitats and migrate long distances in the marine environment (Murawski and Pacheco 1977); the longest oceanic journey recorded was 1,450 km (Magnin and Beaulieu 1963). Tag returns (n = 120) of juvenile Atlantic sturgeon that were originally tagged in the Delaware River provide insight into the coastal migration of this life stage that encompasses a broad size range (C. Shirey, Delaware Department of Fish and Wildlife, unpublished data). After leaving the Delaware River estuary during the fall, juvenile Atlantic sturgeon were recaptured by commercial fishermen in nearshore waters along the Atlantic coast as far south as Cape Hatteras, North Carolina, where they were recaptured from November through early March. Juvenile Atlantic sturgeon repeatedly crossed the mouth of the Chesapeake Bay and traveled around the Delmarva Peninsula in March and April, with a portion of the tagged fish re-entering the Delaware River estuary. However, many fish continued this northerly coastal migration through the Mid-Atlantic and into southern New England waters where they were recovered throughout the

summer months, primarily in the waters of Massachusetts, Rhode Island, and Long Island, New York. Movements as far north as Maine were documented. A southerly coastal migration was apparent from tag returns reported in the fall. The majority of these tag returns were reported from relatively shallow nearshore fisheries with few fish reported from waters in excess of 25 meters (C. Shirey, Delaware Department of Fish and Wildlife, unpublished data).

Little is known about the habitat use of adult Atlantic sturgeon during the non-spawning season, particularly when the sturgeon return to marine waters (Bain 1997; Collins et al. 2000b). While at sea, adult Atlantic sturgeon have been documented using relatively shallow nearshore habitats (10-50 meters; Stein et al. 2004; Laney et al. 2007; Erickson et al. 2017). It is possible that individual fish select habitats in the same areas, or even possibly school to some extent (Bain et al. 2000; Stein et al. 2004; Laney et al. 2007).

Substrate associations at sea

Stein et al. (2004) reported that Atlantic sturgeon were found mostly over sand and gravel substrate and that they were associated with specific coastal features, such as the mouths of the Chesapeake Bay and Narragansett Bay, and inlets in the North Carolina Outer Banks. Laney et al. (2007) found similar results off the coasts of Virginia and North Carolina. The researchers used GIS layers to analyze data from the Cooperative Winter Tagging Cruise and found that Atlantic sturgeon were located primarily in sandy substrates. However, the authors state that GIS does not depict small-scale sediment distribution, thus only a broad overview of sediment types was used. In addition, sediment sampling done along the North Carolina coast shows that gravel substrates are found a little farther offshore from where the sturgeon were found.

Depth associations at sea

The greatest depth in the ocean at which Atlantic sturgeon have been reported caught was 75 meters (Colette and Klein-MacPhee 2002). Collins and Smith (1997) report that Atlantic sturgeon were captured at depths of 40 meters in marine waters off South Carolina. Stein et al. (2004) investigated data collected by on-board fishery observers from 1989-2000 to determine habitat preferences of Atlantic sturgeon. They found that Atlantic sturgeon were caught in shallow (<60 m) inshore areas of the Continental Shelf. Sturgeon were captured in depths less than 25 meters along the Mid-Atlantic Bight and in deeper waters in the Gulf of Maine (Stein et al. 2004).

The Northeast Fisheries Science Center bottom trawl survey caught 139 Atlantic sturgeon from 1972-1996 in waters from Canada to South Carolina. They found the fish in depths of 7-75 meters, with a mean depth of 17.3 meters. Of the fish caught, 40% were collected at 15 meters, 13% at 13 m, and less than 5% at all the depth strata (NEFC, unpublished data, reviewed in Savoy and Pacileo 2003).

Upon entering the marine habitat, Atlantic sturgeon have been documented near the shore in shallow waters where the depths measure less than 20 meters (Gilbert 1989; Johnson et al. 1997). During their tagging cruise off the coasts of Virginia and North Carolina, Laney et al. (2007) captured Atlantic sturgeon at depths up to approximately 6 m. Vladykov and Greeley

(1963) record a maximum depth of at least 18 m. Additionally, Johnson et al. (2005) reported that Atlantic sturgeon were caught within 5 km of the coast of New Jersey in waters approximately 15-m deep.

For a summary of significant environmental, temporal, and spatial factors that affect the distribution of Atlantic sturgeon at all stages, see Table 8.

1.6 APPENDIX A - Tables and Figures

Table 1. Life stage length and age cut-offs for Atlantic sturgeon.

Life Interval	Age Range (years)	Fork Length (mm)	Total Length (mm)
Larvae	<0.08		≤ 30
Juvenile	0.08-11	~20-1340	~30-1490
Non-spawning adults	≥ 12	≥ 1350	≥ 1500
Female spawners	≥ 15	≥ 1800	≥ 2000
Male spawners	12-20	≥ 1350-1900	≥ 1500-2100

Table 2. Spawning (and post-spawn) substrate type for Atlantic sturgeon along the Atlantic coast.

Substrate	Activity	Location	Citation
Rock and bedrock	spawning	St. Lawrence River, Québec	Hatin et al. 2002
Rock, clay, & sand	spawning	St. Lawrence River, Québec	Caron et al. 2002
Irregular bedrock, silt, & clay	spawning	Hudson River, NY	Bain et al. 2000
Clay/silt with rocky shoreline	post-spawning	Hudson River, NY	Bain et al. 2000
Hard clay	spawning	Delaware River	Borodin 1925
Small rubble & gravel	spawning	Delaware River	Dees 1961
Clay	spawning	Delaware River	Scott & Crossman 1973
Limestone	spawning	Edisto River, SC	Collins et al. 2000b
Fine mud, sand, pebbles, & shell	post-spawning	Edisto River, SC	Collins et al. 2000b
Cobble/gravel	spawning	HSI Model	Brownell et al. 2001
Bed Rock, fine gravel, course sand	spawning	Roanoke River, NC	Smith et al. 2015

Table 3. Spawning (and non-spawn) depth ranges for Atlantic sturgeon along the Atlantic coast.

Depth Range (m)	Status	Location	Citation
10 - 22	Spawning	St. Lawrence River, Québec	Caron et al. 2002
17 - 21	Non-spawning	St. Lawrence River, Québec	Caron et al. 2002
15 - 27 (mean)	All	St. Lawrence River, Québec	Hatin et al. 2002
6 - 60	Spawning	St. Lawrence River, Québec	Hatin et al. 2002
>7.6	Migrating	Hudson River, NY	Dovel and Berggren 1983
12 - 27	Spawning	Hudson River, NY	Bain et al. 2000
11 - 13	Spawning	Delaware River	Borodin 1925; Scott & Crossman 1973
1.5 - 13	All	Edisto River, SC	Collins et al. 2000b
2.4 - 8	Spawning	HSI Model	Brownell et al. 2001
<5 (low flow)	Spawning	Roanoke River, NC	Smith et al. 2015

Table 4. Spawning and migration temperatures for Atlantic sturgeon along the Atlantic coast.

Sex	Activity	Month	Temperature Range (°C)	Location	Citation
M/F	Spawning	N/A	14.5 - 23.4	St. Lawrence River, Québec	Caron et al. 2002; Hatin et al. 2002
M	Migration Up	N/A	5.6 - 6.1	Hudson River, NY	Smith 1985a
F	Migration Up	♂+ few weeks	12.2 - 12.8	Hudson River, NY	Smith 1985a
M	Migration Up	April	6	Hudson River, NY	Dovel and Berggren 1983
F	Migration Up	♂+ few weeks	13	Hudson River, NY	Dovel and Berggren 1983
M/F	Spawning	N/A	14 - 26	Hudson River, NY	Bain et al. 2000
M/F	Spawning	April - June	12.8 - 18.3	Delaware River	Ryder 1888
M/F	Spawning	N/A	13.3 - 17.8	Delaware River	Scott and Crossman 1973
M	Migration Up	N/A	13 - 19	South Carolina	Smith 1985b
F	Spent	Sept. - Oct.	17 - 18	Edisto River, SC	Collins et al. 2000b
M/F	Migration Up	March	13.6	Edisto River, SC	Collins et al. 2000b
M/F	Present	Summer	up to 33.1	Edisto & Combahee Rivers, SC	Collins et al. 2000b
M/F	Spawning	N/A	20 - 21	Aquaculture facility	Mohler 2003
M/F	Spawning	N/A	16 - 21	HSI Model	Brownell et al. 2001
M/F	Spawning	September	22-27	Roanoke River, NC	Smith et al. 2015
M	Migration up/down	August-October	20-28	Roanoke River, NC	Smith et al. 2015
M/F	Migration up/down	August October	19-30	James River, VA	Balazik et al. 2012
M/F	Migration up	August	21-22.8	York River, VA	Hager et al. 2014

Table 5. Salinity tolerance ranges for young juvenile Atlantic sturgeon along the Atlantic coast.

Salinity Range (ppt)	Location	Citation
>3	Hudson River, New York	Appy and Dadswell 1978
3 - 16	Hudson River, New York	Dadswell 1979
3 - 16	Hudson River, New York	Brundage and Meadows 1982
0 - 6	Hudson River, New York	Dovel and Berggren 1983
3 - 16	Hudson River, New York	Smith 1985b

Table 6. Depth ranges for young juvenile Atlantic sturgeon along the Atlantic coast

Depth Range (m)	Location	Citation
2 - 12	Massachusetts	Kynard et al. 2000
30 - 40	Long Island Sound, Connecticut	Bain et al. 2000
27 - 37	Long Island Sound, Connecticut	Savoy and Pacileo 2003
Mean = 22.7	Hudson River, New York	Haley et al. 1996
10 – 25 (<700 mm TL)	Hudson River, New York	Bain et al. 2000
16 – 26 (>700 mm TL)	Hudson River, New York	Bain et al. 2000
7 - 16	Delaware River, Pennsylvania	Lazzari et al. 1986
5.5 - 11	Delaware River, Delaware	Shirey et al. 1999
<20	Chesapeake Bay, Virginia	Musick et al. 1994
<7	Brunswick River, North Carolina	Moser and Ross 1995
>10	Cape Fear River, North Carolina	Moser and Ross 1995
1.8 - 5.4	Albemarle Sound, North Carolina	Armstrong and Hightower 2002
3 - 16	Hudson River, New York	Haley et al. 1996
>3	Hudson River, New York	Bain et al. 2000
0 - 12	Delaware River	Shirey et al. 1999
<10	Brunswick River, North Carolina	Moser and Ross 1995

Table 7. Summer temperature ranges for juvenile Atlantic sturgeon along the Atlantic coast.

Temperature Range (°C)	Location	Citation
13.2 – 26.7	Merrimack River,	Kieffer and Kynard
24.2 – 24.7	Hudson River, New York	Dovel and Berggren
27	Hudson River, New York	Haley et al. 1996
24 – 28	Hudson River, New York	Bain et al. 2000
>26	Satilla River, GA	Fritts et al. 2016
>30	Albemarle Sound, NC	Armstrong 1999
21.3-30.2	Savannah River, GA	Bahr and Peterson
Near 30	Altamaha River, GA	Schueller and
24.7-31.4	Ogeechee River, Ga	Farrae and Perterson

Table 8. Significant environmental, temporal, and spatial factors affecting distribution of Atlantic sturgeon. This table summarized the current literature on Atlantic sturgeon habitat associations. For most categories, optimal and tolerable ranges have not been identified, and the summarized habitat parameters are listed under the category reported. In some cases, unsuitable habitat parameters are defined. NIF = No Information Found. N/A = Not Applicable.

Life Stage	Time of Year and Location	Depth (m)	Temperature (°C)	Salinity (ppt)	Substrate	Current Velocity (m/sec)	Dissolved Oxygen (mg/L)
Adult (Spawning)	Freshwater rivers and possibly tidal freshwater regions of large estuaries (in the north) Feb – Southern states April-May – Mid-Atlantic May-July – Northern States and Canada Sept-Dec – Second spawning documented in Southern regions	**Tolerable:** NIF **Optimal:** 2.4-8+ (HSI model for Southern Regions) **Reported:** 3-27 Roanoke River was >5 (low flow)	**Tolerable:** NIF **Optimal:** 16-21 (HSI model for Southern Regions); 20-21 for cultured sturgeon **Reported:** Male migrations 5.6-6.1; Female migrations 12.2-13; Spawning 13-23.4 Roanoke River migrations 22-28 spawning 24-25	**Tolerable:** NIF **Optimal:** NIF **Reported:** Above the salt wedge in fresh water.	**Tolerable:** 2 NIF **3 Optimal:** Cobble/gravel >64mm-250mm (HSI model for Southern Regions) **Reported:** Hard substrate, including rubble, gravel, clay, rock, bedrock, slag from old steel mills and limestone	**Tolerable:** NIF **Optimal:** 0.2 - 0.76 **Reported:** 0.46 – 0.76 okay; unsuitable if ≤0.06, or ≥ 1.07 Roanoke was 55-297 m3/s	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF Roanoke was 8.0 mg/L

Life Stage	Time of Year and Location	Depth (m)	Temperature (°C)	Salinity (ppt)	Substrate	Current Velocity (m/sec)	Dissolved Oxygen (mg/L)
Adult (Estuarine)	Sturgeon do not spawn every year, yet may participate in an upstream migration. After spawning, some sturgeon remain in the rivers through the summer, while others migrate to sea. Downstream migrations occur Sept – Nov in Canada. Present in South March – Oct. Overwinter in the ocean.	**Tolerable:** NIF **Optimal:** NIF **Reported:** 1.5-60	**Tolerable:** NIF **Optimal:** NIF **Reported:** Adult sturgeon documented in waters with temperatures as high as 33.1 in SC.	**Tolerable:** NIF **Optimal:** NIF **Reported:** Documented summer habitat in upper/fresh/ brackish interface, lower interface, and high salinity portions of estuaries in SC. Salinity ranged from 0-28.6	**Tolerable:** NIF **Optimal:** NIF **Reported:** Found over fine mud, sand, pebbles, and shell substrate	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF
Egg and Larval	Eggs are laid in flowing water in rivers along the Atlantic coast. Larval sturgeon are found in same habitat where spawned and are benthic.	**Tolerable:** NIF **Optimal:** 2.4-8+ for egg incubation (HSI model for Southern Regions) **Reported:** Embryos remain in deep channels. Larval collected at 9.1-19.8	**Tolerable:** NIF **Optimal:** 20-21 Cultured sturgeon **Reported:** Eggs hatch in 94-140 hours ranging from 15.0 – 24.5 24-25 for Roanoke River	**Tolerable:** NIF **Optimal:** NIF **Reported:** Found upstream of salt front; have a low tolerance to salinity; mortality reported in 5-10 for some sturgeon species Roanoke River would be 0 at spawning location	**Tolerable:** 4 NIF **5 Optimal:** Cobble/gravel >64mm-250mm (HSI model for Southern Regions) **Reported:** After 20 minutes, eggs become adhesive and attach to hard substrate. Larvae also use hard substrate as refuge	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF

Life Stage	Time of Year and Location	Depth (m)	Temperature (°C)	Salinity (ppt)	Substrate	Current Velocity (m/sec)	Dissolved Oxygen (mg/L)
Juvenile (Estuarine)	Remain in natal habitats within estuary for up to a year before migrating out to sea. Migrations to other estuaries are common. Use brackish water near month of estuary during winter and move up-estuary during warmer months	**Tolerable:** 6 NIF **7 Optimal:** Deep water and holes serve as thermal refuge **8 Reported:** 2-37	**9 Tolerable:** 10 3-28 **11 Optimal:** ~20 **Unsuitable:** Temperatures >28 are sub-lethal Temps in south are commonly 30 in summer with sturgeon present **Reported:** Downstream migration begins when water reaches 20°C and peaks between 12-18°C. Documented range of 0.5-27	**Tolerable:** 12 NIF **13 Optimal:** ~10 **Reported:** Large juveniles found mostly where salinity is >3; found in 0-27.5	**14 Tolerable:** 15 NIF **16 Optimal:** NIF **Reported:** Found mostly over sand substrate and mud or transitional habitats. Also found over rocks and cobble	**Tolerable:** 17 NIF 18 **Optimal:** NIF **Reported:** NIF	**Tolerable:** 19 NIF **20 Optimal:** >5 mg/L **Reported:** Mortality at summer temperatures (26°C) observed at levels <3.3mg/L maybe not the case for southern populations
Juvenile and adult (At-sea)	Use marine waters during non-spawning seasons. Nearshore areas off the Atlantic coast from the Gulf of Maine to St Johns river Florida. Little is known about this part of their lives	**Tolerable:** 21 NIF **22 Optimal:** NIF **Reported:** Most found in shallow waters; greatest depth recorded = 75; depth range 7-43	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF	**Tolerable:** NIF **Optimal:** NIF **Reported:** Marine waters off the continental shelf	**Tolerable:** NIF **Optimal:** NIF **Reported:** Sand, gravel, silt and clay. Suggested that they will use any substrate that supports their food resource	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF	**Tolerable:** NIF **Optimal:** NIF **Reported:** NIF

1.7 APPENDIX A – Literature Cited

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2.0 APPENDIX B – DPS-SPECIFIC BACKGROUND AND LIFE HISTORY

2.1 GULF OF MAINE DPS

Life History

Maturity

For far northern stocks in the St. Lawrence River in Canada, age at maturity is older than the coastwide averages, with maturity being reached around ages 27 to 28 for females and ages 16 to 24 for males (Scott and Crossman 1973). Spawning migrations begin in May through July in rivers in New England and Canada (Bigelow and Schroeder 1953; Hatin et al 2002; Dadswell 2006). A tagging study in the Penobscot River in Maine found that Atlantic sturgeon entered the estuary as early as late May, concentrated within a small area of the estuary, and moved out to the ocean by October, some traveling between the Penobscot and Kennebec rivers (Fernandes et al 2010).

Growth

No age data are available for the Gulf of Maine DPS, but lengths have been collected through fishery-independent sampling. Gillnet sampling in the Merrimack, Kennebec, and Saco Rivers caught both sub-adults (50-150 cm total length) and adults (>150 cm TL) (Figure 2.2.1). Fish caught by the inshore trawl survey exhibited a similar size range (76-193 cm) (Figure 2.2.2).

2.2 NEW YORK BIGHT DPS

Range and History of Fisheries

New York Bight Atlantic sturgeon refers to individuals originating from four separate river systems including the Taunton, Connecticut, Hudson and Delaware Rivers. The Taunton River is the longest undammed coastal river in New England at approximately 64 km. However, because of the low dissolved oxygen and excessive nutrient loads, the Taunton River is not believed to currently support nursery habitat for juvenile Atlantic sturgeon (Taunton Journal 2006, ASSRT 2007). The Connecticut River is the longest river in New England and extends 660 km from the Canadian border to the Long Island Sound with 86 % of historic habitat available to Atlantic sturgeon above Hadley, MA (ASSRT 2007). The Hudson River extends 507 km from the Adirondack Mountains to the Atlantic Ocean adjacent to New York City. Presently, 245 km of historic habitat is available to Atlantic sturgeon from Manhattan to the Federal Dam in Albany, NY in the Hudson River. The Delaware Estuary extends for 531 kilometers from Hancock, NY down to Lewes, DE. Since no dams are located on the main stem of the Delaware River, 100 % of the historic habitat is available to Atlantic sturgeon (ASSRT 2007).

Atlantic sturgeon of the New York Bight Distinct Population Segment (NYB DPS) have supported subsistence fishers prior to colonization although large scale commercial harvest started in the latter part of the 19th century. Reported commercial landings of Atlantic sturgeon are available for NY State from 1880 through 1996. Until about 1980, most of the NY landings came from the Hudson River. Highest annual landings of the time series (231,000 kg) occurred in 1898.

Landings quickly dropped to 15,000 kg or less per year and remained at low levels through the early 1980's. Market demand remained high and effort and harvest increased substantially in NY and NJ. The greatest increase in landings was in the nearshore ocean waters along Long Island and the NJ coast (ASMFC 1998). In 1990, the Atlantic States Marine Fisheries Commission adopted an interstate Fishery Management Plan (FMP) for Atlantic sturgeon (ASMFC 1990). However, because of the population declines of Atlantic sturgeon associated with harvest, the coast wide fishery was closed in 1998 with Amendment I to the FMP.

Historic levels of abundance within the NYB DPS of Atlantic sturgeon sharply declined by the early 1900s as a result of a sharp increase in harvest. Based on harvest from 1880-1901, Secor (2002) estimated 180,000 adult females were supported by the Delaware River prior to 1890. More recently, however, the estimated number of adults in the Delaware River was believed to have declined to less than 300 individuals in 2007 (ASSRT 2007). Based on 1880-1901 harvest rates from NY, abundance was estimated at 6,000 spawning females in the Hudson River (Secor 2002; Kahnle 2007). In 2007, Kahnle et al. estimated an abundance (using fishery dependent data (1985-1995 for females and 1968-1995 for males) and sex-specific exploitation) of approximately 863 spawning adults in the Hudson River (267 mature females and 596 mature males).

More recent estimates of recruitment have focused on river specific (i.e. natal) populations to examine how populations have responded to the significant decline in biomass associated with directed harvest, bycatch, and habitat degradation/loss. Previous population estimates of age-1 Atlantic sturgeon in the Hudson River estimated the 1976 cohort at 25,647 individuals (Dovel and Berggren 1983) and 4,314 individuals in 1995 (Petersen et al. 2000); which suggested a decline in recruitment (Sweka et al. 2006). Hale et al. (2016) estimated the abundance of Delaware River age 0-1 Atlantic sturgeon at 3,656 individuals in 2014 which is similar in magnitude to the age-1 estimates in the Hudson River suggested by Petersen et al. (2000) in the Hudson River for 1995. However, ages were pooled in Hale et al. (2016) and are not directly relatable to the estimates of age-1 fish in the Hudson River as mortality at age-0 was unknown.

Life History

Migration

Spawning migrations of Atlantic sturgeon are thought to occur from late March or April into May and June in the NYB DPS (Murawski and Pacheco 1977; Smith 1985; Bain 1997; Smith and Clungston 1997; Caron et al. 2002; ASSRT 2007) with individuals returning to their natal rivers to spawn after extensive periods in coastal waters (Grunwald et al. 2008). However, a secondary spawning event may occur in the late summer months for the Delaware River (D. Fox unpublished data) as has been documented for DPSs to the south (Collins et al. 2000, Hager et al. 2014, Post et al. 2014, Balazik and Musick 2015, Smith et al. 2015, Ingram and Peterson 2016. Older research suggested that females did not spawn annually and may spawn at intervals from two to five years (Vladykov and Greeley 1963; Van Eenennaam et al. 1996; Stevenson and Secor 1999). However, recent research using acoustically tagged fish, suggests that the intervals may be as short as every year for females returning to the Hudson River (D. Fox, personal communication).

In the Hudson River, females enter the estuary beginning in mid-May and spawn in the deep channel or off-channel habitats above the salt wedge (Dovel and Berggren 1983). The females leave soon after spawning and the season is typically over by July (Dovel and Berggren 1983; Van Eenennaam et al. 1996). Males enter the river beginning in April and some stay as late as November (Dovel & Berggren 1983). In Delaware, the spawning migration is believed to begin between April and May (Borodin 1925; Simpson 2007).

Erickson et al. (2011) examined 23 adult Atlantic sturgeon tagged with pop-off satellite archival tags (PSAT) in the Hudson River from 2006-2008. The PSAT tags were programmed to release within a few months to a year of deployment. The results showed that time spent in the river after tagging ranged from 6 to 132 days (mean = 55 days). Mean daily depths once in the ocean ranged from 5 to 35 meters and never exceeded 40 meters. Fish occupied the deepest depths in the winter and early spring (December-March) and the shallowest depths during late spring to early fall (May-September). The deepest water occupied by a fish was 92 meters in December. Water temperatures ranged from 8.3°C to 21.6°C. Ten of the PSAT tags released on the programmed date and transmitted the data to a satellite. Five of the PSAT tags transmitted outside the Chesapeake Bay, two popped off near Delaware Bay, two popped off in the river and one in the Bay of Fundy (Cobequid Bay), Nova Scotia. The migratory corridor for the majority of the PSAT tagged Atlantic sturgeon ranged from Long Island to Chesapeake Bay at depths < 40 meters. Areas were Atlantic sturgeon aggregated included the southwest shore of Long Island, along the New Jersey coast, off of Delaware Bay and off of Chesapeake Bay.

Oceanic habitat use of juvenile marine migrant Atlantic sturgeon was examine by Dunton et al. (2010) by identifying their spatial distribution using five fishery-independent surveys. They found areas near the mouths of large bays (Chesapeake and Delaware) and estuaries (Hudson and Kennebec rivers) had higher concentrations of individuals during the spring and fall. During these seasonal aggregations, Atlantic sturgeon may experience higher levels of bycatch mortality (Dunton et al. 2015).

Maturity

Age at maturity remains poorly documented for Atlantic sturgeon in the Hudson River Estuary and poorly understood or undocumented within the other estuarine systems of the NYB. In the Hudson River Estuary, the youngest mature male observed by Dovel and Berggren (1983) was 12 years old. The youngest female was 18 or 19 years old. In another study by Van Eenennaam et al. (1996), the youngest mature female observed was 14 years old. However, if ages are estimated using growth curves for fish harvested in the river results suggest that females as young as age 10 enter the river (ASMFC 1998). Van Eenennaam et al. (1996) reported that males in the spawning population in 1992 and 1993 averaged 15 years old while the average age of females was 20 years.

Dovel and Berggren (1983) reported that most mature males were 1.2-2.0 meters total length and 5.4-47.6 kg in weight. Most females were 1.8-2.4 meters long and 40-116 kg. Van Eenennaam et al. (1996) reported that mean total length of males in the spawning population was 182 cm; that of females was 218 cm. Mean weight of males was 37.3 kg; that of females was 72.7 kg. Information on the reproductive cycle of Atlantic sturgeon of the Hudson River Estuary is incomplete. Van Eenennaam et al. (1996) suggested that males spawn annually, but that the ovarian cycle of females might be greater than a year. However, more recent research, suggests that mature individuals may be larger than reported by Van Eenennaam et al. (1996) in the Hudson River (D. Fox, personal communication).

For the Hudson River stock, females mature at age 15 or older and are greater than 200 cm TL and 34 kg in weight. Males mature at age 12-19 and are greater than 150-210 cm TL. Maturity schedules in this region were based on a gonadal development (histology) study (Van Eenennaam et al. 1996; Van Eenennaam and Doroshov 1998).

Age and Growth

Two earlier studies have provided estimates of length at age for Atlantic sturgeon in the Hudson River Estuary. Both used cross sections of fin rays for estimates of age. Dovel and Berggren (1983) reported on data collected from 1976 through 1978. Sturgeon collected in this study ranged from 0 through 29 years old with sample sizes ranging from one to 40 fish per age. The largest sample sizes were from ages two through four. Van Eenennaam (personal communication) shared data from Atlantic sturgeon sampled in 1992-1994. Sturgeon collected in the study ranged from 5-40 years old. Sample sizes ranged from one to 31 fish per age. The largest sample sizes were from ages 12-18. Van Eenennaam's data were reported by sex and were from fish in the Hudson River and the near shore ocean of the New York Bight. Mean length at age and maximum age for older fish differed by sex. Length at age was similar for males and females for younger fish. Data from Dovel and Berggren (1983) were from fish from the Hudson River only with sexes combined.

Stevenson and Secor (1999) examined 634 pectoral-spines collected from the Hudson River and the New York Bight. Otoliths were also examined from severed heads (n=114). The otoliths were irregularly shaped and difficult to interpret and they suggest to use spines for aging. Stevenson and Secor (1999) found that males grew quicker and reached a smaller asymptotic length at a younger age than females. Females grew more slowly and reached a larger maximum length. They stated that the fishery in the Hudson River and along the coast and the samples used from the fishery probably biased their results from the growth estimates. The oldest females was 42 years old and the oldest male was 35 years old (which was not the largest length fish).

Dunton et al (2016) examined 742 fish, collected from a coastal trawl survey to evaluate the current age structure of the New York Bight DPS. The lengths of fish ranged from 54-248 cm total length, with a mean of 109.3 cm (SD = 22.67). They estimated 21 age classes that ranged from 2-35 years old, with a mean of 8.89 years old (SD = 3.027). These data were combined with other age estimate data to estimate the von Bertalanffy growth function for Atlantic sturgeon in the NYB.

Fecundity

Recent estimates of fecundity have ranged from 0.49 million eggs (ages 15-17) to 1.67 million eggs (ages 24-29), varying as a function of size and age, peaking at 2.6 million eggs (J. Van Eenennaam, personal communication) in the Hudson River (ASMFC 1998). In 2017, the DE DFW documented a fresh vessel strike in which the female that was struck was estimated to possess 2.1 million eggs. Similar to more recent estimates, historical estimates suggested fecundity ranged from .800 to 2.40 million eggs (Ryder 1890).

2.3 CHESAPEAKE BAY DPS

Range and History of Fisheries

Atlantic sturgeon range widely and can occur in most segments of the tidal Chesapeake Bay depending on season, depth, and water quality characteristics. Highest incidence of occurrence is during spring and fall months when sub-adults range widely foraging in sub-estuaries and the mainstem (Welsh et al. 2002; E. Markin, University of Maryland Center for Environmental Science [UMCES], unpublished research). Pre-spawning and spawning adults also occur during summer and fall months (Balazik et al. 2012a). Some adults enter the Chesapeake during winter and spawn during spring months (M. Balazik, personal communication as referenced in Hilton et al. 2016).

Sturgeon was an important source of sustenance for original Jamestown pioneers, with accounts emphasizing their seasonal abundance and availability (Tower et al. 2018; Wharton 1957). Nineteenth century fisheries developed in the Chesapeake Bay much as they did in Delaware as a result of improved processing and shipment capabilities to export caviar principally to German and Russian markets (Cobb 1900; Secor 2002). Fisheries in the Potomac and James River are well described and county-specific reports suggest that sturgeon were taken throughout the Chesapeake Bay for caviar and meat (Secor 2002; Hilton et al. 2016). Interestingly seasonal harvest records indicated that only a spring spawning run was targeted (Hildebrand and Schroeder 1927; Secor 2002). Atlantic sturgeon fisheries were not effectively regulated and by the 1920s very few Atlantic sturgeon were still harvested from the Chesapeake Bay (Hilton et al. 2016). As opposed to other DPSs, the Chesapeake Bay saw no apparent recovery in landings during the 20th Century (Secor et al. 2000). In 1976 and 1996, Virginia and then Maryland and the Potomac River Fisheries Commission instituted harvest moratoria on Atlantic sturgeon. In 1998, the ASMFC harvest ban was implemented (ASMFC 1998) followed by federal protection of the Chesapeake Bay DPS under the Endangered Species Act in 2012. Within the Chesapeake Bay, these new federal protections caused the prohibition of a USFWS-led reward program, initially implemented in 1996 (Mangold et al. 2007). This program had yielded over 2400 capture records in the Chesapeake Bay (Figure 1; E. Markin, UMCES, unpublished data) and provided substantial information on the distribution, demographics, and ecology of Atlantic sturgeon (Secor 2000; Welsh et al. 2002; Chesapeake Bay Program 2003; Hilton et al. 2016). ESA listing for the Chesapeake Bay DPS has also provided Section 6 support for studies that have greatly contributed to studies of habitat characterization and migration, and improved documentation of threats (e.g. Balazik et al. 2012a,b; Hager et al. 2014; Kahn et al. 2014; Balazik 2017).

The incidence of Chesapeake Bay shortnose sturgeon, which is sympatric with Atlantic sturgeon throughout most of its range, has been a controversial topic (Balazik 2017). Rare incidences of shortnose sturgeon in spawning tributaries have been reported (Dadswell et al. 1984; Kynard et al. 2009; Balazik 2017), but genetic studies have yet to confirm whether these constitute a separate population(s) or emigrants from elsewhere (e.g., the Delaware Estuary) (Wirgin et al. 2010).

Life History

Balazik et al. (2012b) has undertaken systemic studies of size and age structure within the James River population. They observed a slightly lower maximum size (L-infinite) and growth rate than that reported for the Hudson River (NY DPS), but substantially higher growth rate than that reported for the northern St. John's River population (see Age and Growth section). Only a single confirmed female was included in the study. Maximum age and size recorded in their study was 25 years and 250 cm FL, although larger individuals have been observed as dead carcasses (e.g., ship strikes) on shore. A. Spells (USFWS, pers. communication) measured one individual carcass ~ 270 cm Fork Length. Historical age structure was reconstructed from fin spines collected from 17th Century Jamestown and indicated an older, slower growing population occurred then in comparison to the extant James River population. Juvenile growth rates were estimated for recaptured individuals released into the Nanticoke River in 1996. Mean summertime lengths at age 1 and age 2 were 26.2 and 55.5 cm FL, respectively (Secor et al. 2000). Most growth occurred during summer and fall months. Annual growth rates in weight ranged 0.6-1.8% per day and were consistent with growth rates observed for other systems (Secor et al. 2000; Welsh et al. 2002).

Reproductive schedules are not well studied in the Chesapeake Bay DPS. Balazik reported a single confirmed single ripe females ranging, which was 201 cm FL and 21 years old (Balazik et al. 2012a). Kahn et al. (2014) reported a single confirmed female in the Pamunkey, which measured 192 cm FL. Three ripe females (188-200 FL) have been captured in the Marshyhope Creek during 2014-2016 (C. Stence, MD DNR pers. comm.). Based on observed sizes and ages in the James River, Balazik et al. (2012b) suggested that males mature at age 10 and females mature at age 15, slightly lower than ages at maturation for the Hudson River population (Van Eenennaam and Doroshov 1998). In the James River, telemetry studies indicate more frequent spawning by males (annual) than females (every 2-3 years) (M. Balazik, VCU, unpublished data as referenced in Hilton et al. 2016). Similarly, acoustically-tagged males in the Marshyhope Creek have been observed to return each year (C. Stence ,MD DNR pers. comm.).

A remarkable discovery is the dominance of a fall spawning run of Atlantic sturgeon within the Chesapeake Bay DPS (Balazik et al. 2012a). Studies in other systems and the 19th Century caviar fishery accounts indicated that Atlantic sturgeon only spawned in spring (Hildebrand and Schroeder 1927; Secor 2002). Fall spawning has been documented in the James River (Balazik et al. 2012a), the Pamunkey River (Hager et al. 2014), the Marshyhope Creek (C. Stence, Maryland

DNR, unpublished data), and in other DPS s (Balazik and Musick 2015; Smith et al. 2015). A less abundant spring spawning run may also exist as a separate race within the James River (M. Balazik, VCU, unpublished data as referenced in Hilton et al. 2016). In a review of spawning seasonality Balazik and Musick (2015) proposed a latitudinal gradient associated with fall spawning runs, which are more predominant in the southern part of the range and less so in the northern part of their range. Still, historical 19th Century fisheries were clearly focused on the spring run, which could suggest that the relative dominance of spring versus fall runs may have shifted in the past owing to fishing pressure or ecosystem change.

Spawning phenology, embryo and larval vital rates, and associated environmental dependence have not been studied within the Chesapeake Bay owing to the failure to sample early life history stages.

Factors affecting distribution and production

Improved riverbed mapping through acoustics has shown areas of salinity, flow, depth and substrate in up-estuary tidal freshwater portions of Chesapeake tributaries that offer potential spawning habitat for Atlantic sturgeon (Bruce et al. 2016). Where such mapping has occurred, there are potentially kilometers of potentially suitable spawning habitat in the James, Nanticoke, and Marshyhope Creek. Still such habitats grade fairly abruptly into substrates of sand and sediment which are not suitable for egg deposition (Bruce et al. 2016). Temperature, pH, and other water quality conditions associated with presence of ripe adults in areas of presumed spawning are now under study but suggest temperatures cue their presence and departure from these areas (C. Stence, MD DNR, unpublished data; M. Balazik, VCU, unpublished data). As indicated above, definitive studies on spawning habitats will require successful sampling of early life history stages.

Nursery habitats for larvae and age-0 juveniles include predation refuges, perhaps related to bottom structure (Hilton et al. 2016) or regions of lower water clarity. Laboratory studies on these stages indicate they are structure-oriented and sedentary (Kynard and Horgan 2002). As age-0 juveniles increase size they are expected to forage more widely in Chesapeake Bay tributaries (Secor et al. 2000). The few sampled age-0 juveniles were captured in freshwater and oligohaline portions of the James and York Rivers (Table 1). Small juveniles released into the Nanticoke River persisted in up-estuary brackish regions during the first two months following their early summer release (Secor et al. 2000).

Laboratory studies and bioenergetics models strongly indicate that age-0 to age-2 fish are sensitive to thermal and DO conditions in the Chesapeake Bay (Secor and Gunderson 1998; Niklitschek and Secor 2009a,b). Niklitschek and Secor (2015) suggested a three-way “habitat squeeze” for age-0 juveniles, which were curtailed to up-estuary regions and then sought to avoid super-optimal temperatures occurring in higher sections of estuaries and lower DO, which tended to occur in down-estuarine regions, particularly for Maryland tributaries. In some years, this habitat curtailment was predicted to nearly extinguish all potential summertime habitats within the Chesapeake Bay (Niklitschek and Secor 2005). Behavioral choice studies indicated that age-1 sturgeon selected temperature and DO levels in accord with bioenergetics model predictions (Niklitschek and Secor 2010). Larger juveniles and sub-adults are not as sensitive to temperature, DO, and salinity interactions. By age-2, laboratory studies indicated no response to salinity in growth rates (Niklitschek and Secor 2009a,b). Information from the past USFWS Reward Program indicates relatively frequent incidence of sub-adults occurs at dissolved oxygen levels <50% and temperatures > 25 C, conditions considered stressful for young juveniles (E. Markin, UMCES, unpublished data).

Forage and predation

In the Chesapeake Bay, diet information only exists for those Atlantic sturgeon juveniles released into the Nanticoke River in 1996, and indicated a diet of annelid worms, isopods and amphipods (Secor et al. 2000) – similar to principal diets observed elsewhere (Johnson et al. 1997; Hilton et al. 2016). Growth rates estimated for these released fish and from the USFWS reward program (Welsh et al. 2002) indicated that suitable forage occurred in the Chesapeake Bay. Further, the frequency of sub-adults visiting from other systems suggests that the Chesapeake Bay estuary supports important forage habitats for several DPS units (Mangold et al. 2007).

Predation has not received much study in the Chesapeake Bay. A controversial topic is the role of invasive catfish – piscivorous blue catfish and flathead catfish – in shaping early mortality of juvenile Atlantic sturgeon (Flowers et al. 2011; Hilton et al. 2016). Particularly in the James River blue catfish numbers have grown exponentially during the past decade and now occur at extremely high numbers in tidal freshwater habitats (Schloesser et al. 2011). Although no sturgeon have been observed in diet studies of invasive catfishes, the rarity of sturgeon in comparison to other fish prey is likely quite high suggesting it may take a very large sample of diet samples to be able to quantify predation effects. Predation trials in laboratory tanks suggested that striped bass and channel catfish will consume small juvenile Atlantic sturgeon if available (E. Markin, UMCES, unpublished data).

Dams within the tributaries of the Chesapeake Bay occur high in tributaries at or above head of tide, and therefore are unlikely to substantially interfere with spawning runs (ASSRT 2007; Hilton et al. 2016). Still, St. Pierre documented incidences, albeit rare of Atlantic sturgeon occurring in the Susquehanna, above the region now impounded by Conowingo Dam (R. St. Pierre, USFWS, as referenced by Horton 1994). An important consideration on dam effects is the discovery that large adult Atlantic sturgeon occur in the highest sections of tidal freshwater estuaries, sometimes at depths < 2 meters and in tidal creek sub-tributaries. Although not impounded directly by dams, these areas can be restricted due to bridges, navigation modifications, and shoreline hardening. Further, upstream dams used for hydroelectricity and flow regulation will strongly modify flow, which is expected to strongly influence spawning cues and spawning and nursery habitat conditions in these low volume tidal freshwater reaches.

The C&D Canal is likely an important movement corridor of migration for Atlantic and shortnose sturgeons between the Chesapeake and Delaware Bays (Dadswell et al. 1984; Wirgin et al. 2010).

2.4 CAROLINA DPS

Range and History of Fisheries

Albemarle Sound Basin, NC

The Albemarle Sound area includes Albemarle Sound, its tributaries, Currituck, Roanoke, and Croatan sounds, and all of their tributaries. Albemarle Sound, located in the northeastern portion of North Carolina, is a shallow estuary extending 88.5 km in an east-west direction averaging 11.3 km wide and .9–6.1 m deep. Ten rivers drain into Albemarle Sound, which joins Pamlico Sound through Croatan and Roanoke sounds, and in turn, empties into the Atlantic Ocean via Oregon Inlet. Currituck Sound joins Albemarle Sound from the northeast. Although the headwaters of the Roanoke River are located in the Appalachian foothills of Virginia, most of the tributaries to the Sound originate in extensive coastal swamps. The Roanoke and Chowan Rivers are the principal tributaries (Street *et al*. 1975; Johnson *et al*. 1981; Winslow *et al*. 1983; Winslow *et al*. 1985; Hightower and Sparks 2003).

Chowan River, NC

The Chowan River forms at the confluence of the Blackwater and Nottoway rivers approximately 9 miles south of the City of Franklin, Virginia. The Chowan River flows from the NC/VA border south for 50 miles where it empties into Albemarle Sound, draining 803 miles of streams over 1,378 sq. miles. There are 19 municipalities within the Chowan Basin, including Edenton, Ahoski, and Murfreesboro.

Roanoke River, NC

The Roanoke River is a relatively narrow stream that follows a winding course to its mouth below Plymouth, where it enters western Albemarle Sound. The Roanoke River watershed arises in the mountains of Virginia and covers 25,035 square km (8,893 square miles); only 9,081 square km (3,506 square miles) of the basin lies within North Carolina (NCDWQ 2001). Fifteen counties and 42 large municipalities (e.g., Greensboro, Winston-Salem, High Point, Roanoke Rapids, Williamston, and Plymouth) are represented within the North Carolina portion of the basin. Near the North Carolina-Virginia border, John H. Kerr Reservoir, Lake Gaston, and Roanoke Rapids Lake impound the Roanoke River. The U.S. Army Corps of Engineers (USACE) and Dominion/NC Power Company operate these reservoirs for flood control and hydropower generation. A dam was constructed in 1955 on the River at Roanoke Rapids, North Carolina, 220.6 km (137 miles) from the mouth (Carnes 1965).

Pamlico Sound Basin, NC

The Pamlico Sound area extends from Oregon Inlet south to Core Sound, covering about 1,350,000 acres. Salinity varies from 30 ppt near the three inlets to zero in the upper tributaries. The Neuse and Tar-Pamlico rivers are the two main river systems that provide major fresh water inputs. The average depth of the sound is 16 feet, whereas the Neuse and Tar-Pamlico rivers average 8-11 feet in depth. Both rivers begin in the lower part of the Piedmont Plateau (Copeland and Gray 1991).

Tar-Pamlico River, NC

The Tar-Pamlico watershed is the fourth largest in North Carolina encompassing 14,090 square km (5,440 square miles). From its headwaters in Person County, the Tar-Pamlico watershed is drained by 3,790 km (2,355 miles) of tributaries along its 290 km (180 mile) main-channel length to Pamlico Sound near the confluence of the Pungo River (NCDWQ 1999). River reaches upstream of the City of Washington are designated as the Tar River and are primarily freshwater, while the reach below Washington, referred to as the Pamlico River, has characteristics of an upper estuary. Sixteen counties and six large municipalities (Greenville, Henderson, Oxford, Rocky Mount, Tarboro, and Washington) are represented within the basin. Major tributaries to the river include Fishing, Swift, and Tranters creeks, Cokey Swamp, and the Pungo River. Main stem headwater reaches and tributaries are located within the outer piedmont physiographic region and are characterized by low flows during dry seasons due to minimal groundwater discharge (NCDWQ 1999). However, since the majority of the basin is located within the coastal plain, these waters are largely characterized by slow flowing, low gradient, brown and blackwater streams with extensive floodplains often comprised of bottomland hardwood forests and marshes.

Neuse River, NC

The Neuse River is formed by the confluence of the Eno and Flat Rivers in the Piedmont region of North Carolina and flows in a southeasterly direction through the coastal lowlands discharging into Pamlico Sound 430 km (267 miles) from its origin (Hawkins 1980b; McMahon and Lloyd 1995). Through the Piedmont, the Neuse River has a relatively high gradient, and substrates tend to be rocky (McMahon and Lloyd 1995). As the river passes through the fall line into the coastal lowlands, it widens and slows with the reduced gradient. Downstream of the fall line, substrate is dominated by sand and silt (McMahon and Lloyd 1995). The Neuse River resides entirely within North Carolina and drains approximately 14,500 square km (5,598 square miles) of land, which is composed of approximately 48% forest, 30% agriculture, 9% wetlands, 6% developed lands, and 5% water (Hawkins 1980b; McMahon and Lloyd 1995). Flow regimes in the Neuse River downstream of Raleigh, North Carolina are controlled by Falls Lake Dam (river km 370; river mile 230), which was built in 1983 by the USACOE to create an impoundment for flood control, water supply, water quality, and recreational purposes.

White Oak River Basin, NC

The White Oak River Basin sits between the Pamlico Sound Basin and the Cape Fear River Basin and lies completely within the southern coastal plain. The White Oak Basin contains four river systems (New River, White Oak River, Newport River, and North River) that empty into Bogue, and Core sounds. The Basin consists of 267 miles of fresh water streams and rivers and 192 square miles of saltwater. There are four counties and 14 municipalities within the basin including, Jacksonville and Camp Lejune, Morehead City, and Beaufort (NCDWQ 1997).

White Oak River, NC

The White Oak River is the second largest river in the White Oak River Basin and is directly east of the New River. The river is approximately 48 miles long passing through the Croatan National

Forest and Swansboro. The River flows into western Bogue Sound then to the Atlantic Ocean through Bogue Inlet (NCDWQ 1997).

New River, NC

The New River is the western most river within the White Oak Basin. It is the largest river in the basin and includes the City of Jacksonville and the Marine Core Base Camp Lejune. The river is a coastal blackwater river and is contained entirely within Onlsow County. The upper portion of the river system is characterized by gum-cypress swamps with some upland agricultural and forested lands. The river above the Highway 17 bridge is a narrow free flowing river while the portion below the 17 bridge widens and becomes a slow moving tidal system emptying directly into the Atlantic Ocean through New River Inlet (NCDWQ 1997).

Cape Fear River System, NC

The Cape Fear River, the largest river system in the state, forms at the confluence of the Deep and Haw rivers in the Piedmont region of North Carolina and flows southeasterly for approximately 274 km where it discharges into the Atlantic Ocean at Cape Fear, near Southport, North Carolina. The basin lies entirely within the state, includes portions of 27 counties and 114 municipalities, and encompasses 9,984 km of freshwater streams and rivers, 36 lakes and reservoirs, and 15,864 ha of estuarine waters (NCDWQ 1996). Major tributaries include the Upper and Lower Little Rivers in Harnett County, the Black River in Bladen, Pender, and Sampson counties, and the Northeast Cape Fear River in Duplin, Pender, and New Hanover counties.

Little River, SC

The Little River is a tidal river and flows in both directions according to the tides. The Atlantic Intracoastal Waterway (AIWW) flows across the North Carolina state line in the “Little River Neck” area and merges with the Little River to flow south toward North Myrtle Beach or flow out of the Little River Inlet to the Atlantic Ocean.

Winyah Bay System, SC

The Winyah Bay and its tributaries comprises the northern most watershed in South Carolina and Atlantic sturgeon (ATS) from this basin are included in the Carolina DPS management zone (NOAA 2012a). The Winyah Bay is an 18,158 hectare (ha) estuary that extends nearly 24 kilometers (km) inland and has six tributaries (Sampit, Lynches, Little Pee Dee, Pee Dee, Black, and Waccamaw Rivers). The Sampit is a small, tidal river that becomes unnavigable inland near river kilometer (RKM) 15. The Black River forms in the Pocotaligo and Black River Swamps and courses through the coastal plain for 243 RKM before emptying into the Pee Dee River. The Lynches River begins near the fall line and continues 225 RKM to its confluence with the Pee Dee River. The Little Pee Dee River begins in the coastal plain in North Carolina and continues 187 RKM to its confluence with the Pee Dee River. The Pee Dee River begins at the confluence of the Yadkin and Uwharrie Rivers in North Carolina and flows 90 km in North Carolina and 280 km in South Carolina where it merges with the Waccamaw River and forms Winyah Bay. The Waccamaw River begins in the coastal plain in North Carolina and parallels the Atlantic Coastline for 225 RKM where it merges with the Pee Dee River and forms Winyah Bay.

The upstream limit of the salt wedge varies seasonally and over a tidal cycle. During periods of high streamflow in the watershed freshwater extends to the Atlantic Ocean. During periods of low flow the salt wedge extends approximately 45 km upstream.

All tributaries of the Winyah Bay System flow unimpeded in South Carolina. The first dam on the Pee Dee River is in North Carolina at RKM 302, Blewett Falls Dam. The Pee Dee River is the major river in the Winyah Bay System, and sturgeon are present in the Black, Waccamaw, Pee Dee, and Sampit Rivers (Post et al. 2014, and Collins and Smith 1997).

Historically, ATS were commercially harvested in the Winyah Bay System as it was the primary fishing grounds in South Carolina. Commercial exploitation of the fishery began in the 1870's when Swedish immigrants from Delaware began fishing each spring in Winyah Bay, Georgetown. Declining catch in Delaware Bay was partially responsible for these immigrants and their arrival, coupled with development of rail service from South Carolina to the northern market centers (Baltimore, Philadelphia, New York), and resulted in the commercial exploitation of the sturgeon (Smith et al. 1984). Recorded landings peaked at 218,200 kg in 1897 and just 5 years later, the fishery rapidly declined and in 1902 the recorded landings for South Carolina were 42,600 kg (Smith et al. 1984). South Carolina fishermen, the majority of which fished in the Winyah Bay System, accounted for a significant portion of the U.S. landings of ATS from 1900-1984 (Smith et al. 1984); and South Carolina reported annual landings of 45,000 kg from 1978-1982 (Smith 1985). The ATS gillnet fishery was closed in 1985 throughout South Carolina including the Winyah Bay System and has remained closed to date.

Santee-Cooper System, SC

The Santee and Cooper River Basins originate on the eastern slopes of the Blue Ridge Mountains in western North Carolina (Mathews et al. 1980) and is second only to the Susquehanna on the U.S. East Coast in terms of drainage area and volume of flow (Hughes 1994) and covers 21,700 square miles (Conrads et al. 2002). Atlantic sturgeon (ATS) from this system are included in the Carolina DPS management zone (NOAA 2012a).

In 1938, the South Carolina Public Service Authority (SCPSA) initiated the Santee-Cooper Diversion Project to move water from the Santee River to the Cooper River. This project included the construction of the Santee Dam, locally known as Wilson Dam, for flood control on Santee River at RKM 143, which created Lake Marion, and the construction of Pinopolis Dam at RKM 77 on the Cooper River, a hydroelectric facility and navigation lock, which formed Lake Moultrie (Cooke and Leach 2002). Flows diverted from Lake Marion on the Santee River to Lake Moultrie on the Cooper River. Mean annual flows in the Cooper River increased to 15-20,000 cfs daily and annual flows in the Santee River declined from 525 to 63 cubic meters per second.

Over time, increased flows and sediment loads from the Cooper River led to shoaling in Charleston Harbor. To alleviate this issue, the Cooper River Rediversion Project reduced shoaling in the Harbor by diverting water back to the Santee River through a 15 km Rediversion Canal. The St. Stephen Dam was constructed 7 km up the Rediversion Canal to control the flow from Lake Moultrie to the Canal and has a hydroelectric facility and a fish-lift. The Rediversion

Canal was completed in 1985 and approximately 75 percent of the Cooper River's flow was returned to the Santee River, increasing its flow from 63 to 295 cubic meters per second (Cooke and Leach 2002).

The Cooper River, was historically a small tidal River. While historic data are lacking for the Cooper River it likely supported small stocks of anadromous fish, however it is unknown if sturgeon were present. Presently, the Cooper River is formed by the confluence of the West and East Branches at RKM 48. The East Branch is a tidal slough throughout its 8-mile reach. The upper West Branch is characterized by meandering natural channels bordered by extensive tidal marshes and abandoned rice fields. In the lower West Branch, industrial complexes dominate the river and the east bank contains numerous dredge-material disposal areas. Saltwater in the Cooper River extends from Charleston Harbor upstream to approximately RKM 26. The Cooper River is tidally affected throughout its entire reach (Conrads and Roehl 1999; Conrads et al. 2002). Although water quality is generally good, sediments in some areas are still contaminated due to previous industrial operations and military facilities. The river channel is maintained by dredging all the way to the dam.

The Santee River, formed by the Wateree and Congaree Rivers, was historically one of the longest river systems on the Atlantic coast and supported spawning runs of anadromous fish as far as 438 km inland to Great Falls on the Wateree River and up to 602 km up the Congaree River (Walburg and Nichols 1967). Presently, the Santee River system consists of the North Santee River, North Santee Bay, South Santee River, South Santee Bay and the Rediversion Canal. Throughout the year flows fluctuate drastically depending on discharge from the dam (which is dependent on precipitation and electrical power demand). When not in flood, the Santee River is a shallow, slow moving, meandering river that flows through hardwood swamps (Bulak and Curtis 1977).

Historical landings of Atlantic sturgeon (ATS) in the Santee-Cooper system have been reported, however the nearby Winyah Bay System was the primary fishing grounds in South Carolina. The presence of several dams has resulted in the loss of access to over 62 percent of the historical sturgeon habitat in the complex Santee-Cooper system. This has resulted in the loss of important spawning and juvenile developmental habitat and has reduced the quality of the remaining habitat by affecting water quality parameters (such as depth, temperature, velocity, and DO) that are important to sturgeon (ASMFC 2007; NOAA 2012a).

Charleston Harbor Rivers, SC

Included in the Carolina DPS, the Cooper River system consists of Charleston Harbor, West branch of the Cooper River, East branch of the Cooper River, and the Wando River. Historically, all tributaries to Charleston Harbor were small coastal plain rivers with minimal freshwater flows, which were tidally influenced for their entire lengths. The completion of the Santee Cooper project in the 1940s dramatically changed river discharge in the Cooper River. From the 1940s into the 1980s, nearly all river discharge of the Santee River was diverted through the Santee Cooper project, run through the hydroelectric units in Pinopolis Dam, and discharged down the Tailrace Canal and into the Cooper River. In the 1980s the Rediversion Project diverted part of the Santee River discharge back to the Santee River, however a significant discharge of freshwater still flows into the Cooper River. The Cooper River provides the dominant freshwater input for the Charleston Harbor and provides 77 RKM of riverine habitat (Post et al 2014).

Wando River, SC

The Wando River is a tidal slough that tapers from a width of about ½ mile at its mouth to a narrow tidal creek 34 km upstream from the confluence with the Cooper River. Saltwater extends throughout the Wando River. The banks of the river are dominated by extensive *Spartina alterniflora* salt marshes. The Wando River is tidally affected throughout its entire reach (Conrads and Roehl 1999) with varying levels of urban development (Yassuda et al. 2000).

Cooper River, SC

The Cooper River is mainly a tidal river. Along its course, it merges with Mepkin Creek to form the West Branch of the Cooper River, which converges with the East Branch Cooper River (this area is known as the “T”). The river is then is joined by the Back River, Goose Creek and the Wando River before finally joining the Ashley at the Harbor to flow into the estuary (X).

Life History

Chowan River, NC

Limited information exists to describe the life history of Atlantic sturgeon within the Chowan River. Commercial fisherman have reported collections of various sizes of sturgeon collected from gill nets and pound nets. Sizes reported range from small juveniles to large adults, though the adults have been few. Telemetry data collected during Post et al. (2015) provides additional data on movements of Atlantic sturgeon within the river. Detection data show sturgeon heavily use the lower portion of the Chowan River near the Highway 17 bridge. Adults, sub adults, and juveniles have been detected within the arrays in the Chowan River. Detection data show adults use the mouth of the Chowan as a staging area prior to ascending the Roanoke River in the fall. Data also show young juveniles use the mouth of the Chowan as habitat during all months of the year, sub adults use this habitat during the spring through fall, and fish that have been tagged in other DPSs have frequented this area during their coastal migrations (Post et al. 2014). Spawning of Atlantic sturgeon is not known to occur within the Chowan River.

Roanoke River, NC

Historical reports of Atlantic sturgeon spawning within the Roanoke River suggest a primary spawning in the spring coinciding with the striped bass spawning run (Yarrow 1874; Worth 1904). An alternate spawning time was documented by Worth (1904) who described collections of Sturgeon with various roe conditions during August and September. Additionally, Smith et al (2015) detected a fall spawn occurring in the Roanoke River through the use of acoustic telemetry and artificial substrates. Smith et al (2015) used detection data to identify locations for deploying artificial substrates (spawning pads) to collect released eggs. They were successful in collecting 38 eggs over 21 days of sampling immediately below the first shoals at Weldon. Estimated spawning dates were 17-18 and 18-19 of September when water temperatures were 25 to 24°C and river discharge was 55 to 297 m3/s. These telemetered fish arrived in Weldon typically in August when water temperatures were near 28°C, remained for an average of 40 days then departed late September or early October when water temperatures were near 20° (Smith et. al. 2015).

Tar River, NC

Limited information exists on the life history of Atlantic sturgeon within the Tar/Pam River. Unpublished data from the NCDMF Independent Gill Net Survey and Observer Program show collections of possible young of year (less than 500 mm TL) and juveniles within the Tar/Pam River. Based on collections of Atlantic sturgeon less than 500 mm TL and that early juvenile Atlantic sturgeon reside in their natal system, reproduction may be occurring with the river system (Smith 1985; Secor et al. 2000; Armstrong and Hightower 2002).

Neuse River, NC

Limited information exists on the life history of Atlantic sturgeon with in the Neuse River. Unpublished data from the NCDMF Independent Gill Net Survey and Observer Program show collections of adult size fish (up to 2,300 mm TL), young of year size fish (less than 500 mm TL), and large juvenile and sub adult collections. Though these collections have not been genotyped to a specific DPS the collection of small juveniles or YOY would suggest spawning does occur within this system, however collections of these sizes of fish do not occur every year.

Cape Fear River System, NC

A comprehensive survey of anadromous, estuarine, and resident fishes in the tidal freshwater portion of the lower Cape Fear River drainage was initiated by the NCDMF in January 2002. A total of 145 Atlantic sturgeon was tagged with T-bar tags for the US Fish and Wildlife Service and three were recaptured (2.1% recapture rate [Shelia Eyler, USFWS, personal communication]). One fish emigrated and two fish remained within the Cape Fear. The migrating sturgeon was tagged in the Cape Fear River and recaptured in the Waccamaw River in South Carolina 59 days later. The fish that remained in the Cape Fear did not show any movement based on location of recapture. One fish tagged and subsequently recaptured was at large only one day at the same site. The other recapture was at large for 201 days and recaptured at the same site (NCDMF 2007).

Based on data collected through telemetry tagging, sub-adult sturgeon movement and distribution in the Cape Fear River followed seasonal patterns likely driven by physical conditions within the system. During the summer months (June- August) when temperatures are reaching their maximum, sturgeon distribution was compressed and shifted upriver, and large-scale movements were limited. This shift in distribution and tendency of individual fish to remain in one location during this time period suggest fish are possibly seeking thermal refuge in areas upstream of the salt wedge. During the coldest time of the year (January – February) tagged sub-adult sturgeon are primarily absent from the system, having migrated to the ocean (Post et. al. 2014).

High inter-annual return rates of acoustic tagged sub-adult Atlantic sturgeon to the Cape Fear River demonstrates fish have fidelity to this system. This implies the Cape Fear basin may be the natal system of these fish, or is at least a highly important foraging area (Post et. al. 2014).

Three of the smallest individual Atlantic sturgeon caught, and not implanted with acoustic tags are of particular interest due to their small size. These fish were between 410 and 458 mm FL and were captured during the months of January and February, when nearly all of the larger tagged fish had emigrated and prior to the spring immigration of fish. The size and time of capture of these fish would indicate possible age-1 fish within the Cape Fear River, also suggesting this system may be their natal drainage (Post et. al. 2014).

The observed directed upstream movements of a tagged individual ripe and running mature adult Atlantic sturgeon during the spring spawning season of 2012, and its subsequent behavior in the following years does suggest this fish made a spawning migration. Interestingly, this fish migrated to both the freshwater tidal reaches of the main stem and Northeast Cape Fear Rivers, and has returned each year subsequent to tagging. The area where the fish concentrated its spring movements was well below the accepted historical spawning areas around the fall line on the main stem of the Cape Fear River. If there is successful spawning occurring within the Cape Fear basin, movement data from this single adult fish would suggest it is occurring between RKM 131 and 65 on the Northeast, or between RKM 95 (Lock and Dam #1) and RKM 64 on the main stem of the Cape Fear River. Possible available spawning substrates include cobble fill at the base of the dam or exposed limestone bedrock outcroppings within the freshwater tidal reaches of river (Post et. al. 2014).

Winyah Bay System, SC

Historic commercial landings suggest robust populations of spring spawning fish were once very abundant in the Winyah Bay System. However, since the closure of the commercial fishery in 1985, data on returning adults in the watershed was limited. In 2001-2002 and 2007-2009 telemetry studies were conducted that were primarily focused on Shortnose Sturgeon, however, many Atlantic sturgeon were captured at every netting station in a 30 mile stretch of river, indicating a healthy juvenile population. Additionally, in 2010 funding for a multi-state telemetry study that was focused primarily on adult Atlantic sturgeon provided much more information. Results from this study indicated that fall spawning was also occurring. In September and October adults were located well inland, 150-290 river kilometers (RKM) on suspected spawning migrations. One of these fish was detected spawning in consecutive years, 2012 and 2013. Also of note, two ATS transmitted in other areas (New York and Delaware) were also spawning. In addition to detecting spawning movements in fall and spring, this study also reinforced previous hypotheses on the highly migratory nature of ATS, as 41 fish transmitted in other locations (Connecticut, New York, Delaware, North Carolina, Virginia, and the Edisto and Savannah Rivers, South Carolina) were detected in the Pee Dee and Waccamaw Rivers. In summary, presumed spawning movements were detected in the spring and fall and telemetry as well as sampling results indicate there is a population of ATS in the Winyah Bay System. Although successful spawning has not been confirmed via egg collection, telemetry evidence as well as captures of ATS <500mm TL (Gibbons and Post 2009; Post et al. 2014) point to a successfully reproducing population of ATS.

Santee River, SC
Limited information exists on the life history of Atlantic sturgeon in the Santee River. Results from a multi-state telemetry survey show three fish tagged in the Santee River left the river and were not detected in the Santee River throughout the study. During this study, only one ATS, originally tagged in North Carolina, was detected in the lower Santee River (RKM 16). Additional sturgeon were detected at the mouth of the Santee River but were not detected further upstream and include ATS that were tagged in New York, Delaware, Virginia, North Carolina and the Great Pee Dee, Edisto, and Savannah Rivers, South Carolina (Post et. al. 2014).

In 2014, a study evaluating the status, distribution, and population structure of sturgeon in the Santee River. Receiver data increased tagged ATS detections in the Santee River to 41 fish nine locations from the Altamaha River, GA to the Hudson River, NY. Continued netting efforts have resulted in the capture of 48 Atlantic sturgeon, ranging in size from 286 – 1,880 mm TL. The capture of ten potential young of the year (YOY) fish (286 – 376 mm TL) suggests successful spawning may occur in the Santee River. However, these results must be interpreted with caution since, in 2015, South Carolina experienced historical flooding and it is possible that these YOY fish were transported to the Santee by flood waters from the Pee Dee or Waccamaw River via Winyah Bay and the Intracoastal Waterway (ICW).

Cooper River, SC
Limited information exists on the life history of Atlantic sturgeon in the Cooper River. In 2015, a more comprehensive study of the Cooper River in order to fill in data gaps with objectives to evaluate the status, distribution, and population structure of sturgeon in the Cooper River, and potential reproduction and recruitment of SNS and ATS sturgeon in the Cooper River. To date, this study has captured eight Atlantic sturgeon, ranging in size from 684 – 1638 mm TL . Four of these fish (684 – 1,232 mm), were captured mid-river (RKM 26 – 40) above the saltwater/freshwater interface. The other four fish (1,173 – 1,638 mm TL) were all running ripe males captured at the known SNS sturgeon spawning grounds immediately below Pinopolis Dam (RKM 77). All fish were implanted with Vemco transmitters with an estimated battery life of 1,741 days. After insertion, receiver data detected subsequent downstream migrations indicative of post-spawning behavior. This recent catch data, in conjunction with the capture of juveniles (490 – 610 mm) in the Cooper River in the late 1980's (Collins and Smith 1997), suggests ATS spawning activity occurred and still may occur below Pinopolis Dam.

The well-documented population of SNS sturgeon spawning in the Cooper River at the base of the Pinopolis Dam (Duncan et al. 2004) provided evidence that sturgeon rarely pass through the lock even though they are congregated at the base of the dam, since passage would require swimming upward along a vertical wall approximately 50 ft. high (Cooke et al. 2002). Though SNS sturgeon spawning upstream of Pinopolis dam has been documented there is scant information to support existence of a land-locked subpopulation of Atlantic sturgeon in Lakes Marion and Moultrie. However, in 2007, an Atlantic sturgeon was captured in the fish lift at St.

Stephen Dam; it was removed and released into the Santee River downstream from the dam. (A. Crosby, SCDNR, pers. comm.). It could not be determined whether this animal entered the fish lift from the exit leading to Lake Moultrie or from the downstream entrance in the Rediversion Canal, only that it was in the fish lift.

Wando River, SC
There is no documented evidence that a resident population of sturgeon exists, or ever existed, in the Wando River, however both sturgeon species have been observed. Five ATS sturgeon have been detected by a receiver at RM 3.5, although none spent any substantial amount of time in the river. These fish were tagged in multiple areas: NY, NC, SC, and GA. No netting effort has directly targeted sturgeon in the Wando River.

Maturity

South Carolina fish mature between ages 7- 19 for females and 5-13 years for males (Smith et al 1982). Spawning migration begins in February in South Carolina (Smith 1985) and Atlantic sturgeon leave the system by October to November (Collins et al 2000). Tidal freshwater, river, and lower and upper estuaries were used during the summer months and both fall and spring spawning runs were documented in the Combahee and Edisto rivers in South Carolina (Collins et al. 2000).

2.5 SOUTH ATLANTIC DPS

Range and History of Fisheries

As described in NOAA 77 FR 5914 the definition of the South Atlantic DPS is "South Atlantic'' population segment, which includes Atlantic sturgeon originating from the ACE basin (Ashepoo, Combahee, and Edisto rivers), Savannah, Ogeechee, Altamaha, and Satilla Rivers.

Ashley River, SC
Included in the South Atlantic DPS, The Ashley River is a tidally influenced, Coastal Plain river that extends approximately 30 miles from Cypress Swamp in Dorchester County to its mouth at Charleston Harbor on the Atlantic Ocean. The entire drainage of the Ashley River system, including its headwaters in Cypress and Wassamassaw swamps, extends approximately 60 river miles. Along its winding course, the river passes through a varied natural and cultural landscape of forested swamps and uplands, tidal marshlands, residential and commercial developments, historic sites and structures, and major urban development at the City of Charleston (SCDNR 2003).

Stono River, SC
No information is available for Atlantic sturgeon in the Stono River.

North Edisto River, SC
No information is available for Atlantic sturgeon in the North Edisto River.

ACE Basin Rivers, SC
The ACE Basin is comprised of the Edisto, Ashepoo, and Combahee Rivers. These three rivers flow unimpeded for their entire lengths and are classified as coastal plain blackwater rivers. The ACE Basin consists of roughly 350,000 acres of marshlands, cypress swamps, beaches, and maritime forests, and the rivers drain into the St. Helena Sound which is located between Charleston and Beaufort, S.C. (Post et al 2014). The lower Edisto and Combahee rivers supported a directed commercial fishery for Atlantic sturgeon prior to the fishery closure in 1985.

Edisto River, SC
The Edisto River is the largest river in the ACE Basin, and begins in the transition zone between piedmont and coastal plain. It is the longest free flowing blackwater river in South Carolina, and during excessive rainy seasons will inundate lowlands and swamps and the flow basin increases to a mile wide or more.

Port Royal Sound Rivers, SC
The Port Royal Sound system consists of the Beaufort, Broad, Colleton, Chechessee, Coosawhatchie, Pocotaligo Rivers, and Whale Branch. The Coosawhatchie River is the largest of the tributary rivers and extends inland 80 RKM. Port Royal Sound receives minimal freshwater input from tributary rivers due to the small watershed it drains, and all of the tributary rivers are characterized as coastal plain blackwater rivers. There are no barriers to upstream migration in the Port Royal Sound system (Post et al 2014).

Calibogue Sound Rivers, SC
No information is available for Atlantic sturgeon in the Caliboge Sound area.

Savannah River, SC-GA
The Savannah River System is comprised of the mainstem Savannah River and the Front, Middle, and Back River. The Savannah River begins in the foothills of Appalachian Mountains in Georgia, and South Carolina and flows 506 km across the piedmont and coastal plain before emptying into the Atlantic Ocean. The river serves as the border between Georgian and South Carolina throughout its entire length. The first barrier to upstream migration is the New Savannah Bluff Lock and Dam (NSBL&D) located at RKM301 near Augusta, Georgia. The lock was designed for navigation and initially provided very limited fish passage. In the late 1980s, identification and documentation of more efficient passage methodologies were completed at NSBL&D and have since been implemented annually. The first true barrier with no dedicated fish passage is the Augusta Diversion Dam located at RKM333 (Post et al 2014).

Wassaw Sound Rivers, GA
No information is available for Atlantic sturgeon in the Wassaw Sound Rivers

Ossabaw Sound Rivers, GA

Ogeechee River, GA

The Ogeechee River begins in the east central piedmont at the confluence of the North and South forks and flows for 564 km uninterrupted into Ossabaw Sound then to the Atlantic Ocean. The River is a blackwater river with only one major tributary, the Canoochee River that joins the Ogeechee near RKM55 (Flemming et al. 2003).

St. Catherines Sound Rivers, GA

No information is available for Atlantic sturgeon in the Catherines Sound Rivers.

Sapelo Sound Rivers, GA

No information is available for Atlantic sturgeon in the Sapelo Sound Rivers.

Deboy Sound Rivers, GA

No information is available for Atlantic sturgeon in the Deboy Sound Rivers.

Altamaha River System, GA

The Altamaha River System is located entirely within the State of Georgia and is formed by the confluence of the Oconee and Ocmulgee rivers. The mainstem flows across the Atlantic coastal plain in a southeasterly direction for 207 km to the coast where it empties into the Atlantic Ocean near Darien, Georgia. Depths average 2–3 m, with a maximum of 18 m in Altamaha Sound (Heidt and Gilbert 1978). The lower Altamaha estuary is characterized by a tidally flooded salt marsh that gradually gives way upstream to cypress swamp. The location of the freshwater–saltwater interface is highly variable (Rogers and Weber 1995). Most of the Altamaha's discharge originates in the Ocmulgee (40%) and Oconee (36%) tributaries (Rogers and Weber 1995). Isolated rocky shoal habitats are found above RKM 80 and throughout the lower reaches of both the Ocmulgee and the Oconee (Flournoy et al. 1992). Both major tributaries have but they are located above the fall line and the biological effects of these dams are considered to be moderate (Dynesius and Nilsson 1994).

St. Simons Sound Rivers, GA

No information is available for Atlantic sturgeon in the St. Simon Sound Rivers.

St. Andrew Sound Rivers, GA

Satilla River

The Satilla River begins in Ben Hill County Ga and flows unimpeded for approximately 378 km before emptying into St. Andrews Sound and the Atlantic Ocean. The saltwater/freshwater interface is around RKM 32 and the tidal influence of the river can be seen as far up stream as RKM 93 (Georgia Shad Plan).

St. Marys River, GA-FL

The St. Marys River begins in the Okenokee Swamp flows for 203 unimpeded km before emptying into the Atlantic Ocean through Cumberland Sound. This river forms the eastern portion of the border between the states of Georgia and Florida. The watershed encompasses

3,350 km2, 59% in Georgia and 41% in Florida. The saltwater/freshwater interface is typically at RKM 33 while the tidal influence extends up to RKM 88. Additional information on Atlantic sturgeon interactions within the St. Marys River have been identified but are not yet available as they are being prepared for publication.

Nassau River, FL
No information is available for Atlantic sturgeon in the Nassau River.

St. Johns River, FL
No information is available for Atlantic sturgeon in the St. Johns River.

DPS-Specific Life History

Current and historical abundance of Atlantic sturgeon is relatively unknown for many of the river systems within the South Atlantic DPS. Much of the available data are from short term studies in a select few rivers. However, some data describing growth, age distribution, abundance, movement, and survival are available for the Edisto River, Combahee, Port Royal Sound, Savannah River, Altamaha River system, the Ogeechee River, and the Satilla River.

Ashley River, SC
There is no documented evidence that a population of Atlantic sturgeon exists, or ever existed, in the Ashley River (ASMFC 1998).

Edisto River, SC
Since 1995 thousands of Atlantic sturgeon juveniles, including 500 age 1 sturgeon have been captured in the Edisto River near the confluence of the Edisto, Ashepoo, and Combahee rivers (Collins and Smith 1997). In March of 1997, four adult Atlantic sturgeon were captured in the Edisto River, one being a gravid female that measured 234 cm total length. A ripe male originally captured in the Combahee River was recaptured a week later in the Edisto suggesting a single reproducing population that spawns in at least two of the rivers.

The Edisto River was also included in the 2011-2014 multi-state study (Post et al 2014). In 2011-2014, most ATS entered the Edisto River between April – June and were detected in the saltwater tidal zone until water temperature decreased below 25°C. They then would enter the freshwater tidal and some fish would make presumed spawning runs around September - October. ATS were detected undertaking upstream migrations in the fall to presumed spawning areas (RKM 146, 183, and 205) each of the 4 years. Post et. al. 2014. Collins et. al. (2000) presumed these spawning locations to be at RKM 105 and 190 in the Edisto River. However Collins et. al. (2000) collected a potentially actively spawning female at RKM 56 and a very recently spawned female at the same location, both in the spring.

Additionally, ATS less than 120 mm, presumably young-of-year, have been observed in the Edisto River during July and August (Post et. al. 2014).

Limited information on ageing of Atlantic sturgeon from the Edisto River exist. Although ages of Atlantic sturgeon collected from the Edisto River were determined from 38 fin spines. Ages were from 7 – 20 years with a modal age of 9 and a mean age of 10.8. When identified to sex, males were aged from 7-15 years and females from 15-20 years (Collins et. al. 2000).

Limited information on sex ratios or maturity exist for the Edisto River as well. Collins et al 2000 collected information on 28 sturgeon, 21 males and 7 females during 1998 and 1999. The males ranged in length from 139-192 cm TL and the females from 180-234 cm TL. Ripe males were collected as early as March 2 and females as early as March 7 when water temperature was 13.68°C (Collins. Et. al. 2000). Spent males were captured as early as late March and spent females as late as mid May. Ripe males began reappearing in sampling during the end of August, only one of seven males captured in October were not running ripe. A late developing female was collected in June and this female moved up stream to RKM 105 in late September. Spent females were collected during September and October when water temperatures were 17-18.8°C (Collins et. al. 2000). Smith (1985) reported males mature as early as age five in South Carolina and Collins et al (2000) reported males mature at age 7.

One estimate of abundance is available for the Edisto River. This was for ATS greater than 1 m in TL from work Flowers and Hightower (2015). They estimated abundance of ATS greater than 1 m at 343.5 individuals with a (150-788 confidence interval).

Potential fall spawning movements for the Edisto River occurred in the late summer through fall as water temperatures began too cool. The typical movement pattern for a spawning fish was to arrive at a river mouth in late spring, remain in the saltwater tidal area through the summer, migrate upstream to freshwater riverine environments (when water temperatures approached 25°C) and remain upstream 2-6 weeks in the fall (when water temperature was between 14 and 25°C), and migrate downstream and exit the river system in late fall/early winter as water temperatures continued to cool (Post et al 2014).

Combahee

The Combahee River was also included in the 2011-2014 multi-state study (Post et al 2014). ATS that were tagged in the Combahee River were absent from the system for the majority of the study period. An ATS that was tagged in June of 2011 left the system in the fall of 2011, returned in July 2012 and left the system again in the fall of 2012. This fish was detected the farthest upstream of any tagged ATS in the Combahee River (RKM 56). Another ATS was identified as a running ripe male at capture in the Combahee River in March 2011, was relocated exhibiting spawning behavior in the North East Cape Fear River, NC in March, 2012, and in 2014 was detected from February – April in the Winyah Bay System (Post et al 2014).

Mortality or survival estimates are limited from the ACE Basin. Hightower et al. (2016) produced an estimate of annual apparent survival rate of 0.871 (95% CI 0.796-0.928) from the ACE Basin. These estimates were calculated from acoustic telemetry tagging data collected during a multi-state tagging project. This estimate is probably low due in part that nine fish that were not detected during the final study have since been detected.

Port Royal Sound System

The Port Royal Sound system is not traditionally known to have a considerable sturgeon population. However, it is situated between two systems that historically and currently have sturgeon populations, the Savannah River and the ACE Basin (Post et. al. 2015). Little to no scientific sampling has been conducted in the Port Royal Sound and Rivers (Smith et. al. 1984). The Port Royal Sound system was included in the 2011-2014 multi-state study (Post et al 2014). With the funding of the Multi State Telemetry work, and array was deployed throughout the waterbody and ATS were detected using the system. There were a total of 18 ATS sturgeon detected during the course of the study. These include ATS transmitted in Delaware, North Carolina, Georgia, and the Edisto, Combahee, and Savannah Rivers, S.C (post et. al. 2014). There were no major upstream migrations or seasonal sturgeon movement patterns of note detected (Post et al 2014).

Savannah River, SC-GA

Estimates of abundance have been determined for age 1 Atlantic sturgeon in the Savannah River by Bahr and Peterson (2016). Barh and Peterson (2016) set gill net and trammel nets within the Savannah River to capture juvenile Atlantic sturgeon. These sturgeon had ages estimated based on length frequency. Estimates of age-1 Atlantic sturgeon were 528 in 2013, 589 in 2014, and 597 in 2015 (Bahr and Peterson 2016).

The Savannah River was also included in the 2011-2014 multi-state study (Post et al 2014). Detection data collected from the Four ATS entered the Savannah River and migrated upstream during the late summer and fall months. Two ATS previously tagged in the Savannah River made upstream spawning movements; this was the second year (2011) one of these fish was detected making similar upstream movements. These two fish were also detected immediately upstream of the New Savannah Bluff Lock and Dam, RKM 301. It is unknown if they passed through the lock or swam over the dam during high flows. Based on detection data, there is a strong possibility that one fish may have been detected by the receiver directly upstream while still remaining downstream of the dam while flow control gates were in a full open position. One ATS tagged in the Savannah River made similar movements in 2011. The other two detected ATS were tagged outside the boundaries of the South Atlantic (SA) DPS (Post et al 2014).

Many sturgeon tagged outside of the Savannah River were detected in the Savannah River throughout the study, and two ATS from DPS's outside of the South Atlantic were detected making presumed spawning migrations in the Savannah River. These two ATS, one tagged in the James River, VA (Chesapeake Bay DPS) on May 13, 2009, was 995mm FL and weighed 9.3kg; and the other one was tagged off the coast of Delaware on May 3, 2011, had eggs present at the time of capture and was 1950mm FL and weighed 72kg. As mentioned previously the ATS transmitted off the Delaware Coast made back-to-back migrations in the Savannah River in 2012 and 2013. It must be noted at this point, efforts were made to contact original taggers of these fish in order to obtain information, if available, concerning genetic assignments based on

DPSs. Through this process, ATS #20473 was confirmed to be a SA DPS fish (Personal Communication Dr. Dewayne Fox, Wirgin et al. *In press*). The genetic sample for the James River, VA fish has not yet been analyzed. Post et al 2014

Twelve sturgeon (eleven ATS and one SNS) originally captured and tagged in the Cape Fear River, NC were detected in the Savannah River. Eight sturgeon originally captured and tagged in the Altamaha River, G.A. were detected in the Savannah River. Five ATS that were tagged in the Edisto River, S.C. were detected in the Savannah River. Two ATS that were tagged in the Great Pee Dee River, S.C. were detected in the lower portion of the Savannah River. Post et al 2014

ATS were detected near upstream spawning grounds in the fall. Most upstream movements began in August, however one fish began ascending the Savannah River in late May. ATS were detected near presumed spawning grounds in August and September at temperatures between 24-29°C. At the conclusion of the spawning event all ATS rapidly returned downstream and exited the system. Post et al 2014

Ogeechee River, GA

In an attempt to provide population estimates for the Ogeechee River Ferrae et. al. (2009) conducted a study in the tidally influenced portion of the river. Gill nets and trammel nets were set in the river 25-90 minutes per set. All Atlantic sturgeon captured were tagged and released, subsequent mark recapture data were analyzed using Huggins closed capture model to estimate abundance. In total 58 juvenile Atlantic sturgeon were collected, including 4 recaptures. Age samples from the collections confirmed age-1 fish were 242-361 mm TL and age-2 and age3 fish measure 606-1015 mm TL (Ferrae et al. 2009). According to Ferrae et al (2009) the most plausible model estimated abundance of juveniles at 450 individuals with a 95% confidence interval of 203-1125 individuals.

The Ogeechee River was also included in the 2011-2014 multi-state study (Post et al 2014). the multi state telemetry study conducted within the Ogeechee River detected Atlantic sturgeon tagged in Coastal Delaware, James River, VA, Cape Fear River, NC, Altamaha River, GA, Edisto, Combahee, Savannah rivers, SC, Long Island Sound, CT, and the NY/NJ Coast.

Altamaha River, GA

Juvenile Atlantic sturgeon were studied extensively during 1991-1994 by Rogers et al (1995). During this study over 2,000 juveniles were collected using trammel nets, 800 of which were nominally age-1.

The Altamaha River was also included in the 2011-2014 multi-state study (Post et al 2014). During three years of the study, 45 adult Atlantic sturgeon were captured and tagged with acoustic transmitters. Size of tagged fish ranged from 1,255 to 2,030 mm FL. Data from acoustic telemetry indicated that the tagged fish were present in the Altamaha River system from April–December. The maximum extent of upriver migrations was documented at RKM 408 on the Ocmulgee River and RKM 356 on the Oconee River (Post et al 2014). Post et al. (2014) described two different migratory patterns for fish in the Altamaha, those that were direct migrants to the spawning areas and those that staged in a location prior to final migration to spawning areas. The two step migrants began in April–May with fish remaining at mid-river locations during the summer months before continuing upstream in the fall. The late-year migrations initiated in August or September and were generally non-stop. All fish exhibited a one-step pattern of migrating downstream in December and early January as water temperatures reached their annual minimums. After leaving the Altamaha River in late winter, 15 (36%) of the tagged fish were subsequently documented in other river systems in Georgia, South Carolina, and Florida (Post el al 2014).

The potential spawning migrations documented in Post et al. (2014) showed that Atlantic sturgeon used approximately 74% of the river habitats available to them within the Altamaha System below the Fall Line, including the Ocmulgee and Oconee tributaries. No individuals migrated all the way to the Fall Line in either tributary. Additionally one individual fish migrated to RKM 408 in the Ocmulgee River, the longest documented migration of an Atlantic sturgeon within a U.S. spawning river. By comparison, adult spawning runs in the Hudson River only reach RKM 182 and spawning runs in the James River have been documented to reach RKM 155 (Van Eenennaam 1996, Balazik et al. 2012).

The presence of adult Atlantic sturgeon within the Altamaha, Oconee, and the Ocmulgee indicate that the estuarine and riverine habitats found within the Altamaha system were used for spawning runs during the late fall as water temperatures decline. Telemetry data indicated the Oconee was used to a lesser extent than the Ocmulgee.

Limited age and growth data are available for the Altamaha River basin from work conducted by Peterson et al. (2008) and Schueller and Peterson (2010). Peterson et al. (2008) aged Atlantic sturgeon collected during 2004 and 2005. These fish ranged in age from 4-14 years (mean 10 years) in 2004 and from 5-17 years (mean 10 years) from 2005. Schueller and Peterson (2010) identified distinct modal distributions of juveniles. Length frequency analysis combined with age data identified age- individuals with lengths ranging from 350-550 mm TL, age-2 individuals ranged from 550-800 mm TL, and age-3 individuals ranged from 800-1,050 mm TL. Schueller and Peterson (2010) did find slight variation in length at age during 2007 when the boundary between age-2 and age-3 fish was identified as 750 mm TL.

Estimates of mortality are available for the Altamaha River through work conducted by Perterson et al. (2008). Peterson et al. (2008) mean estimates of mortality for 2004 was 17.3% and 21.3% for 2005. Estimates of survival are available from three studies completed on the Altamaha River. Peterson et al. (2008) identified annual survival estimates of 0.79 – 0.83 through catch curve analysis for adult Atlantic sturgeon in the Altamaha. Schueller and Peterson (2010) estimated annual survival of Atlantic sturgeon males (0.66) and females (0.88), similar to Peterson et al. (2008). Estimated apparent annual survival of juvenile Atlantic sturgeon was low (0.03-.34) (Schueller and Peterson 2010). These low estimates of apparent survival are most likely attributed to emigration from the system and not true mortality. Hightower et al. (2016), through tagging returns conducted using acoustic telemetry obtained annual apparent survival estimates of 0.842 (95%CI 0.722 – 0.932) for the Altamaha River basin, a size effect (TL covariate) was not evident for the Altamaha River basin.

Schueller and Peterson (2010) also identified estimates of age-1recruitment. The estimates of recruitment ranged from 0.82 to 1.38, indicating recruitment that was slightly less than to more than the previous years' age-1 population. These estimates also indicated that recruitment was time varying and significantly influence by fall discharge with in the river system (Schueller 2010).

Schnabel adult population estimates for the Altamaha River were 324 individuals (CI 143-667) in 2004 and 386 (CI 216-787) in 2005 (Peterson 2008).

Satilla River
Rogers and Weber (1995) indicated that sampling in the Satilla River indicated a highly stressed Atlantic sturgeon population. However, Fritts et al. (2016) targeted Atlantic sturgeon within the Satilla River during 2008-2010. A total of 218 Atlantic sturgeon were captured including 22 in river recaptures. Like in the Ferrae (2009) study on the Ogeechee, fin rays were collected to verify age of Atlantic sturgeon collected during 2010. Results showed age-1 sturgeon were 340-540 mm Tl, similar to those found in the Altamaha River (Fritts et al 2016). After ages were assigned and models estimated an age-1 cohort of 154 fish, with a 95% confidence interval of 108-231 individuals (Fritts et al 2016). These results also indicate that spawning is likely occurring within the Satilla River, based on collections of age-0 and age-1 fish. Genetic collections indicated the juvenile fish collected most closely related populations from other South Atlantic DPS, however results could not positively identify if these fish were from Satilla ancestry (Fritts et. al. 2016). Interesting to note, Fritts et al. (2016) found a high prevalence of Haplotype D among genetic samples collected form the Satilla that proved the Satilla fish were genetically distinct from other collections coastwide based on genetic distance index analysis.

St. Marys River
Hamlen (1884) indicated abundances of Atlantic sturgeon in the St Marys river that were an impediment to the commercial shad fishery. Sampling conducted within the St Marys River yielded zero catch of Atlantic sturgeon (Rogers and Weber 1995).

Nassau River, FL
According to the 2013 Florida Draft Action Plan there has been one interaction with a sturgeon in the Nassau River during the last decade. However, one Atlantic sturgeon tagged within the Altamaha River, GA during a multi-state telemetry study was detected on an array in the Nassau River (Post et. al. 2014).

St. Johns River, FL
Information on Atlantic sturgeon in the St Johns River is lacking. Hamlen (1884) discussed abundances of Atlantic sturgeon in the St Johns River that were an impediment to the shad fishery. More recently, in the last decade there have been 3 reported recreationally caught Atlantic sturgeon from the St. Johns River. According to the 2016 ASMFC Florida Sturgeon

Compliance Report a single Atlantic sturgeon was collected in the St. Johns River, Fla in an experimental gill net. The fish measured 920 mm TL, was tagged, and a genetic sample collected.

Maturity

In the Altamaha River in Georgia, males begin to mature at age 5 and are fully mature by age 9 while females begin to mature at age 11 and are fully mature by age 13 (Peterson et al. 2008). Spawning migration begins in February in Florida and Georgia (Smith 1985).

2.6 APPENDIX B - Tables and Figures

Table 1. Incidence of age-0 Atlantic sturgeon (<50 cm FL) in Chesapeake Tributaries

Year	Number	Source
1972	3	James River, VIMS Trawl Survey
1975	1	James River, VIMS Trawl Survey
1978	2	James River, VIMS Trawl Survey
1979	1	James River, VIMS Trawl Survey
?		York River, VIMS Trawl Survey
2004	1	James River, VIMS Trawl Survey
2012	3	Pamunkey River, VIMS Trawl Survey
2015	2?	James River, power plant?
2016	1	James River, research gill nets (M. Balazik, VCU)

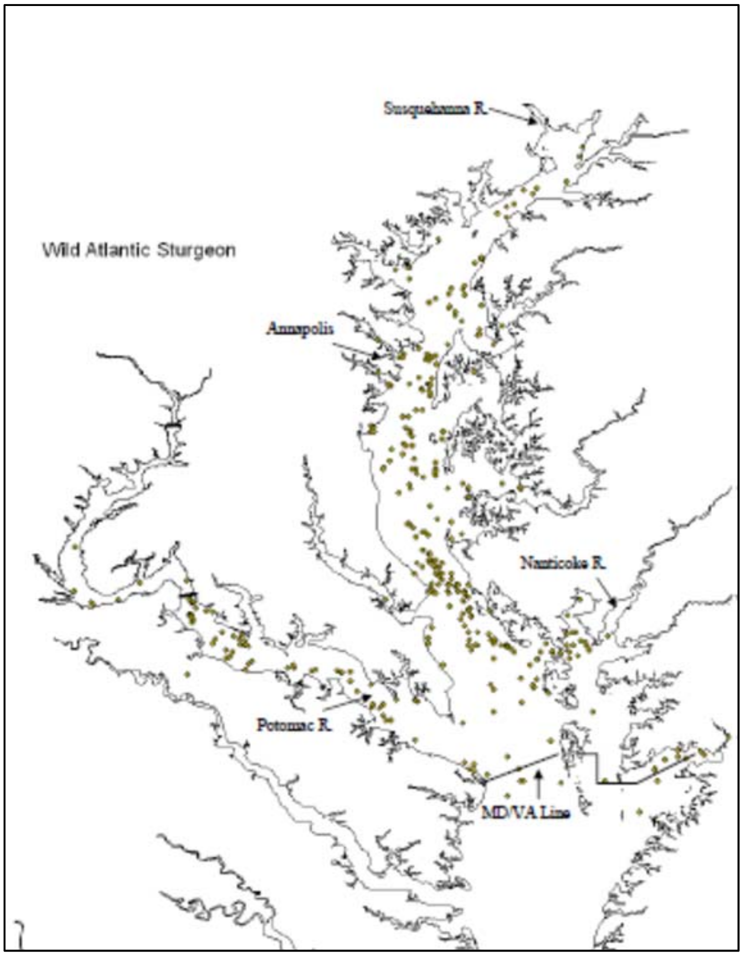

Figure 1. Map of sturgeon captures throughout the Chesapeake Bay during the period 1996-2010. Data from the USFWS Atlantic sturgeon reward program. Placeholder from Mangold et al. 2007. Revised figure will show entire Chesapeake with symbols indicating spawning sub-estuaries.

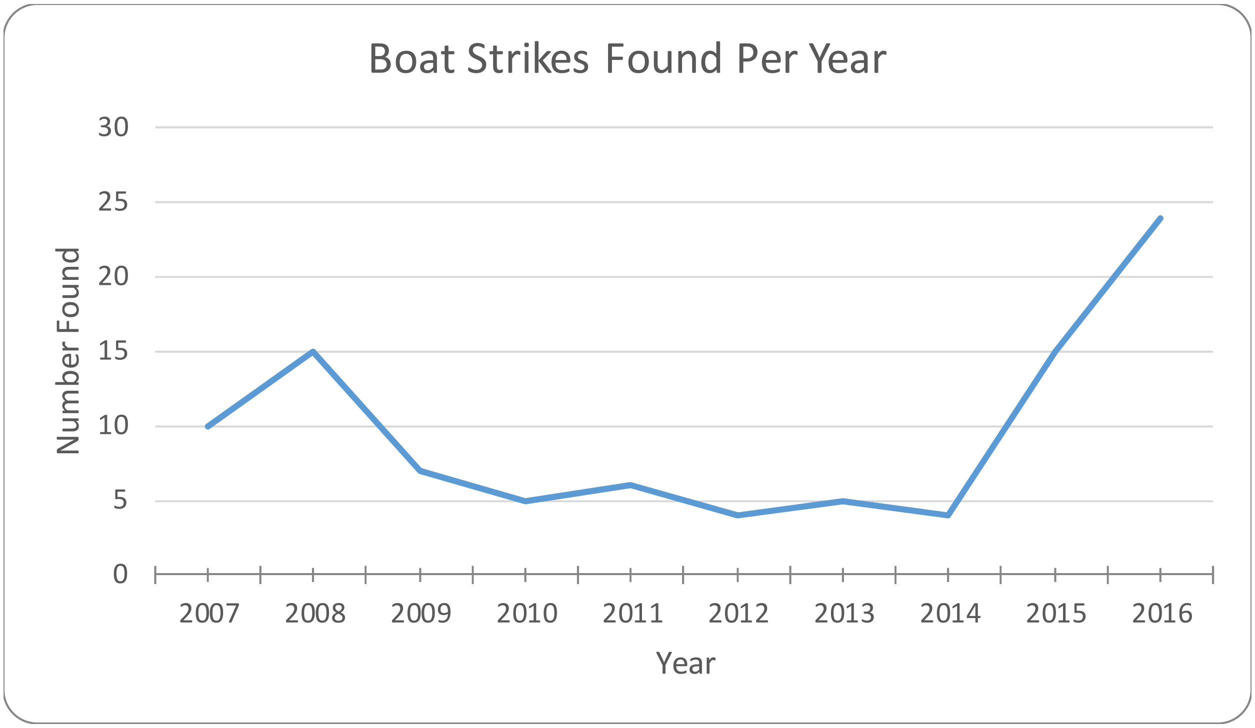

Figure 2. Annual vessel strike Atlantic sturgeon carcasses observed in the James River and its approaches. Data and graphic from M. Balazik, VCU.

2.7 APPENDIX B – Literature Cited

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Appendix R1. Additional Figures Requested at the Review Workshop

The peer review panel requested two sets of additional figures at the review workshop to help them better evaluate the data and the results. The first set was of the length frequency distributions of the fishery independent indices, since they had only been described qualitatively in the Assessment Report. The second set was of the posterior distributions of the annual survival estimates from the tagging model, since only the confidence intervals had been presented.

These figures are presented in this Appendix to provide supporting documentation for the Review Panel's discussions and conclusions.

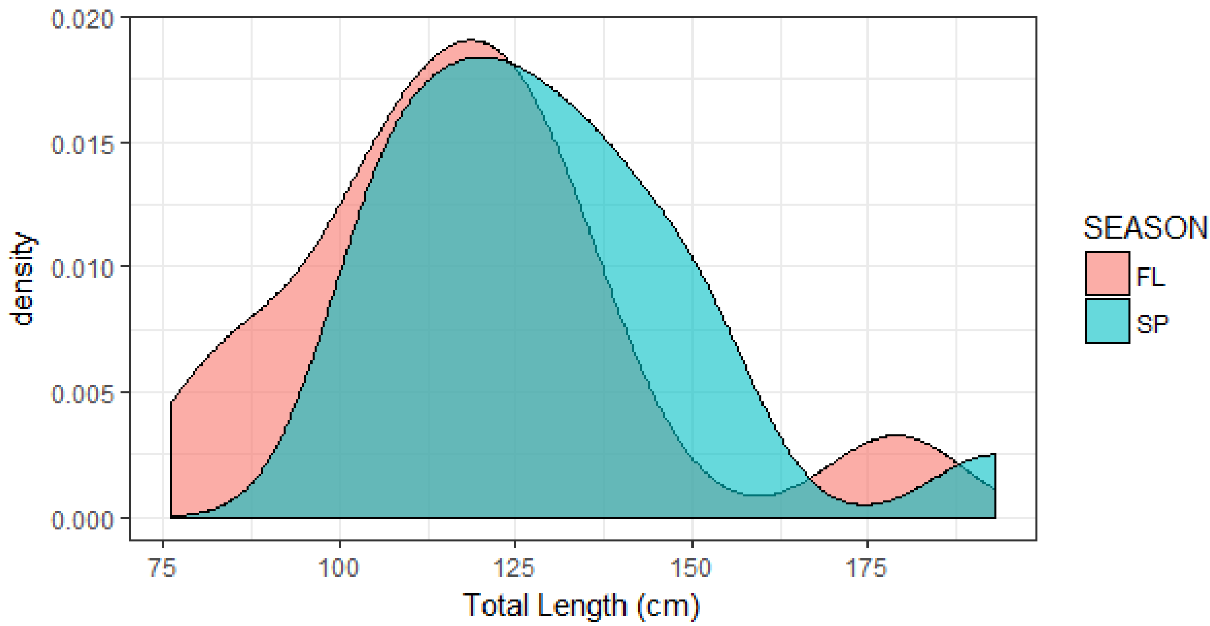

Figure 1. Length distribution of Atlantic sturgeon caught in the ME-NH Trawl survey by fall (FL) and spring (SP) seasons.

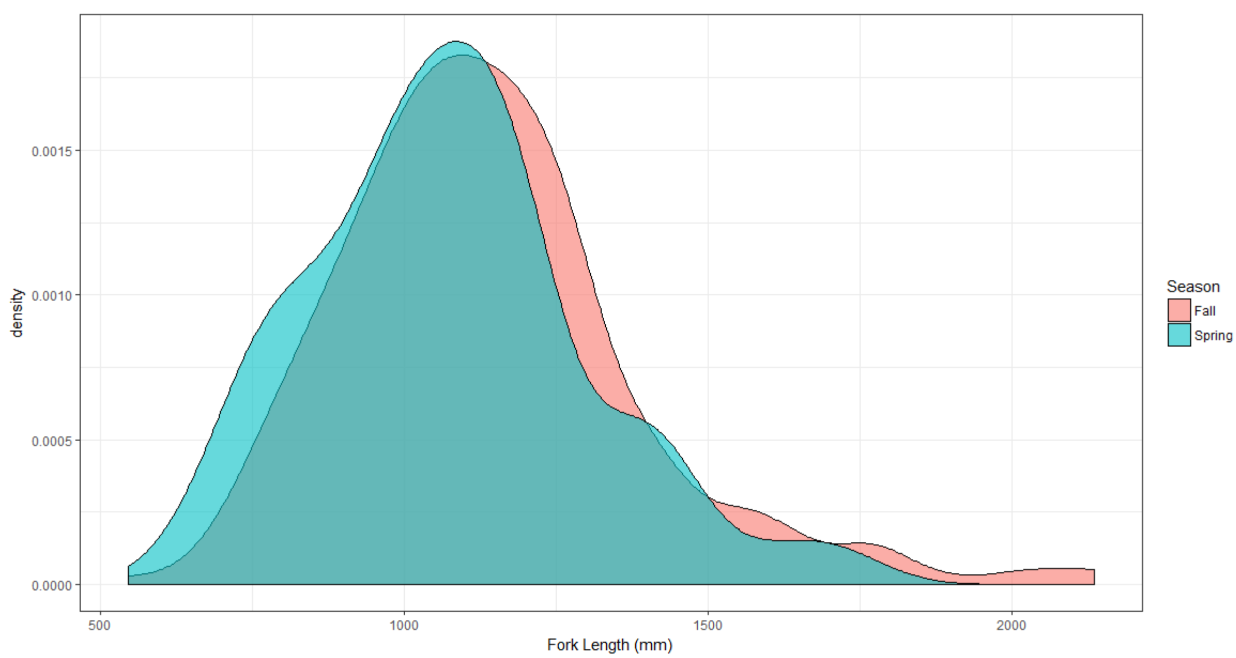

Figure 2. Length distribution of Atlantic sturgeon caught in the CT LIST survey by season.

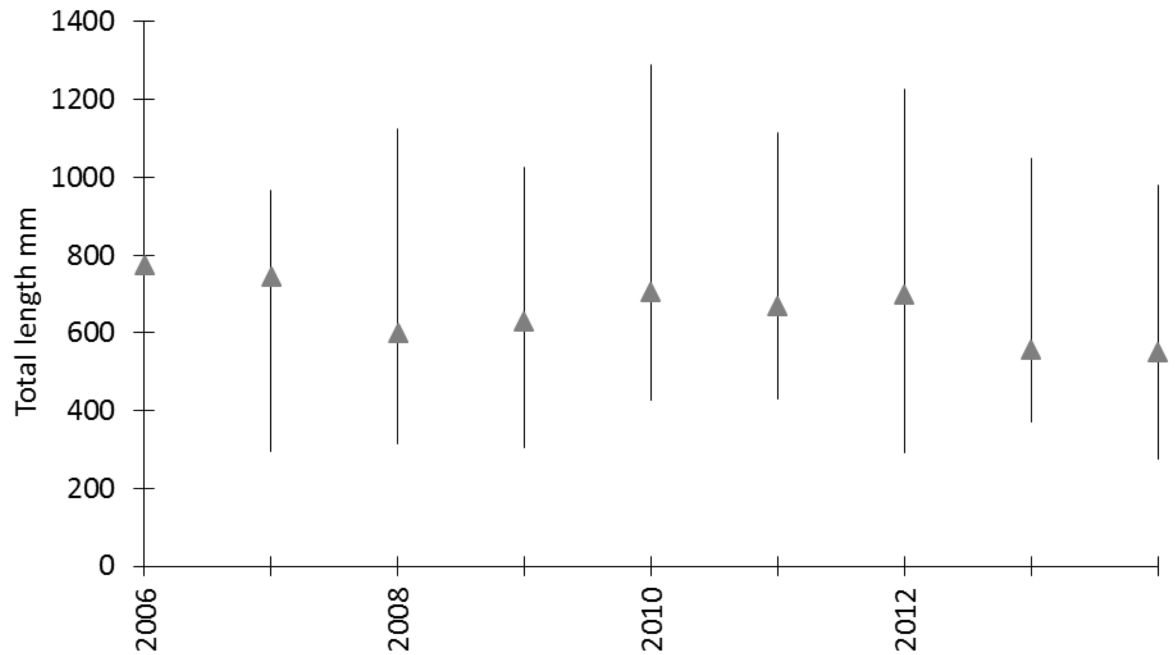

Figure 3. Mean and standard deviation of the lengths of Atlantic sturgeon collected by the NY JASAMP survey.

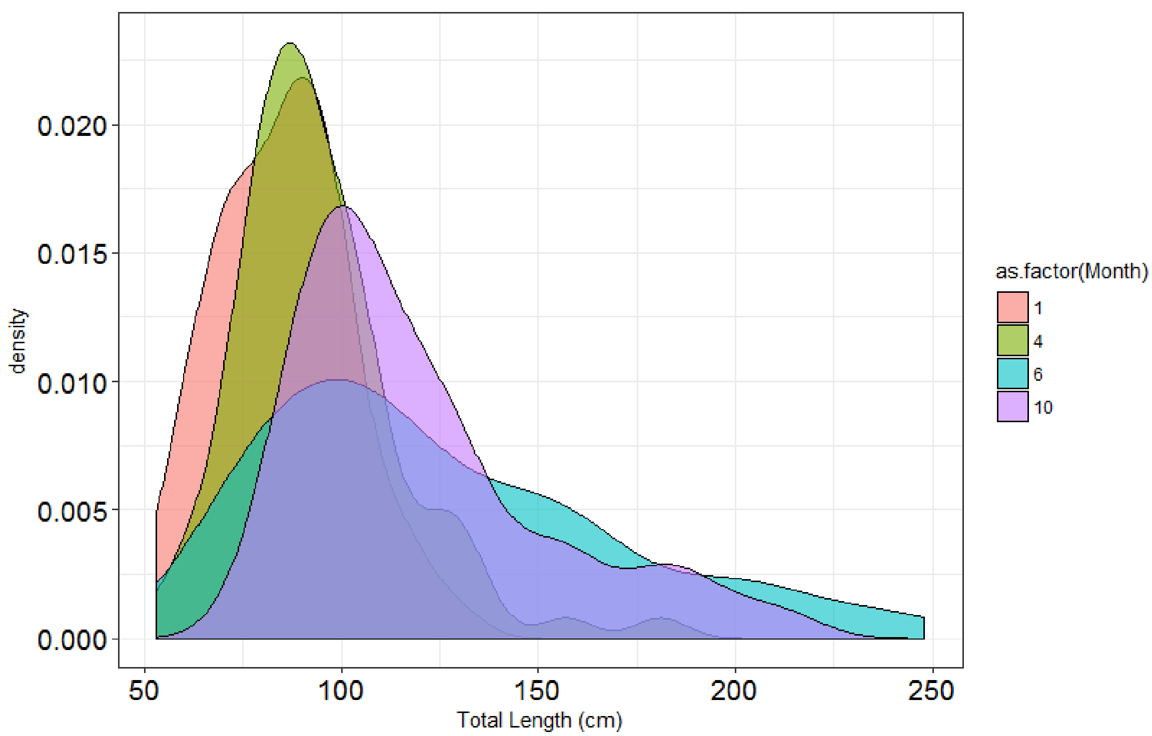

Figure 4. Length distribution of Atlantic sturgeon caught in the NJ OT survey by sampling month.

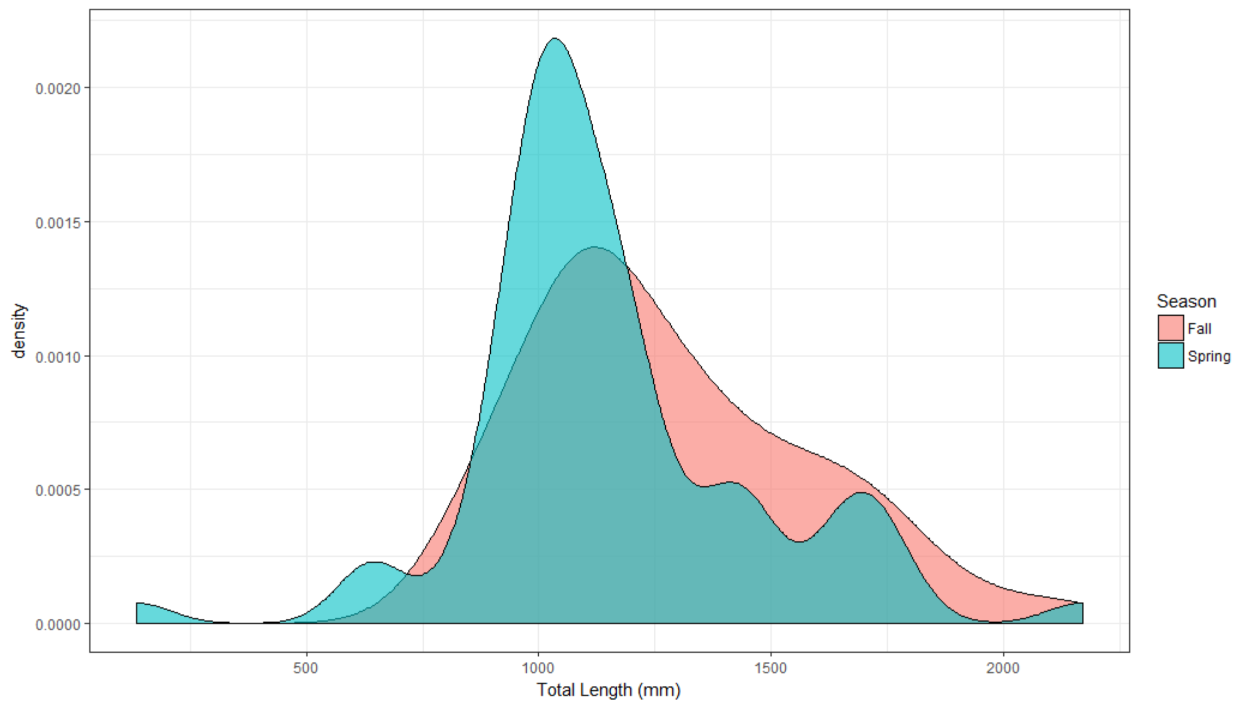

Figure 5. Length distribution of Atlantic sturgeon caught in the NEAMAP survey by season.

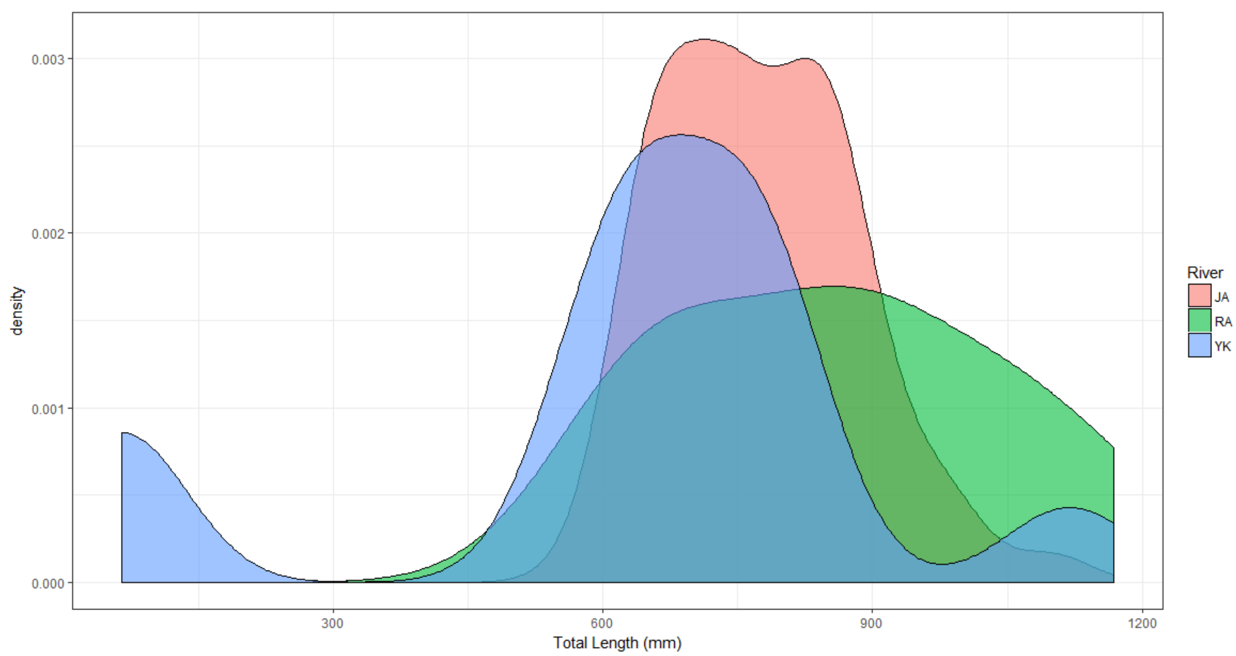

Figure 6. Length distribution of Atlantic sturgeon caught by the VIMS Shad and River Herring Monitoring Program in the James, Rappahannock, and York Rivers.

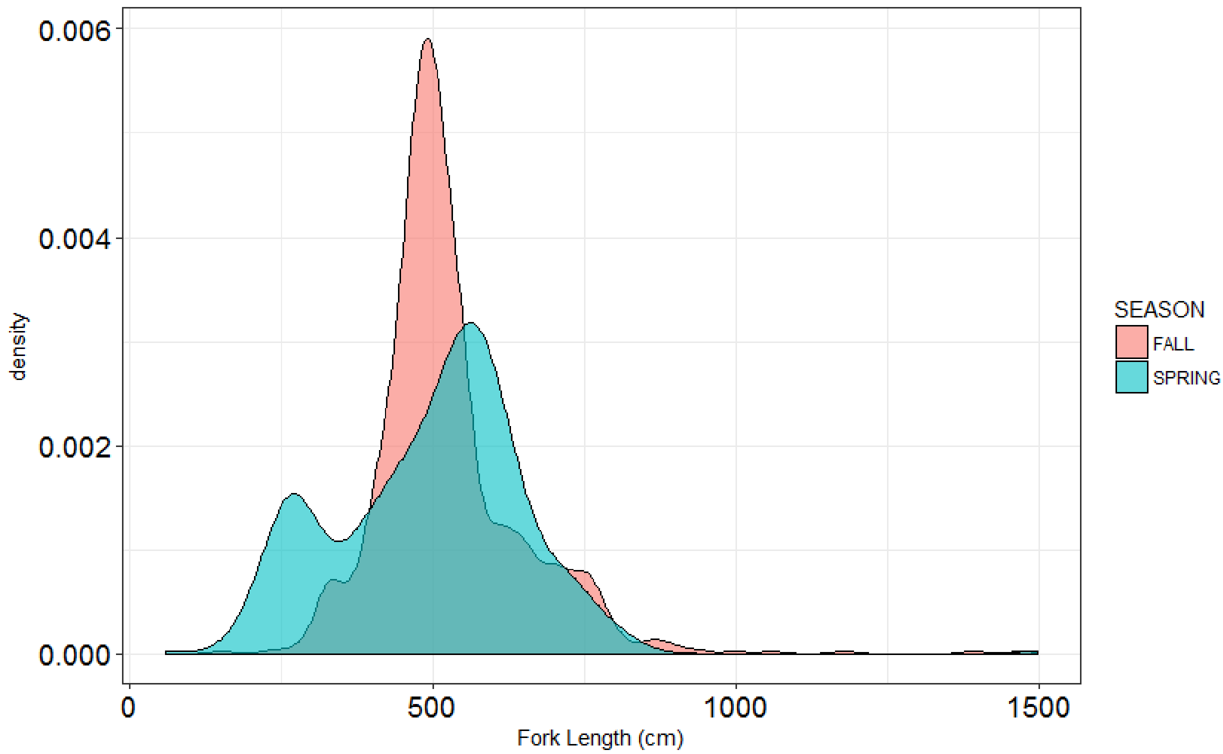

Figure 7. Length distibution of Atlantic sturgeon caught by the NC Program 135 survey.

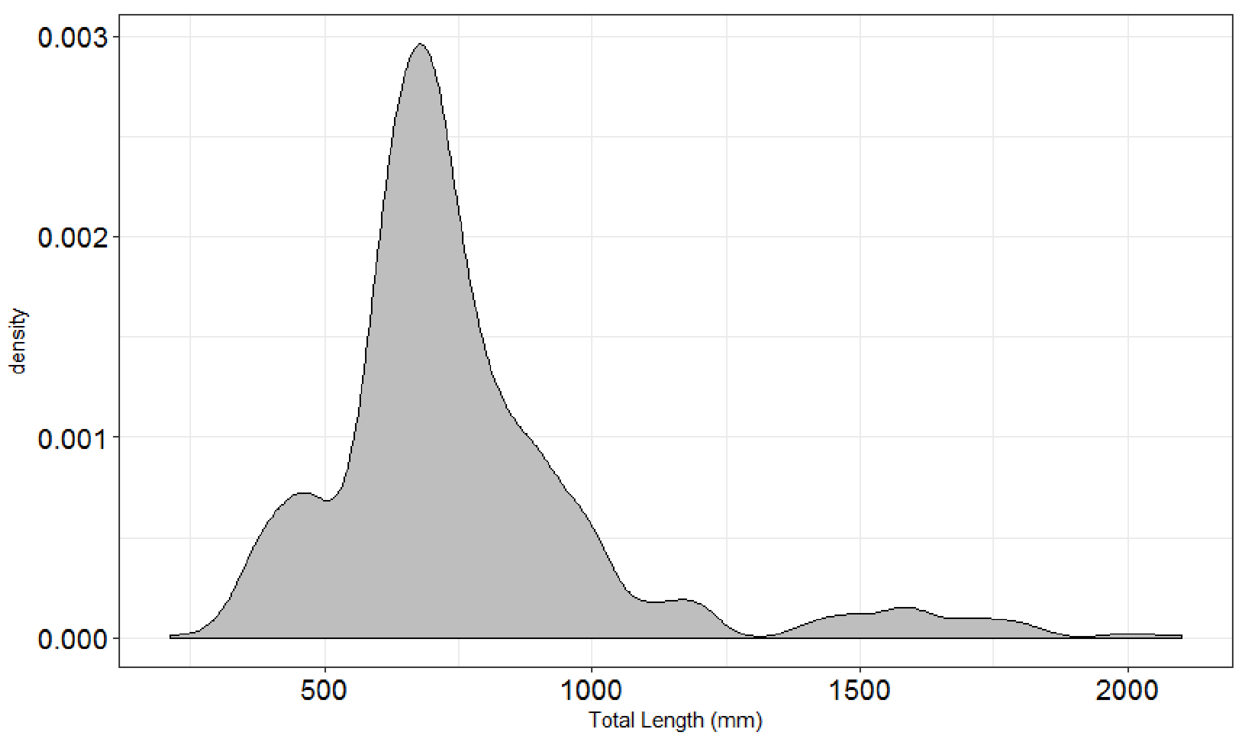

Figure 8. Length distibution of Atlantic sturgeon caught by the SC Edisto survey.

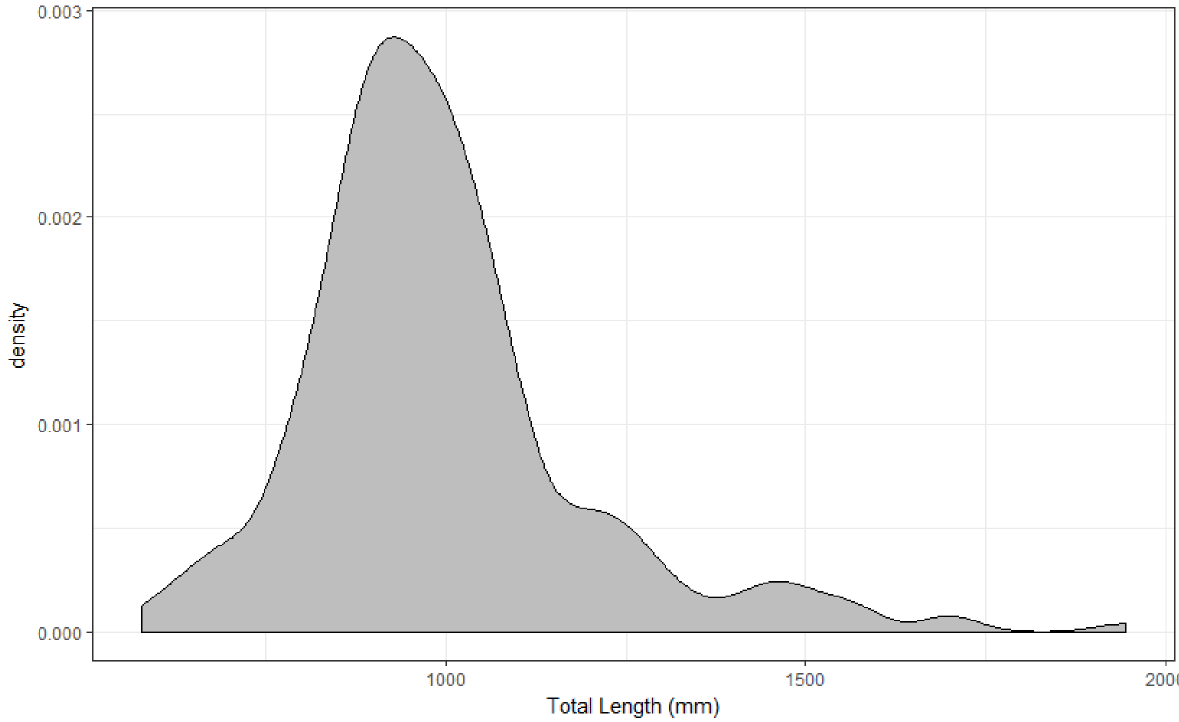

Figure 9. Length distribution of Atlantic sturgeon caught by the USFWS Coop survey.

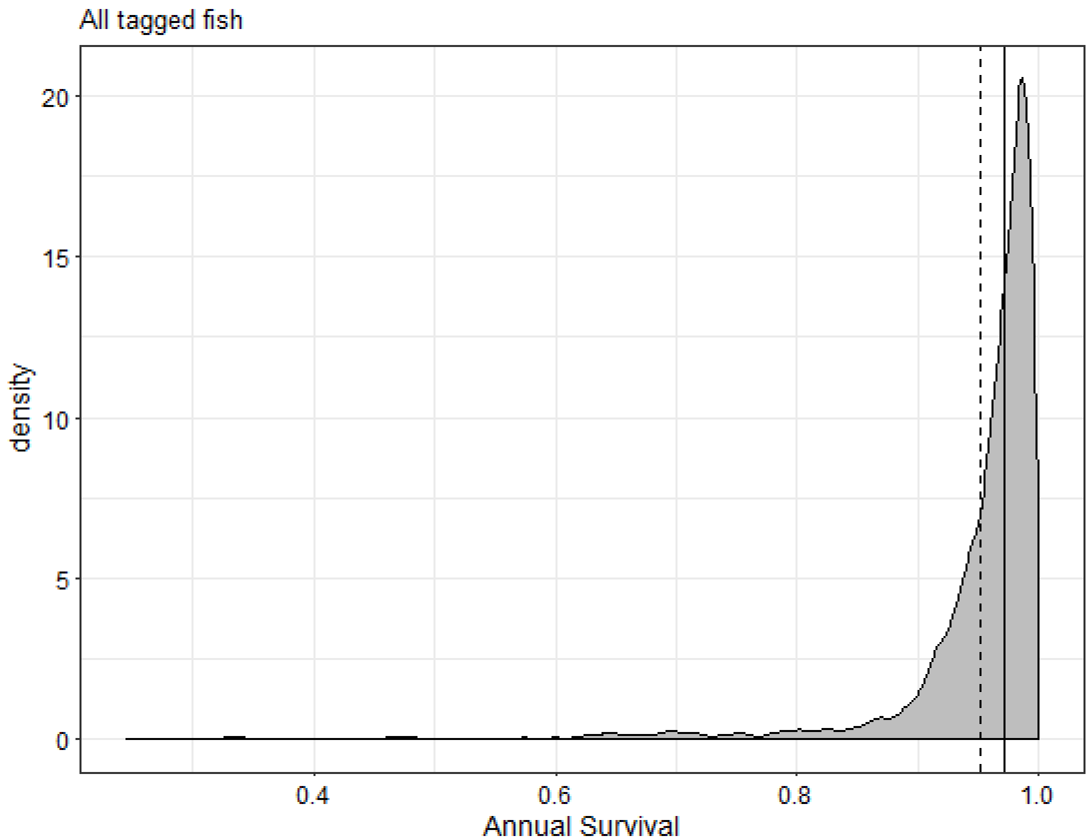

Figure 10. Posterior distribution of annual survival estimates from the acoustic tagging model for all tagged fish. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

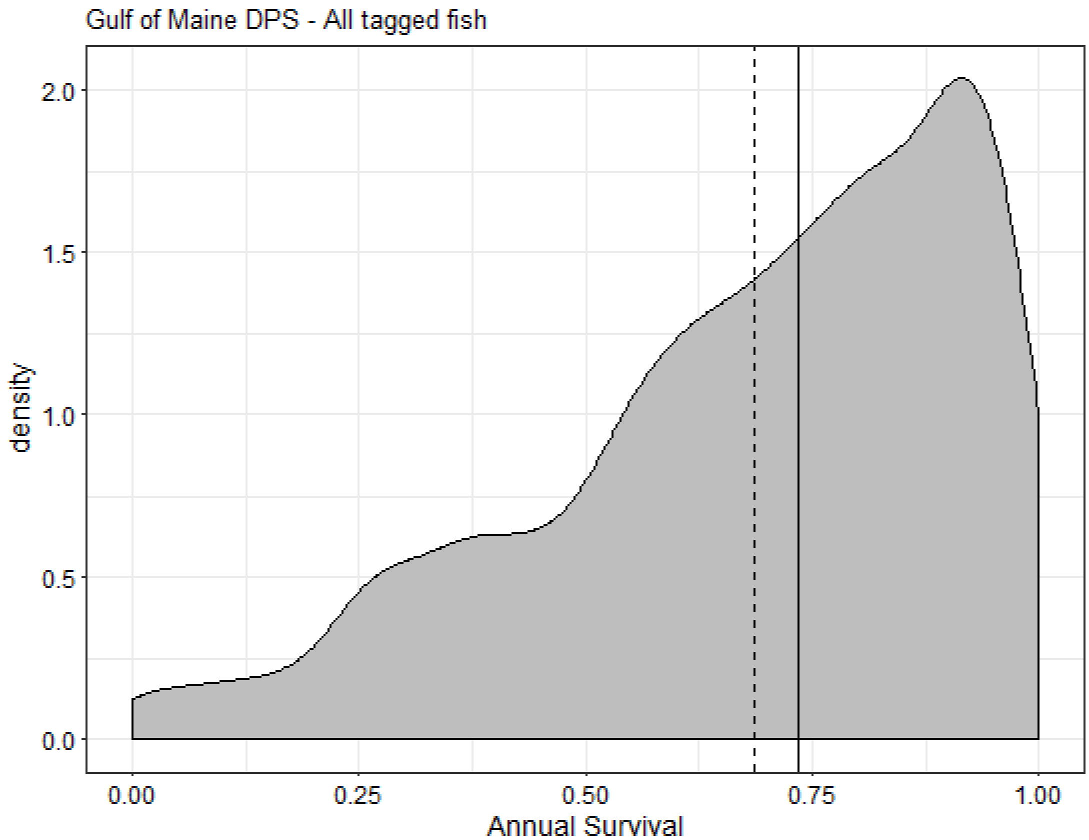

Figure 11. Posterior distribution of annual survival estimates from the acoustic tagging model for all tagged fish from the Gulf of Maine DPS. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

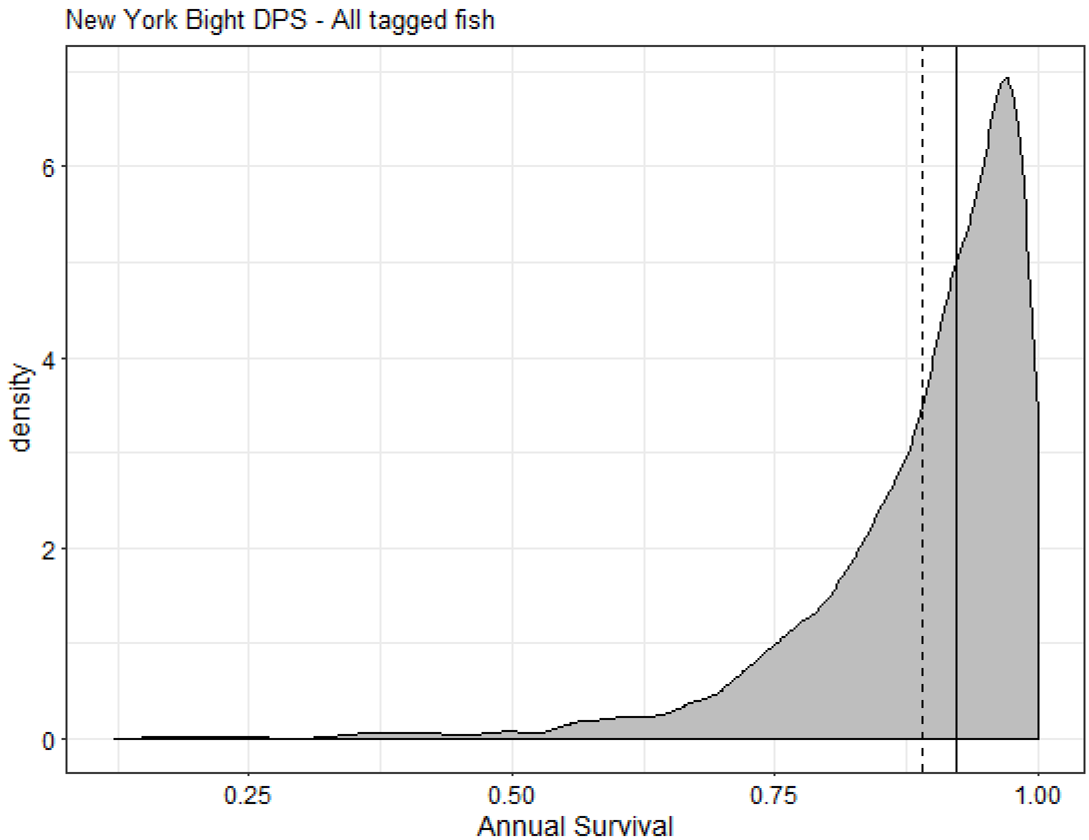

Figure 12. Posterior distribution of annual survival estimates from the acoustic tagging model for all tagged fish from the New York Bight DPS. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

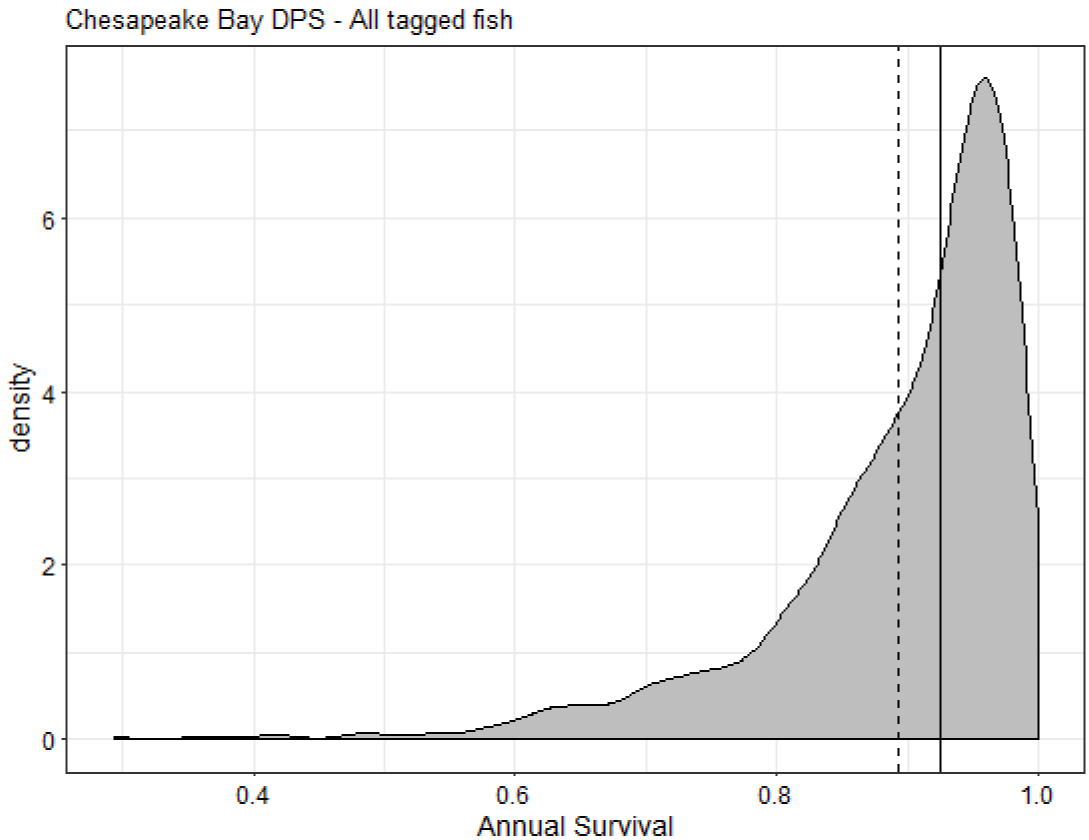

Figure 13. Posterior distribution of annual survival estimates from the acoustic tagging model for all tagged fish from the Chesapeake Bay DPS. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

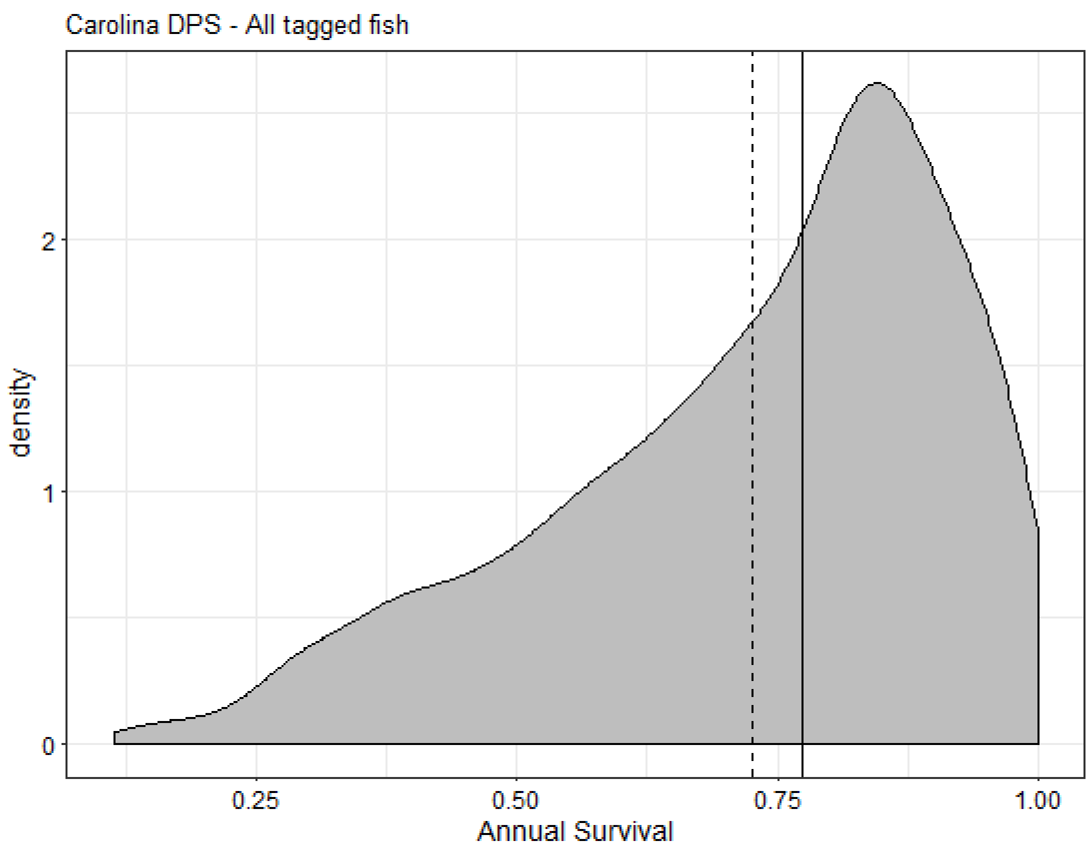

Figure 14. Posterior distribution of annual survival estimates from the acoustic tagging model for all tagged fish from the Carolina DPS. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

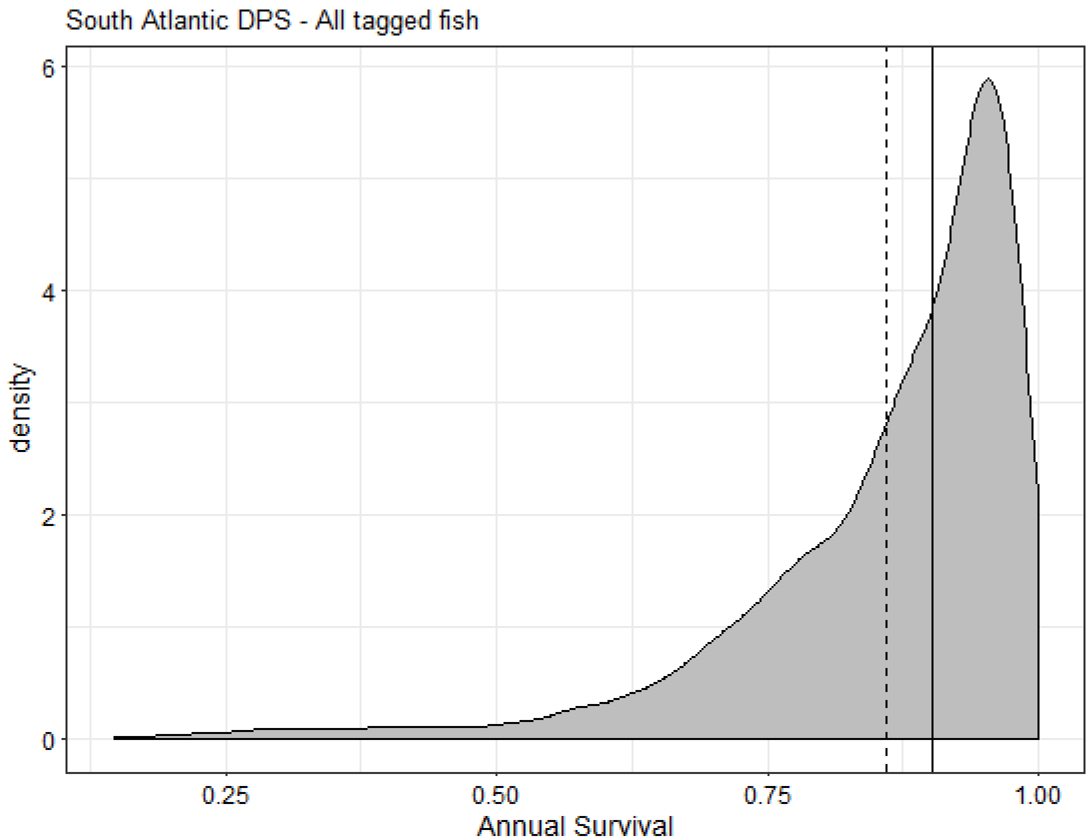

Figure 15. Posterior distribution of annual survival estimates from the acoustic tagging model for all tagged fish from the South Atlantic DPS. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

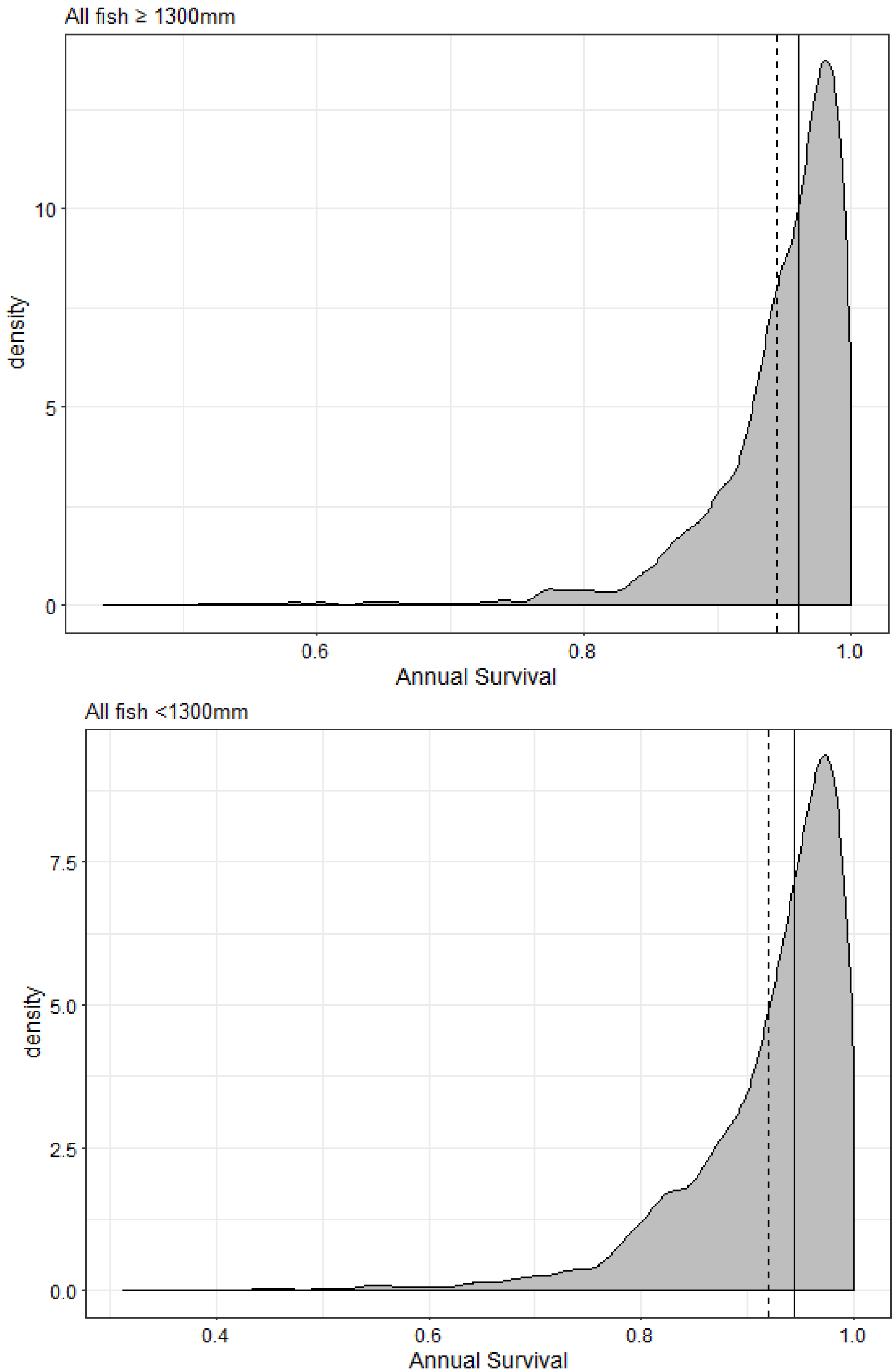

Figure 16. Posterior distribution of annual survival estimates from the acoustic tagging model for adult (top) and juvenile (bottom) tagged fish from all DPSs. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

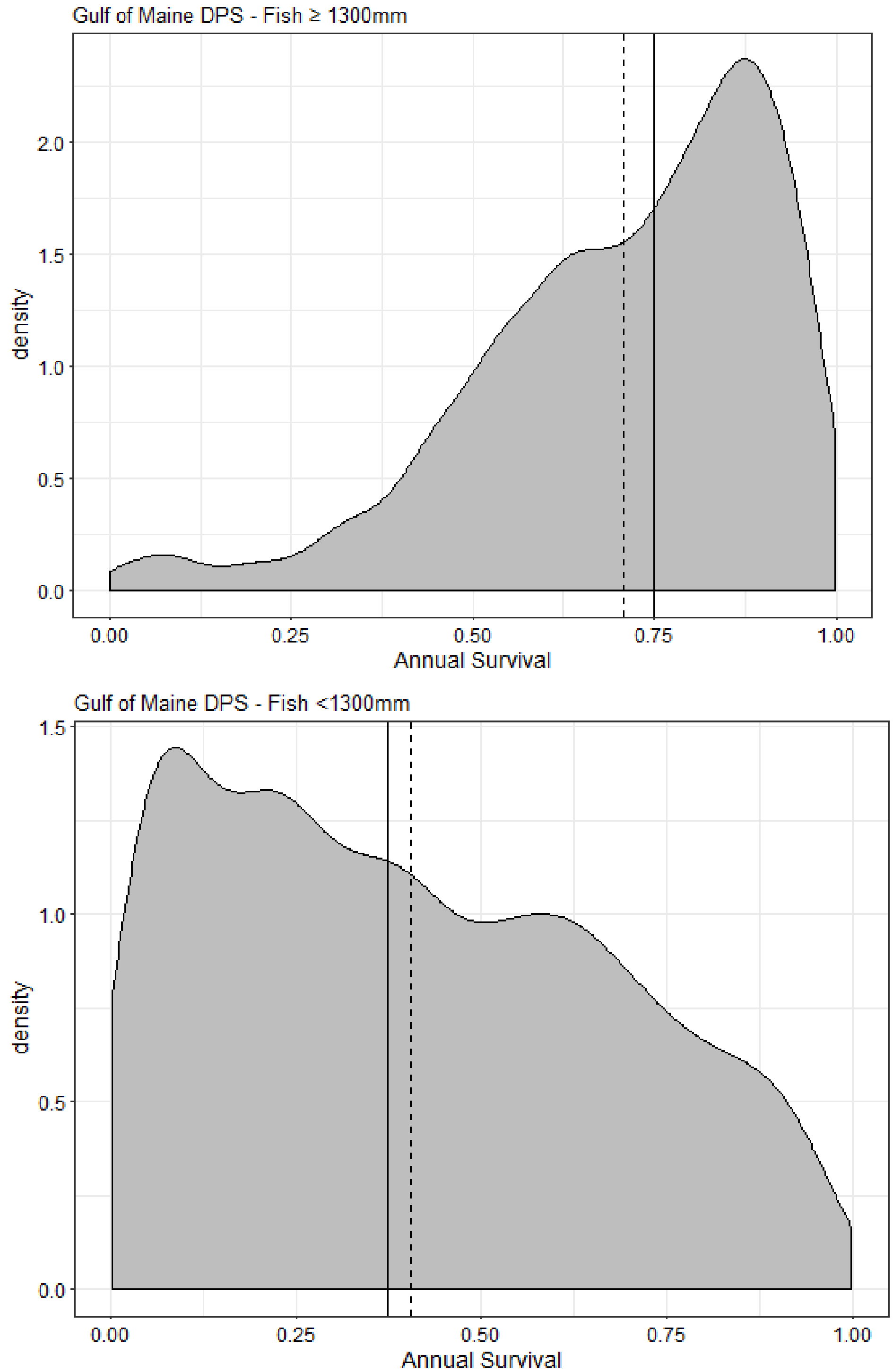

Figure 17. Posterior distribution of annual survival estimates from the acoustic tagging model for adult (top) and juvenile (bottom) tagged fish from the Gulf of Maine DPSs. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

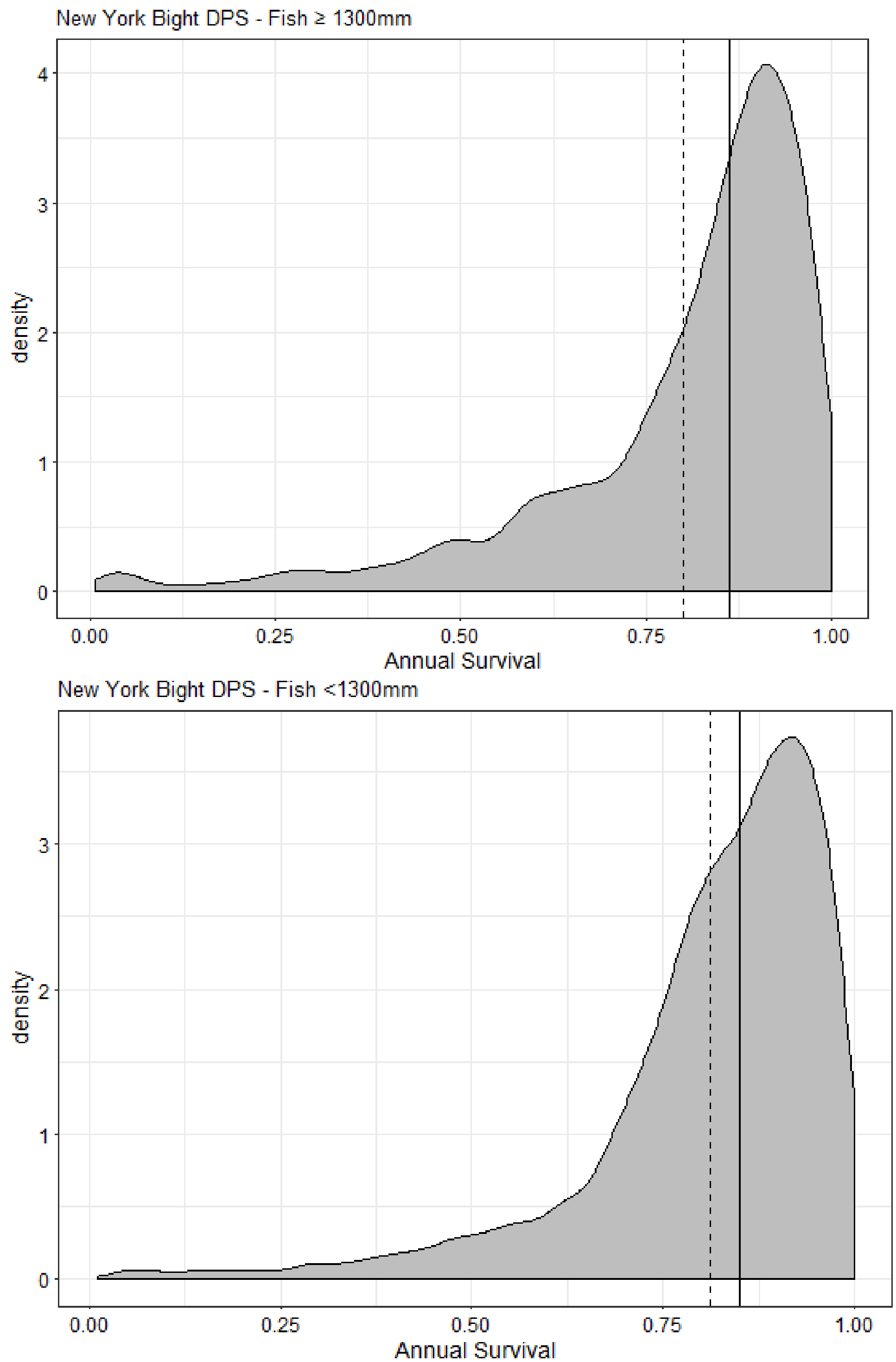

Figure 18. Posterior distribution of annual survival estimates from the acoustic tagging model for adult (top) and juvenile (bottom) tagged fish from the New York Bight DPSs. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

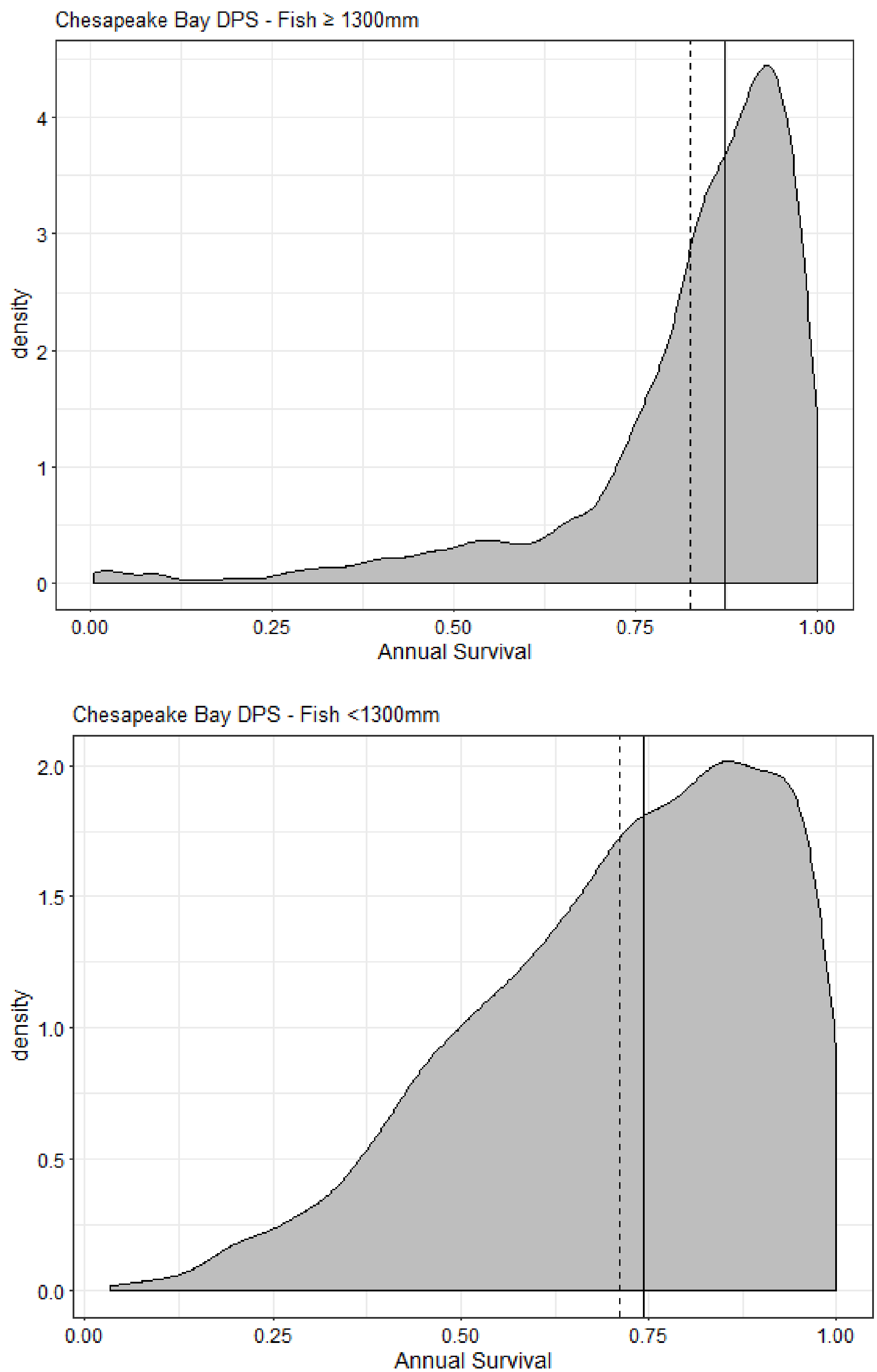

Figure 19. Posterior distribution of annual survival estimates from the acoustic tagging model for adult (top) and juvenile (bottom) tagged fish from the Chesapeake Bay DPSs. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

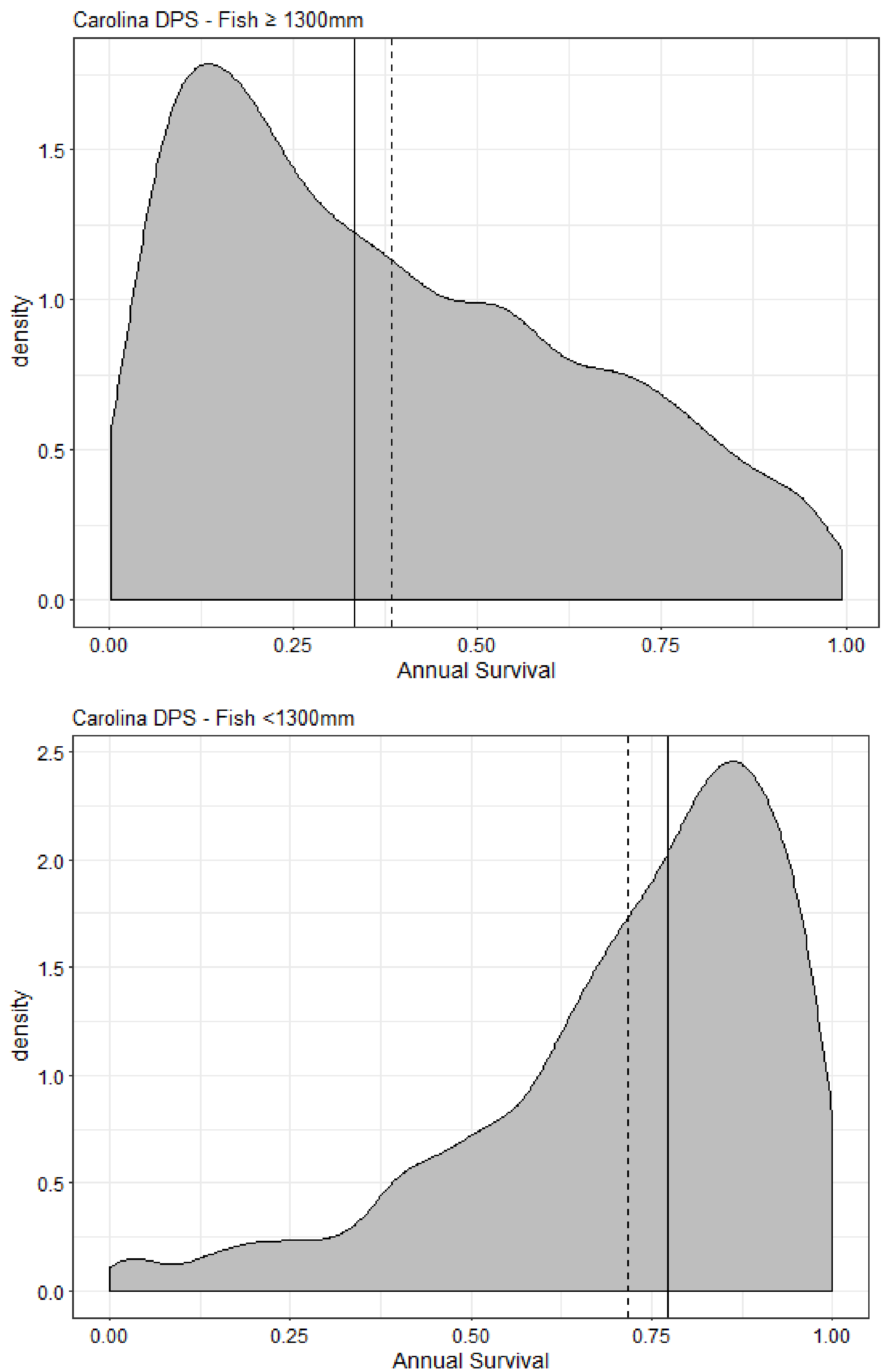

Figure 20. Posterior distribution of annual survival estimates from the acoustic tagging model for adult (top) and juvenile (bottom) tagged fish from the Carolina DPSs. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

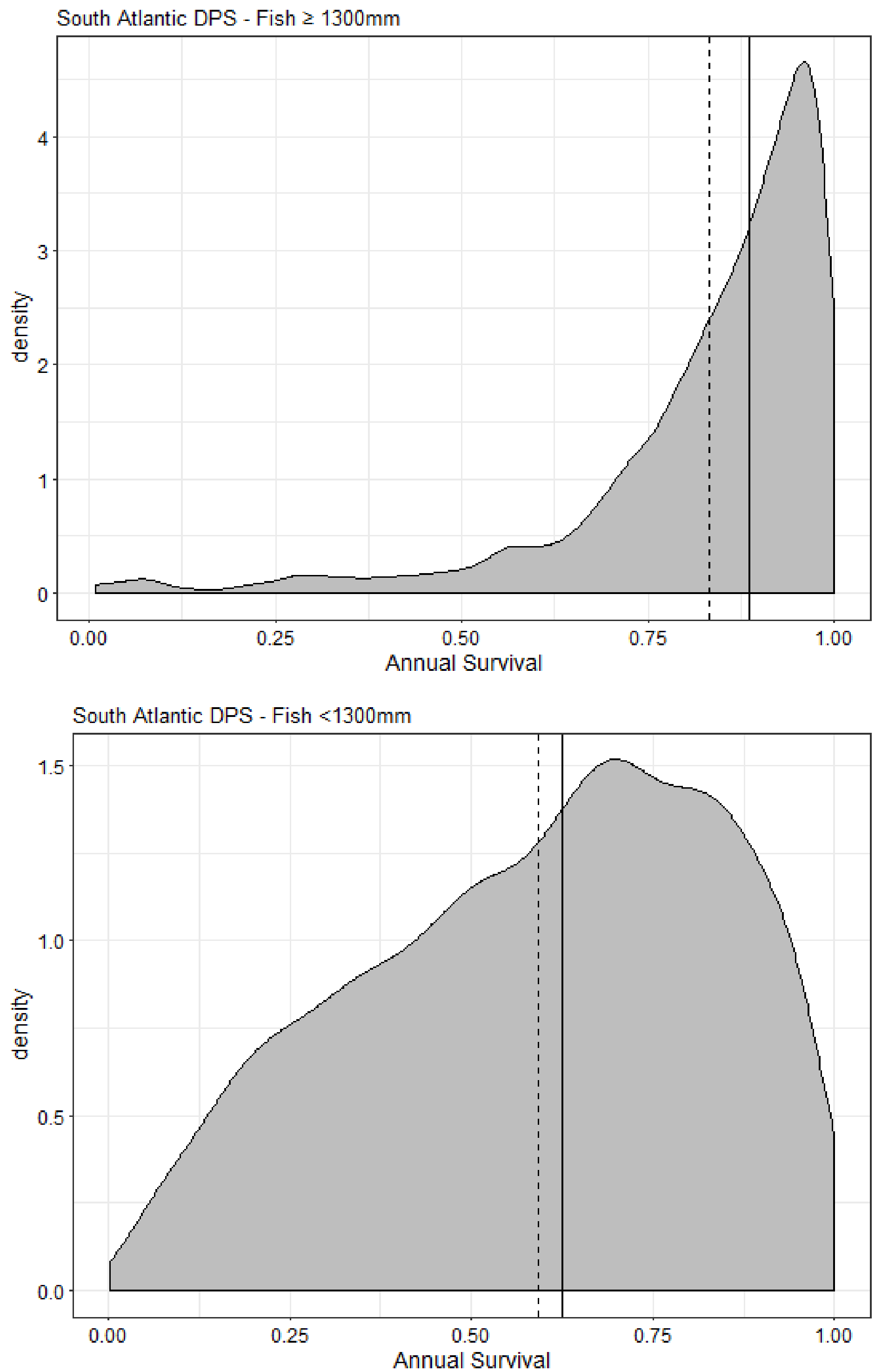

Figure 21. Posterior distribution of annual survival estimates from the acoustic tagging model for adult (top) and juvenile (bottom) tagged fish from the South Atlantic DPSs. The solid vertical line is the median of the posterior distribution and the dashed vertical line is the mean.

Atlantic States Marine Fisheries Commission

Summer Flounder, Scup, and Black Sea Bass Management Board

October 18, 2017
4:15 p.m. – 6:00 p.m.
Norfolk, VA

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)* 4:15 p.m.
2. Board Consent 4:15 p.m.
   - Approval of Agenda
   - Approval of Proceedings from August 2017
3. Public Comment 4:20 p.m.
4. Black Sea Bass Draft Addendum XXX for Board Review **Possible Action** *(K. Rootes-Murdy)* 4:30 p.m.
5. Review Preliminary 2017 Recreational Harvest Estimates Through Wave 4, If Available (*K. Rootes-Murdy*) 5:05 p.m.
6. Consider Approval of 2017 FMP Reviews and State Compliance Reports (*K. Rootes-Murdy & C. Starks*) **Action** 5:35 p.m.
7. Consider a Potential 2018 Wave 1 Opening of the Black Sea Bass Recreational Fishery **Possible Action** (*M. Luisi*) 5:50 p.m.
8. Other Business/Adjourn 6:00 p.m.

The meeting will be held at the Waterside Marriott Hotel, 253 East Main Street Norfolk, Virginia; 757.627.4200

MEETING OVERVIEW

Summer Flounder, Scup, and Black Sea Bass Management Board
October 18, 2017
4:15 p.m.-6:00 p.m.
Norfolk, Virginia

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: August 3, 2017
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 August 2017

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. Black Sea Bass Draft Addendum XXX for Board Review (4:30-5:05 p.m.) Possible Action
Background • In August, the Board was presented recommendations from the Black Sea Bass Recreational Working Group on potential management alternatives to be included in draft addendum XXX. The draft addendum XXX proposes new regional approaches to managing recreational black sea bass. • The Working Group met in October to consider the revised draft addendum and provide guidance on further development of management alternatives (**Supplemental Materials**)
Presentations • Overview of updated Draft Addendum XXX and Working Group Recommendations by K. Rootes-Murdy
Board Actions for Consideration • Approve draft addendum XXX for public comment

5. Review Preliminary 2017 Recreational Harvest Estimates through Wave 4, if Available (5:05-5:35 p.m.)
Background • Wave 4 harvest estimates should be posted by October 15, 2017
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

6. Consider 2016 FMP Reviews and State Compliance (1:15-1:45 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. **(Meeting Materials)**. • Massachusetts has not implemented mesh size requirements consistent with the Scup FMP • 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 • Consider State Compliance Reports • Approve *de minimis* requests from Delaware for summer flounder and scup

7. Consider a Potential February 2018 Opening of the Black Sea Bass Recreational Fishery (5:50-6:00 p.m.) Possible Action
Background • The Board discussed the possibility of a 2018 Black Sea Bass Recreational Fishery starting in January through February (Wave 1) at the Joint Council and Board Meetings in May and August 2017. • The Council will consider a potential one month opening of the Black Sea Bass Recreational Fishery for February 2018 at their October Meeting.
Presentations • 2018 Recreational Back Sea Bass Wave 1 Fishery by K. Rootes-Murdy
Board Actions for Consideration • Consider a potential February 2018 opening of the Black Sea Bass Recreational Fishery

8. 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
August 3, 2017

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.

Table of Contents

INDEX OF MOTIONS

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

2. **Approval of proceedings of May 2017** by consent (Page 1).

3. **Move to rescind the possession limit of 5 Fish in Wave 6 for the 2017 black sea bass recreational fishery; made at the May 2017 meeting. States would maintain their 2016 Wave 6 measures unless otherwise approved by the Board** (Page 18). Motion by Jim Gilmore; second by Tom Baum. Motion carried (Page 24).

4. **Motion to adjourn** by consent (Page 38).

ATTENDANCE

Board Members

Pat Keliher, ME (AA)
Doug Grout, NH (AA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)
Nichola Meserve, MA, proxy for D. Pierce (AA)
Bob Ballou, RI, proxy for J. Coit (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Mark Alexander, CT (AA)
Lance Stewart, CT (GA)
Jim Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Tom Baum, NJ, proxy for L. Herrighty (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)
Mike Luisi, MD (Chair)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Rachel Dean, MD (GA)
John Bull, VA (AA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Chris Batsavage, NC, proxy for B. Davis (AA)
Doug Brady, NC (GA)
David Bush, NC, proxy for Rep. Steinburg (LA)
John Bullard, NMFS
Sherry White, USFWS

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

Ex-Officio Members

Staff

Robert Beal
Toni Kerns
Kirby Rootes-Murdy
Megan Ware
Caitlin Starks

Guests

Kelly Cates, NOAA
Kiley Dancy, MAFMC
Jeff Deem, VMRC
Lindsey Fullenkamp, NMFS
Matthew Gates, CT DEEP
Molly Masterton, NRDC
Mark Gibson, RI DEM
Arnold Leo, E. Hampton, NY
Chip Lynch, NOAA
Jason McNamee, RI DEM
Brandon Muffley, MAFMC

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, August 3, 2017, and was called to order at 10:34 o'clock a.m. by Chairman Michael Luisi.

CALL TO ORDER

CHAIRMAN MIKE LUISI: Good morning everyone, I would like to call to order the meeting of the Summer Flounder, Scup, and Black Sea Bass Management Board. My name is Mike Luisi; I'm the Chairman of the Board, and from the state of Maryland. Let me point out before we begin that we are starting this meeting about an hour and 15 minutes short of when it was supposed to begin; but that does not mean that we've just added an hour and 15 minutes to the agenda.

We're going to try to maintain what originally was set out for a two-hour conversation and discussion, which takes us to the point where we can break for lunch. We did have a lunch break scheduled as part of the agenda. If it gets to 12:30 and we still have some work to do, we may just take a quick break. I'll look to the other Commissioners to advise me on that. But I've been told that we can't let the food sit out there forever.

We've got to get through our agenda and move on to tautog; so folks can get home and catch flights and get their travel arrangements.

APPROVAL OF AGENDA

CHAIRMAN LUISI: With all of that said, we're going to go to Item Number 2; which is Board consent and approval of the agenda. Are there any modifications, changes to the agenda? Emerson.

MR. EMERSON C. HASBROUCK: As a holdover from our previous Board meeting that ran until seven or eight o'clock in the evening last time, we didn't have time to initiate a discussion about the research set aside program; so I would like to add that under other business, please.

CHAIRMAN LUISI: Yes, we'll do that Emerson. Thanks for bringing up that last meeting. It took me a few minutes just to cross over the threshold of the doors on the way in this week; remembering the last meeting that we had last time. Yes, we'll add that to the list. Are there any other changes to the agenda? Okay seeing none; the agenda is approved by consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN LUISI: Moving on to the proceedings from the May, 2017 meeting of this Board, are there any changes or modifications to the proceedings? Seeing none; consider the proceedings approved.

That takes us to public comment. We didn't have anybody sign up for public comment for items that are not on the agenda; but I'll look to the audience.

Is there anyone from the audience that would like to provide public comment on items that are not on the agenda?

UPDATE ON SUMMER FLOUNDER RECREATIONAL WORKING GROUP

CHAIRMAN LUISI: Okay seeing none; we're going to move on to Item Number 4 on the agenda; which is an Update on Summer Flounder Recreational Working Group Kirby is going to provide us the information for that. I just want to thank Bob Ballou; the Vice-Chair of this Board for the efforts that he took in the leadership role in providing information for the discussions that we had this summer. With that said, Kirby the floor is yours.

MR. KIRBY ROOTES-MURDY: To what Mike just mentioned, we do have a number of Summer Flounder Recreational Working Group members here at the table; so if there are additional items that I don't touch on in my presentation that you think need to be brought up, please feel free to do so afterwards.

In terms of an outline, I'm going to just give some brief background; and then get into what the Rec Working Group discussed, and primarily the draft prospectus document. That document became available for the Board last week. It was submitted in supplemental materials. We have printouts available on the back table.

If you have not had a chance to read it yet, please grab a copy, look it over, and you can ask me some questions. I'm going to focus on today primarily the short-term-strategy discussion. I'm trying to look at what the recreational management options the group discussed for 2018, and in turn what their overall recommendations were.

Then I'll take any questions folks have. As it was alluded to earlier, we had a very long meeting in May. At the very tail end of it there was an interest expressed in having a Recreational Working Group reenergize from their previous discussions in the fall, in helping craft Addendum XXVIII; and think through recreational management for 2018, and possibly beyond.

The group met via conference call in June and July of this summer. Staff presented that group with information on recent addenda, laid out kind of how the fishery has performed relative to MRIP estimates; as well as trying to make clear what the bounds we have in the management program for what we're able to work under.

The draft prospectus as I said, I think lays out very well a number of the items the group worked through and discussed. The first thing I just wanted to kind of make clear is that this is really a discussion on whether to have a new type of addendum for 2018 management. Under that broad topic, the group was in favor of continuing regional management in 2018; as well as the current regional alignment that we have in 2017.

For 2016 and 2017, we've had the same regional alignment now; where you have the regions of Massachusetts by themselves, Rhode Island by themselves, Connecticut through New York, New Jersey by itself, Delaware through Virginia, and then North Carolina by itself. The group noted there were challenges in moving to some kind of different approach than that regional alignment that has been in place the last two years.

One idea was to create a coastwide set of measures that then each state or region could then alter to meet their needs. But it needs to be made clear, and staff brought this up on the call that it is not sure how that would work in relation to our joint management plan with the Mid-Atlantic Council.

As many of you know, we have conservation equivalency specific to this plan that lays out how if there isn't an interest to go to a coastwide set of measures, states have either an individual share that they can set their measures to, or operate under the addenda's regional management measures. Coming up with something where there is a coastwide set of measures that are then adjusted for each state or region is outside of the box of those options. As I said, under this idea of whether or not to initiate a new addendum for 2018, a number of items were discussed; and I'm going to walk through those.

The next thing was looking at the 2018 recreational harvest limit, and discussing how to evaluate coastwide harvest. The Rec group expressed interest in treating the coastwide recreational harvest limit as more of a soft target than an actual hard ceiling. That is generally how we've been doing it for over the last 20 years; where we have to set measures to hit that RHL and not exceed it.

Part of this argument of moving away from that to more of a soft target is tied to recent Technical Committee arguments on the timeliness of data that is provided by MRIP, the imprecision of MRIP data, and the Addendum XXVIII process and ultimate results, as many of you are aware of.

That approach presents challenges as well, in trying to move to some kind of more soft target than an actual limit; with regards to our joint management with the Mid-Atlantic Council and the Council's accountability measures, but as well as how the Council operates in relation to NOAA Fisheries, which is that they would set a recommendation or make a recommendation to NOAA Fisheries.

NOAA Fisheries then puts in place either federal water measures or agrees with conservation equivalent measures that the Board submits. Coming up with an approach that basically says that we are moving away from looking at that RHL as the limit, and that something of a softer target will run counter to our current practice.

One Recreational Working Group member recommended using instead of harvest that total fishing mortality. That would be encompassing the discard mortality, as well as our A + B1 data points that were used to evaluate harvest annually in that process; as opposed to just harvest by itself.

Moving on, there was a move to look at all outside of the 2018 recreational harvest limit, should there be a consideration of having some kind of addendum in place for two years. The Recreational Working Group members did not reach consensus on if there should be a new addendum for more than one year; so just looking at 2018 was really on everyone's mind.

People really couldn't get beyond that and think about how something could be set in place for two years. Many Rec Working Group members indicated that if an addendum were initiated, it needed to be crafted specifically to the 2018 RHL. With those kinds of two comments, staff did note that the current addendum we were working under in 2017, Addendum XXVIII, can be extended for an additional year.

I'll make this point throughout my presentation that unless there is something different that the Board wants to do, we have the flexibility to turn through the addendum to continue much of what is in place this year. I will note, and it's been a point that has been brought up at the working group level that these recent addenda have not laid out, in terms of regional management, very clearly how regional measures need to be evaluated and then adjusted annually; based on the coastwide harvest, because there aren't regional targets. We don't set any kind of bounds around what those measures need to normally achieve; and then hold regions accountable. It's really a broad, if we think that everyone has gone above what we projected in the harvest we then need to adjust.

That creates a bit of ambiguity on how we're supposed to adjust those measures year in and year out. Moving on to talking about evaluating MRIP differently than just the point estimate of harvest, which is what we generally do when we're talking about looking at harvest relative to the coastwide RHL.

There was a discussion of considering confidence intervals as MRIP estimates are generally considered a statistic and not an actual hard landing; looking at confidence intervals for evaluating both 2017 harvest relative to the RHL, as well as projecting 2018 harvest. While the Technical Committee has lain out in previous memos an interest in exploring this further; and there was an initial analysis done as part of Addendum XXVIII to make clear the challenges of setting measures to the RHL annually.

It needs to be understood that the TC has not had time to fully develop this type of approach. We have really had the Technical Committee nearly every month work on some kind of set of TACs from this Board, to try to get at either immediate questions or policy decisions; and there hasn't quite been the time to fully explore and investigate how this could further play out.

As I said, one of these big challenges is that we've had fairly consistent measures for the last three years; in terms of what the regional measures are. Yet harvest estimates have fluctuated significantly. In addition to that those harvest estimates have fluctuated in relation to the RHLs. The RHLs have not stayed constant either; they have gone largely down over the last three years.

But harvest has not consistently gone down by the same degree. That creates a challenge in trying to say if we're setting measures to achieve that RHL that we can evaluate it best with a confidence interval with great certainty. It's just that the TC needs more time to fully develop and explore that approach if that's of interest to the Board.

With all those considerations in mind, the group recommended that in the short term, the immediate term for this year that we maintain evaluating preliminary harvest; as we have in previous years, against the 2018 RHL. Evaluating how we're doing this year to help us understand what we need to set measures for next year.

The group notes that using data through Wave 4 has worked in recent years, and has been fairly stable in making a projection on how harvest will go through the end of the year; as most states don't have their fisheries open beyond October; unless you're considering some of the more southern states that have fairly small harvest, even at that point of the year.

Continuing along with the draft prospectus, there was other discussions on whether a different regional alignment than what was in Addendum XXVIII needed to be put forward. As I said, the group could not come up with a new approach. In moving on to thinking about conservation equivalency, and whether there needs to be a reconsideration of how that works within the plan, the group really got into the crux of the problem; which is trying to think through a different approach that keeps the flexibility that all the states and regions are interested in having, but at the same time maintaining the consistency in those regional measures. One of the challenges with Addendum XXVIII was with some of the conservation equivalency proposals that were put forward at times.

They were either going against what the regional measures should be, and if you have more than one state in a region having two separate sets of measures for two states within a region, or three states within a region, undermines what a region is really supposed to be. As I said, central question is state-by-state conservation equivalency; which this Board knows very well through the plan, and having a state target versus continuing on with regional management that doesn't have targets.

The group did also raise concerns about moving to more regional targets, and there was a lot of hesitation in actually assigning some type of target; because many viewed that as a de facto allocation, which in light of some of the impending changes to MRIP estimates, Rec Working Group members were apprehensive about assigning at this point.

In discussing the time table of a potential addendum, staff pointed out as I said before that if there is no new approach that is being put forward, or no new regional alignment, and that we are going to maintain evaluating harvest as we have in previous years. Starting an addendum process sooner than we had in recent years is not feasible; because we inherently are waiting for that preliminary estimate of Wave 4 data that won't be available until October.

We can't get after anything, even if there are new ideas put forward, and these other considerations are agreed upon by the Board; until later this year. I will offer that one alternative was offered after the group had discussed it, and I didn't get any additional feedback on it; so I just wanted to offer it up here, and just say that there wasn't consensus or group consensus on it.

But one alternative put forward was at the joint meeting that will take place next week with the Mid-Atlantic Council, after setting 2018 specifications, in December evaluating preliminary 2017 estimates, and if we assume that the 2017 harvest is equal to the RHL then there is effectively no change in what the measures would be for 2018.

Trying to look at this more with the confidence interval approach, if there are higher estimates than what we have the 2018 RHL set at, then looking at those confidence intervals and seeing how that estimate fares relative to those confidence intervals. If it's within the upper or lower bound, and if the 2018 RHL is higher than the upper bound of that estimate, then there would be a difference between those two numbers and allowing the regions to effectively liberalize their measures.

But if the RHL is lower than what those bounds indicate, then they would require regulations to be more restrictive than what we have currently in place for 2017. I'm going to briefly talk through on these last two slides what the long term strategy discussion was; and it was very brief, as most of the summer flounder discussions these days go longer than expected.

There was a discussion on undertaking the new benchmark assessment, and that's something that needs to be done in order to more fully evaluate a new management approach; in many of the Rec Working Group members eyes. One thing that is coming up soon, and will be completed hopefully by summer of 2018, is evaluating an F-based management approach for recreational management. The Mid-Atlantic Council has put out an RFP, and they'll be going through that process. I have my colleague Kiley Dancy in the audience, and she may be able to answer more questions on that time table, if people have questions on it.

But that's something that will feed into a longer term strategy. The last two things we're trying to have, the Board, the Rec Working Group, and the Technical Committee better understand recreational catch and effort data; as that seems to be one of the biggest challenges in trying to use that information in setting annual management measures.

The last thing was trying to better develop a visioning process, for what the states and the Board wants to have in place for recreational management in the future; because many have indicated that they don't think that the current system is what stakeholders are seeking to have. In summary, the Rec Working Group did not reach consensus on a different recreational management approach for 2018.

As I said before, we have our three main approaches in the tool box that we've used in recent years. Annually we either want to set coastwide set of measures, or move to conservation equivalency. We have state-by-state shares under conservation equivalency that the states are very familiar with, or there is the ability to extend Addendum XXVIII for one more year. Again, an addendum is not needed unless a different approach is preferred. With that I'll take any questions the Board has.

CHAIRMAN LUISI: Questions for Kirby, John Clark.

MR. JOHN CLARK: Thanks for the presentation, Kirby. One of your early slides just reminded me of something, and I hope I'm not misinterpreting. But I thought at the Director's Meeting when NOAA Fisheries was explaining how the decision was made on the New Jersey proposal that their interpretation was that Magnuson-Stevens requires a reduction in total mortality.

They recommend to the Secretary that the discard measures that New Jersey was taking would help reduce mortality. When you had that point here, and once again other people that were at that meeting, if I'm misinterpreting something please let me know. But I'm just curious as to whether that could help in our regulation process if we would get credit for reducing discard mortality as New Jersey did. I mean, if I recall that was a legal interpretation of Magnuson-Stevens.

MR. ROOTES-MURDY: I wasn't at that meeting, so I'm going off of what you're asking now. I will point out, and as I said my colleague Kiley from the Council is in the audience and she can help better explain this if I mess up. We account for projected discards, both on the commercial and the recreational side; in setting what the RHL is annually.

Currently we do account for that in our annual process, aside from setting the measures to specify harvest. While there could be an effort to further evaluate total fishing mortality; and again that term is a little vague, depending on what we actually are talking about. That could be further encompassed into our annual measure-setting process, which as I said is different than where we set our specifications annually in August.

CHAIRMAN LUISI: John, follow up?

MR. CLARK: Just to follow up on that, Kirby. I'm just curious as to, I know that the discard mortality is already worked into the model, but does this mean that if we said we were taking similar measures, you know like an educational program. Russ showed me some of the hooks that were being distributed, things like that. That we could reduce the discards; that factor in the model, and therefore there would be more flounder that could go to harvest.

MR. ROOTES-MURDY: I will give you my best answer on this. We had a Technical Committee review of New Jersey's proposal; and I'll point out that one of the big challenges with that proposal for the Technical Committee was quantifying how their proposed measures were going to reduce their discard mortality by approximately 2 percent.

That is something the Technical Committee could look into further. But it is a challenge to try to develop a set of measures that we think is going to go against established research that it indicates what discard mortality is for summer flounder recreational measures.

CHAIRMAN LUISI: John, one more follow up and then I've got a comment I can also make.

MR. CLARK: Like I said, I understand that. I know we examined this thoroughly. As far as I'm concerned, NOAA Fisheries kind of inadvertently opened this can of works; and I'm just wondering, there are so many arbitrary aspects of this management at this point that even just lowering discard mortality by a couple of percentages could help all states have more to harvest.

CHAIRMAN LUISI: Thanks for those comments, John. I'll just add I think, the actions that have happened over the course of this last year have provided me at least, in my mind, a sense of some gained flexibility to how we can make a proposal to NOAA regarding conservation equivalency measures. Kirby mentioned in his

presentation that there was one alternative approach; which included confidence intervals and the use of previous years catch.
In my mind those are all methodologies that we now may be able to explore a little more thoroughly. While the Technical Committee review had to report on the New Jersey's proposal from last year as it did. The Technical Committee may need to start thinking and evolving a little bit with some of these changes and some of these decisions that are being made outside of the Commission process. That's how I see it, John. Roy Miller.

MR. ROY W. MILLER: Kirby, in your summarization, thank you. I didn't hear mention with regard to regionalization, of this concept of Delaware Bay specific regional allocation standards. Did that particular topic, since that has been an important topic over the past couple years, for New Jersey's consideration of equity within the Delaware Bay region. Did that come up in your working group?

MR. ROOTES-MURDY: No, it wasn't a specific discussion item by the group. I will note that it was generally understood as being in the regional discussion of New Jersey having a set of different measures for Delaware Bay specific in the last two years; but there was no discussion of an allocation for that shared water body between the two states, or an allocation for just that water body.

CHAIRMAN LUISI: Jim Gilmore.

MR. JAMES J. GILMORE, JR.: I'm just looking, in terms of the third option. That is sort of the regional management option; and right now I don't think we have regional management any more. I mean the reality is you have regional management for the southern states, for Delaware south it's regional.

Once you get north, with the exceptions of Connecticut and New York, I mean everything is sort of like it's almost state by state again. I don't even think that could be an option; because right now, correct me if I'm wrong, but we would have to adopt Addendum XXVIII or continue it exactly with the measures we have. We couldn't modify those.

For instance, I'm not sure the measures in there right now are different for when those measures were put forward, New Jersey, New York, Connecticut were in a region. Now there are different measures in New Jersey; so if we go back to those measures that were originally in there. Then again, we're going to have to see what harvest is, because I think Jersey rolled the dice and hopefully it will work out for them.

But if it turns out that there is excessive harvest because of that so that doesn't even look like Addendum XXVIII is an option. Regional management isn't even on the table anymore, unless we start a new addendum, is my understanding. I don't know how we would even continue XXVIII, because it's really very different from what we originally agreed on; and what we actually have right now.

CHAIRMAN LUISI: Thanks for those comments, Jim. I think staff and we may disagree just slightly on whether or not Addendum XXVIII is still a viable option for continuation. I think it has more to do with the structure of XXVIII, the regionality as it's designed, or whether or not the regional approach of XXVIII would need to be modified to the degree we would need to start a new addendum. But I'll look to Kirby to help explain.

In my view XXVIII, we can get into XXVIII again, and modify regulations between the regions and the states; to come up with a new plan, as new data become available in '17, to address whether either a liberalization or restrictions in the next year. We're going to have to look at that; and I think that's the mechanism that we have some flexibility now to work with, those methodologies.

But the point Kirby made, and I think the thing that we need to be thinking about as a Board is, do we want to deviate from that regional approach that we've used now for the last few years? If so, if something is going to be entirely new, we need to initiate an addendum; and that addendum might need to be initiated today. But if we want to use what we have in place and make changes, we can do that with an extension of XXVIII and just an evaluation of new data. Kirby, if I missed anything, please feel free to add.

MR. ROOTES-MURDY: No, I think you captured it well. Just again in summary, we have if you want to keep the same regions in place for 2018, we can do that through Addendum XXVIII. The language in the addendum from staff's standpoint is that the measures can be adjusted for 2018, to try to hit the 2018 RHL.

CHAIRMAN LUISI: Are there any other questions for Kirby? Adam Nowalsky.

MR. ADAM NOWALSKY: Building on that methodology that we keep hearing about. I feel like the Working Group, having been a part of it in a number of calls, and quite frankly us as a Board, I feel like we're wading through a forest of fruit trees; just trying to find the best tree that we could get some low-hanging fruit off of.

It's hard. We spent a lot of time in that forest already, and we've picked a lot of fruit from the trees; quite frankly. But the methodologies element is something that clearly is an area that when you looked at the addendum last year, we basically were able to put forward an addendum that the Service accepted that deviated from needing to meet to the number RHL, it was a 43 percent number we were looking at.

We were able to put forward something different. The Service has clearly indicated they're willing to look at confidence intervals; New Jersey's proposal from last year with total fishing mortality that there were comments from the Service at the Directors Meeting. We have all these different methodologies that are out there, another alternative put forward here. How can we direct the TC, between now and December to try to hone in on a couple of those methodologies to give us something different?

The FMP says you must design measures to meet the RHL in a given year, but is silent on the mechanism for doing so. We've gotten into the practice of comparing only to last year's harvest; which at the time we're doing it is preliminary in nature and estimated. How do we start getting some solid advice on saying here are some other proposals we as a TC endorse for you to look at as a Board, for crafting measures to meet the RHL?

CHAIRMAN LUISI: Well, Adam I think in the experience that we've all gone through this year, we have a lot of different tools that we can use. What we ultimately decide to use, I guess will be a decision that this Board will have to make. I don't know if there is a strict definition of methodology that we need to follow.

In working through this previous year, and discussing with Commission and Council staff, and folks from GARFO. When the Council and the Commission decide that the states are going to manage summer flounder through conservation equivalency, it's up to the states to present what that conservation equivalency is; and be confident in conservation equivalency in achieving next year's RHL.

How that justification or argument is made is up to the Commission. As you know last year the Commission made an argument, and it was supported by NOAA ultimately, which was a different argument than what we've used in the past. I would like to say that we have a clear, defined path on using the different methods to achieve the desired result. But I don't think that we have that at this time. Again, I'll look to Kirby to add to the discussion; Kirby.

MR. ROOTES-MURDY: Yes, one of the things the Technical Committee is going to need direction from this Board on is if there is an interest in doing something other than our standard methodology of evaluating harvest to the RHL; that there is agreement from the Board on that. Because one of the challenges we have, and we dealt with this this year in evaluating the New Jersey proposal is that if there is a different approach used, coming up with a sense of what is conservationally equivalent becomes very problematic; because it could be very relative. Having agreement from the Board and effectively the states on what they want to use; is what the TC is going to need some clarity from the Board on. Because if it's left to every state coming up with what they think is their best idea, then that might be difficult to come to consensus on an approach.

CHAIRMAN LUISI: Rob O'Reilly.

MR. ROB O'REILLY: Maybe a question, but some comments also if I may. The question is during one of the Working Group calls I was asking about the regionalization of the data. For many, many years we've always heard that coastwide data are the best; in terms of the precision, and it filters downward from there to the state level.

I asked on the call, as a matter of fact the last call, if there was a regional dataset that was used for those states that are in regions; and I'm aware that some states are a region unto themselves. The answer was yes, but then after that someone was talking to me from the Committee and said; no we just sort of blend together the estimates.

I don't know what the answer is, but I know that perhaps one small element might be to make sure that when we look at the regions we look at the collective or pooled data, and go from there; regardless of whether we end up with confidence limits, or variations in the lower bounds of the PSE, or standard deviation, or the actual mean statistic, which is the landings. That is kind of a question.

I think it's solid enough that Kirby probably can answer it in a second; but I wanted to make a comment or two as well. Kirby had put up there from the call the concerns about de facto targets. I might be in the minority, but we really don't have targets, and I hear other members of the Board talking about targets; as if we really have targets, and we don't.

We were told from the very beginning in 2013 that we don't have targets. This is a quazi-coastwide approach. When there are problems, we will figure things out on a coastwide basis, and alter regulations for regions as they're needed. Then we sailed through 2014 and '15. But the problem is maybe worse than the 1998 dilemma that many have found; in that we have simply shifted fish for landings from other states, starting in 2014 with the 2013 dataset.

Each year those states which because of the way things are with the stock, having underages, those fish are just moved. My major concern is we'll reach a point where the stock will start to rebuild. It's not in need of rebuilding yet, but we don't have the next assessment either, the benchmark. But we're perilously close to a rebuilding frame.

My concern is what happens then? What happens to the states from Delaware south especially, and even New Jersey that will be in a situation where there is this holding on to what the targets are. That is for consideration. The second consideration is from 2014 I have been asking for a contingency plan.

What happens, where's our menu of provisions that when we have problems with regional management that we have a menu? We have one, two, three different options that the Board can agree on as to how things will occur. Will there be any liberalization? How will the reductions go? Who will take the reductions? We haven't done that because obviously each year has been filled with enough technical work that we really haven't had the ability to sit down our Technical Committee and go that next step. But I still think it's needed; regardless of where we go from here.

The only thing that I'm comfortable with now is that we do have the Option 5, we do have Addendum XXVIII, and at least if you talk about fairness, I'm sure there are some states that didn't like to go up in the size limit. But there are many states who felt, well you know what, this stock is not doing that well, and I think we can do that and we can keep our bag limit, our possession limits at a relatively low level.

I conclude that we do have the ability to move forward with Addendum XXVIII provisions. I still have concerns about the other items that I mentioned, and I think that at some time they really need to be looked at closely; because we have essentially developed regional management starting in 2013, on the heels of a stock decline, which has continued.

I think it should be apparent that with any type of rebuilding, any type of stock growth, things are going to change. They may not necessarily change with exactly the pictures that we've had of our surveys over the last few years. I appreciate the time. They are concerns I have. They are workable concerns; they are things that can be worked out. For the immediate future we do need to worry about 2018. Again, I think we're on the right track that way for 2018; and if Kirby wants to answer that question that's okay.

MR. ROOTES-MURDY: Generally speaking yes, you can pool data at a regional level and the associated proportional standard error is lower; depending on how you are trying to pool that data, in terms of those regions. I think you might get different PSEs, but I would have to consult with the Technical Committee members before I could get you a straighter answer on that.

CHAIRMAN LUISI: Thanks Kirby, and Rob to your point regarding some differences and things that we can look at for the future. Just keep in the back of your mind that this Commission and work is working with the Council on a comprehensive amendment to the summer flounder plan.

The recreational aspects of that amendment have been put on hold, until we have the new benchmark assessment, until MRIP has recalibrated landings data so that we have a basis to work from. Perhaps some of the thoughts that you have can be factored into that process; which again is not a short term but more of a long term solution. Chris Batsavage.

MR. CHRIS BATSAVAGE: Kirby, when you were going over the short term options for coastwide measures, I thought you said that it would have a base set of measures that the states could; I guess craft something from that. Did the Workgroup give any hypothetical examples of what that might look like?

MR. ROOTES-MURDY: For summer flounder we didn't get into specifics on how they would apply to, again the coastwide set of states; because as we know there are very different measures currently, depending on where you are on the coast.

CHAIRMAN LUISI: Tom Fote.

MR. THOMAS P. FOTE: What has concerned me on summer flounder for the last couple of years are that we keep talking about we might have to rebuild; like Rob was talking about. We are at the highest levels for the last five or six years, or seven years that summer flounder has been recorded that we have documents for; and recruitment has steadily gone down.

It is difficult to understand how we can have fish that when we started at the rebuilding period we had ones, twos and threes, and most of those ones and twos; and they rebuilt the stocks and had great recruitment. It was when we started getting from ones to twelve that we seemed to be getting into problems.

I mean those big females are still out there, they're just not producing. Is it on the summer flounders fault or is on environmental issues? My question has been, because we would have been coming back for a couple years now because of poor recruitment, and it doesn't have any effect on whether we get good recruitment the following year.

As a matter of fact the last benchmark stock assessment says recruitment is not tied to the spawning stock biomass once you're above a certain level. That is why I think we need to start looking at this fishery a little differently. The other thing is, when we do striped bass we know we were always going to have higher hook and release mortality; or be at the same level as the fish we keep. That is historically what happened.

That is changing a little bit, because they can't fish for summer flounder, black sea bass, and now everybody's talking striped bass, as some people are in there targeting it as a food fish a lot differently than was harvested 15 or 20 years ago, when it was mostly a catch and release fishery. But summer flounder, black sea bass and scup are not catch and release fisheries; they're catch and eat.

We've got to figure out more ways of getting the discards down, or how do we accomplish that; of not throwing 20 to 1, 15 to 1, 19 to 1, and that's what most guys are doing is up to 30 to 1 sometimes you've got to keep a fish. Even at the 18 inch size limit in New Jersey, from what I'm hearing from the guys, they said they are not just getting any keepers anyway. They are just hooking and releasing a lot of fish to feed to the hook and release mortality.

I guess my last point is I've supported regionalization, if it's done under a region that fishes the same. When you get put in a region that has different types of fisheries than you do, and fish on big fish and have the fish available, but we should look at regions that are basically the same bottom.

When you go look at New Jersey and almost all south, you have to go a long way to get 120 feet of water. When I lived and fished on Long Island Sound, you just couldn't go up the bank a couple of feet and you would get deeper water than that. You get it up in New York also on the north shore. We should be looking at regions that have the same size fish to do it regionally, and the same availability of those fish.

Sometimes we looked at north and south, but actually true it's the bays and the coast that have different size limits. It's like Maryland; you go fishing on the coast you're going to see bigger summer flounder on the coast than you'll probably ever see inside the Bay. If we're going to talk about regionalization, let's talk about real regionalization; and that means we have to cross state lines. People are scared about doing that so if it's a law enforcement problem or not, we've done it in New Jersey. We did it with striped bass years ago, and it works. You've got to enforce the rules; that's all it is. If that is the way we want to go, we've got to look at true regionalization, not just lumping states together.

CHAIRMAN LUISI: I think we've had a decent discussion here regarding the question that Kirby asked, whether or not the Board would want to move forward in an entirely new direction. I'm not getting the sense from the comments and some of the questions that have been asked if that is the intention of the Board.

With that said, I'm taking it that this Board would like to continue to work within the confines of Addendum XXVIII, and explore possible methodologies that would address catch in 2017 as it relates to the 2018 RHL. Unless somebody has a different idea, or wants to make a motion to the effect of initiating a new addendum, again which would entirely shift away from the regional approach to something new. I think it's time that we move on in our agenda to the next discussion. John Clark.

MR. CLARK: Mike, just a question. In terms of things like the F-based management, we don't have the data, right? I mean some of these ideas that came up we can't go to them at this point, because we don't have the information.

CHAIRMAN LUISI: Well, the F-based management approach is something that's being explored right now through an RFP at the Council level. I spoke just a little while ago with Kylie and Brennan about where that's going; and there is a Steering Committee evaluating the proposals on whether or not an F-based approach would be something that we could implement for the future.

But right now those tools are not part of what we can package together, and the reason is due to some of the challenges that we have in managing this jointly with the Council. Magnuson directs more of what we have to do, with the Council actions as well, rather than just being able to incorporate something like that with the Commission. Toni, did you have something to add?

MS. TONI KERNS: I was just going to say Kirby and I did have a conversation with Jason McNamee, and he is going to look at some stuff for us; to see if there is anything that we can do within our packaging abilities with some of the thoughts that he had. He'll come back and get to us on whether or not there is anything he thinks that we can work around; and bring that back to the Board. But that I think, the stuff that he can potentially may or may not be able to come up with, would work within the bounds of this regional management approach.

CHAIRMAN LUISI: What I've also heard from Council staff is that the Steering Committee, as they're reviewing this idea; that we may be able to work within the guardrails that we're under, in a way that we could change some of the policy at the Council level with some of these flexibility ideas that we may not actually be in an F-based approach, but something similar under the current guidelines. Again that was the conversation I had an hour ago, and we could further develop that as we continue to meet. John.

MR. CLARK: That would be great, thank you, Mike. Right now it just seems like we get in a straightjacket every year. Obviously the Working Group came up with the idea that everybody wants, which is to have the same regulations for several years at a time; but we've tried to do that and each time it seems like we get these decisions that we have to cut, and we can't keep the regulations. Anything we can do to get us in that direction would be great.

CHAIRMAN LUISI: Okay I'm going to move on. Adam, do you have something?

MR. NOWALSKY: Yes, I don't understand how we can say we're going to continue under Addendum XXVIII. Are we saying we're just going to continue under the idea of the Option 5 that was approved; and that's the management paradigm we're going to look at, or are we saying that later this year we're going to go back and look at the options again from Addendum XXVIII, and pick one?

If we are just saying we're going to use Option 5, which is what we approved, Option 5 lays out the concept for a one-inch size limit increase. That is what Option 5 says; which to me would say that we're sitting here right now, and even though we don't know what change in measures we may or may not need to make. We're going with a one-inch size limit increase.

It doesn't give any flexibility from where I'm sitting to other size increases if needed, no size increase and change in seasons. I'm trying to understand how we could use that option; and how prescriptive it was, because we knew what we needed to do last year, how we could sit here and say this is the path we're going to move forward with. Unless you can give me something substantial to say this is how we're going to apply it, if say we should be able to liberalize or something else; then I'm prepared to make a motion to initiate another addendum.

CHAIRMAN LUISI: Kirby.

MR. ROOTES-MURDY: As we discussed before, the addendum lays out what the measures are for 2017. It also, because it has the option to extend it an additional year, it lays out that based on harvest and the 2018 RHL, we can adjust those measures to meet the 2018 RHL. As I also made clear earlier, it does not provide great guidance on how that happens; but it does allow for the flexibility of those regional measures to be adjusted for 2018, to meet the 2018 RHL.

CHAIRMAN LUISI: Bob Ballou.

MR. ROBERT BALLOU: I was going to say exactly what Kirby just said. I'm reading from the Addendum right now. There is a section at the end; Management for 2018, and it says exactly what Kirby just said. This really responds to both Jim Gilmore's comments earlier and Adam's comments just now.

I think that room to maneuver within the parameters of Addendum XXVIII is there. I'm glad we put it forward in the way that we did; to enable us to not just roll it forward, but to roll it forward perhaps with some adjustments made within the framework. I do agree that it's best to stick with this, continue it for 2018; and look to the Technical Committee to offer up some various approaches for how we might address setting the regulations for next year.

CHAIRMAN LUISI: Toni.

MS. KERNS: Just to make it super clear to everyone. What it's holding on to is the regional boundaries; and you're adjusting your measures. Those regional boundaries are fixed. If you want to change those boundaries then we would have to make a change through an addendum.

CHAIRMAN LUISI: Thanks for that clarification, Toni. Adam.

MR. NOWALSKY: Based on that Mr. Chairman, I have no choice, and given the fact that we now have New Jersey broken out as its own region. However we got there that's where we've got there. I think the only way to continue that process would be through another addendum; correct? Is there any mechanism through Addendum XXVIII that would allow for New Jersey to have separate measures the way we have at this point?

MS. KERNS: I don't see that. No. I mean you can have your breakout as you do, having the Delaware Bay separate, as we have already done in the past couple years. But if you want to have it completely, entirely different management measures; then no, you're no longer in that addendum.

MR. NOWALSKY: Then I have no choice but to make a motion to initiate Addendum XXXI; is that what we're looking at, an addendum, for 2018 management that would use the options for regions from Addendum XXVIII, and include an option for New Jersey as its own region, and would maintain New Jersey with no more than a one-inch size difference from New York and Connecticut.

CHAIRMAN LUISI: All right let's get that on the board, before I look for a second, just to make sure it's clear as you've proposed, Adam. Just give us a second. Go ahead, John.

MR. CLARK: Just a question. I thought we, in a way, already broke New Jersey out as a region; because didn't they have to be a region to have a separate size limit for Delaware Bay, so aren't they technically a region right now?

MR. ROOTES-MURDY: They are. But one of the challenges that we have had, and part of why Addendum XXVII specified New Jersey's measures, and Addendum XXVIII to be similar for the northern part of the state to New York is the volume of harvest that comes from the state.

Trying to develop a set of measures that both constrains effectively the former region of Connecticut through New Jersey's harvest that largely dictates what the coastwide harvest would be, was the guiding principal there. Choosing to do something different, where the minimum size is different between those neighboring and boundary regional states would be different than what we have in Addendum XXVIII.

MR. CLARK: Sorry, but it wouldn't be allowed, even though they are a region?

MS. KERNS: I think what Kirby is saying is that the Addendum specifies that the northern end of New Jersey has to be the same size limit as and the same measures, bag and season, as its northern counterparts. While they are, it has this locked in specificity there.

CHAIRMAN LUISI: All right, before I entertain any additional comments or questions on the motion; Adam, does the motion reflect your interest?

MR. NOWALSKY: Yes, and that point specifically; that one line that appears under Option 5 that causes us to maintain those same size limit, bag limit, and number of days. Even though we're a different region on paper, is what this motion would give New Jersey the needed flexibility for.

CHAIRMAN LUISI: With that clarification, I'll look for a second. Is there a second to the motion on the floor? Okay seeing no second; the motion fails for lack of a second. Nicola.

MS. NICOLA MESERVE: I am looking at the Addendum, and I'm looking for where it says that New Jersey has to have the same regulations as the states to the north for its coastal waters; and it doesn't say that I don't believe. It establishes the regions with New Jersey as itself. It establishes that we're moving away from the 1990-based allocations; that regulations are set to not exceed the next year's RHL.

I didn't second Adam's motion, because I don't think it's necessary, because I think the flexibility already is there for New Jersey to have its own regulations, because it is specified as its own region there. I think I just have a different interpretation than staff on this one. I don't know if more discussion of it is necessary.

CHAIRMAN LUISI: Thanks for that Nicola, and I think in my sidebar here with Kirby. Kirby is telling me that he believes that there is the flexibility to allow this within the Addendum. Bob Ballou.

MR. BALLOU: I was going to echo what you just said, and picking up on Nicola's comment. I mean it is absolutely true that it specifies that the regions are broken out, and New Jersey is identified as a standalone region. Then if you move down in the Addendum to Table 5, which is titled Example 2017 regional management measures.

There is an asterisk next to New Jersey, and the asterisk reads New Jersey, east of the colregs at Cape May, will have management measures consistent with the northern region of Connecticut and New York. I think therein lies the point that has been made. But I think there might be some room to move there.

I mean first of all that is under example measures, it isn't necessarily specified above, and consistent doesn't necessarily mean identical. I agree with Nicola's comment that there might be some room to move in the existing Addendum that would not require us to do a new one.

CHAIRMAN LUISI: In moving forward, I'm just going to go on the record to say that we've had the discussion and we feel that there is the ability for some flexibility with the current Addendum as it stands. We had a motion that did not get a second, and it failed for lack of a second. At this time, seeing no other hands; I'm going to go ahead and move on to the next agenda topic, if that's okay with you guys.

Our next agenda item Number 6, we're skipping lunch, but we will get lunch in a little while. We're going to Review the 2017 Black Sea Bass Recreational Measures; and Kirby has a presentation for this. As you will remember, actions that were taken back in February would establish the '17 recreational measures for black sea bass as a status quo from the 2016 measures; in an attempt to achieve the necessary RHL. New information that was available to us in May caused the Board to take additional action to establishing a five-fish bag limit for certain states in the north for Wave 6. It has been asked of me to bring this discussion back to the table; and I'm going to turn to Kirby for the presentation.

REVIEW OF 2017 BLACK SEA BASS RECREATIONAL MEASURES

MR. ROOTES-MURDY: I'm going to go through black sea bass management measures for Wave 6 this year. Just to give the group some background again. At the joint meeting in February, 2017, there was a move to increase the 2017 RHL from 2.82 million pounds to 4.29 million pounds.

The Board and Council approved status quo federal measures, with the understanding that the northern region states of Massachusetts through New Jersey would maintain 2016 harvest levels in 2017. At the joint meeting in May, final 2016 estimates came out; and indicated that they had exceeded both the 2016 RHL and they were also above the 2017 recreational harvest limit.

In turn the Board moved to reduce the possession limits for the states of Rhode Island through New Jersey to five fish for Wave 6. I've got up here on the Board now what that change, based on the Board action, would do for a number of states. As you can see we've got a change then what was in place in 2016 for a number of states.

As you can see for New York and New Jersey, as well as Rhode Island, it further separates what some of their fall measures would be in Wave 6. It goes from say in Rhode Island, what had been a seven-fish-possession limit through the end of the year; it becomes five fish from November 1st onward, same for Connecticut, New York and New Jersey.

Following the Board meeting there was analysis done; as it should be noted that the Board at the time did not know what that reduction would be from taking that five-fish-possession limit reduction. The analysis indicated that it would be an approximate 5 percent reduction coastwide; in terms of harvest. It should also be noted that following that Board meeting, many of those states have not implemented the change in their 2017 Wave 6 measures as of yet.

The next slide I've got up here shows what that reduction calculation is; and it shows that in numbers of fish, which is what we generally try to evaluate harvest on to make changes in measures, has different levels of reduction in that wave for these states. But coastwide it results in an approximate 5 percent reduction for the projected harvest this year. With that I'll take any questions Board members have.

CHAIRMAN LUISI: Okay, I'll look around the table for questions, specific questions to Kirby's presentation on the data as it's displayed. John Clark.

MR. CLARK: Just out of curiosity, what is the RHL for 2017?

MR. ROOTES-MURDY: John, I have it in another slide, so apologies for that. The 2017 RHL is approximately, I believe it is 4.29 million pounds.

MR. CLARK: Will this change keep us under the RHL?

MR. ROOTES-MURDY: With the 5 percent reduction will that get us under the 2017 RHL?

MR. CLARK: Yes.

MR. ROOTES-MURDY: No. Not based on projected harvest.

CHAIRMAN LUISI: David Bush.

MR. DAVID BUSH: Just a quick question. Is this overage that we're looking at the overage that was based on the highly contested MRIP estimates that we saw from New York, from the private shore-based mode?

CHAIRMAN LUISI: That's correct. If you remember, I'll just add while I'm looking around the room for any hands. You know part of the discussion that we had in May had to do with what NOAA would do, as a result of the Board taking no action. The Board took action as a result of the new MRIP information, the final data as it came out; and that action was not understood.

We didn't have the information at the time in May to understand what that reduction in Wave 6 bag limit for those states would cause on a coastwide level. We now know that information, and since May NOAA has put forth their final rule to establishing federal waters measures for the rest of this year.

There was a concern, I guess. I know that folks in the southern region were concerned about actions taken by NOAA as it related to the Commission taking no action. Now we have all the information in front of us; and we need to decide whether or not we want to maintain this approach for Wave 6, or consider some alternative. Jim Gilmore.

MR. GILMORE: On that just let me maybe go back a little bit to the May meeting. I think Mike made some good points. To your point also, we essentially had one data point that was highly inflated. We had been averaging maybe 20 to 30,000 black sea bass in that wave for many years, and then all of a sudden we get a new 300 something, an order of magnitude higher harvest in that one.

We got one outlier data point, which we were trying to make an argument that we're thinking maybe it has to do more with MRIP, and maybe it would be higher, but that just didn't seem to make any sense. But Mike's right. There was a concern back then, I think based upon some states seeing that one data point; was it real?

Then on top of that there was a concern that NOAA Fisheries hadn't filed their rules yet.

There was a sense at the meeting in May that we needed to do something. Unfortunately what we ended up doing was that we started doing arbitrary things, which we tend to do in situations like that; just as a general rule we've got to stop doing.

I mean we've gotten into trouble with Jonah crab and things like that; where we need to have analysis. At that point, the thing was for the northern states we would just reduce the bag limit by cutting it down to five fish for those northern states; with no analysis. We went back and looked at it, and tried to come up with, well is this going to be meaningful or not? The analysis you have on the board really shows that it comes out to be, it's less than a 5 percent reduction. If you look at the error, in terms of just the assessments, MRIP, whatever, this is well within that error. Then you start factoring into, we have a 240 percent above the target right now that we've got an extremely healthy fishery. What we did in May just seemed to be a reaction to do something; which I don't think we needed to do. Now we're penalizing fishermen in that northern region; who are struggling.

I mean the fluke harvest in New York is horrible this year. They're struggling to keep going, and now they're well aware of how many black sea bass are out there; and we're about to cut their bag limit in Wave 6 for no reason, quite frankly. We hear it all the time is that every time we see a reduction in the stock or whatever, you guys are like that. You're ready to cut us back.

But the minute we see growth and liberalization, it's like well we take days or whatever. We're doing punitive actions on this, quite frankly. Lastly, I mean we kind of all agreed yesterday on the Lobster Board. We spent hours discussing about what we were going to do, and then we came up with, well 5 percent; and we all pretty much agreed.

We're not doing anything with 5 percent, it's irrelevant. We sort of killed that addendum yesterday for them. At this point that 5 percent or less than 5 percent reduction is really not going to do anything in this fishery. We don't think it's going to have any real impact; in terms of the stock. But it is going to have economic impact on several states. With that I have a motion when you're ready, Mr. Chairman; unless you want to take some more comments.

CHAIRMAN LUISI: I'm sorry, Jim. I missed the last point you made.

MR. GILMORE: I was up to the point where I was moving it along to make a motion, so unless you want to take more comments; or would you like me to offer a motion now?

CHAIRMAN LUISI: I didn't see any additional questions regarding Kirby's presentation. But Bob may have one. We'll just finish with questions, then I'll turn to you if you have a motion that you would like to make. Bob.

MR. BALLOU: I'm sorry if this is not a focused question. I'm still suffering from Menhaden hangover. But I do remember, I think I remember at that infamous meeting in May or our past meeting. We were looking at a 17.3 percent projected overage in 2017; which led to the response to initiate the action that we took, with regard to the Wave 6 reductions. Now we're looking at a 5 percent. Am I understanding that via the action we took in May, the projected overage has been reduced from 17.3 percent down to 5. Do I understand that correctly?

CHAIRMAN LUISI: I don't think and I can't confirm the 17 percent, but let's just say that's what it was. The action we took in May would reduce that now to 12 percent. It's the additional 5 percent. I think to Jim's point. The reason why it was 17 percent in the first place had to do with what is believed to be an estimate from MRIP that is grossly unbelievable in some ways. We have to decide if that 17 percent is a true need, or was that a reflection of the MRIP estimate as it was reported; any other questions for Kirby? Adam.

MR. NOWALSKY: I'll take that question one step further. Looking at New York Wave 6 estimates, 2012, 1,400 fish, 2013, 8,600 fish, 2014, 2,000 fish; you get the gist here, 2016, 306,000 fish. These numbers were calculated, comes up with a Wave 6 reduction of 227 percent. If you actually look at more recent logical harvest that number is likely in the low thousands, which would make this actual percent reduction less than 1 percent. Did the TC actually look at any recent harvest numbers, to say based on recent harvest this is what the reduction could be, or they solely looked at that one year, came up with a 227,000 fish reduction when I could probably pull up 15 years of MRIP data and not get 227,000 fish harvested in New York in Wave 6?

MR. ROOTES-MURDY: That was just based on 2016 data.

CHAIRMAN LUISI: It's a good point, Adam, thank you. All right, seeing no other questions; oh I'm sorry, I had one more. Nicola Meserve.

MS. MESERVE: I just wanted to follow up on what you said about the timing of the federal rules being set this year. Did you say that NOAAs decision to set their federal rules was based on the 5-fish bag limit for Wave 6, and if so would our changing that cause NOAA to reconsider the federal rules measures?

CHAIRMAN LUISI: I can't speak for NOAA, and I'll look down the table in a second here. But what I will say is that in the discussions that I had with GARFO before that meeting, they were waiting for action by the Commission before they went forward with their final rule.

Lindsey, I make look down the table to any comment that you have about if this Board were to consider reversing its decision, based on this analysis and points that were made around the table so far. Would we expect that a rule change, given that it's August and the fishery will be over in December?

MS. LINDSAY FULLENKAMP: I think you're right on the timeline it would certainly be tight. I don't know the answer to that. You've said that status quo was maintained in federal waters; based on the decision to implement the more restrictive possession limit. I just don't know moving forward.

CHAIRMAN LUISI: Thank you for that. Kirby has a clarification on the percent reduction.

MR. ROOTES-MURDY: Bob Ballou spoke to this before. Based on final 2016 numbers, the 2017 reduction, in order to hit the RHL, was approximately 17.3 percent. Again that was based on final numbers. The 5 percent reduction would knock that down to closer to 12 percent; that would still be the difference between our 2017 RHL and what our projected harvest is. But again that is based on just 2016; with no smoothing or adjustment of New York's Wave 6 numbers.

CHAIRMAN LUISI: Jim Gilmore. If you have a motion, Jim, it will help frame the discussion.

MR. GILMORE: Kirby, do you have a written out? Okay. I don't want to initiate an addendum. **Move to rescind the possession limit of 5 fish in Wave 6 for the 2017 black sea bass recreational fishery; made at the May, 2017 meeting. States would maintain their 2016 Wave 6 measures, unless otherwise approved by the Board.**

CHAIRMAN LUISI: Thanks for that motion, Jim, do I have a second? Tom Baum seconds the motion. Okay we have a motion, now for a discussion. Is there any discussion? Nicola Meserve.

MS. MESERVE: It probably isn't a surprise that I'm opposed to this motion. I'm looking ahead to 2018, where we have I believe a 14 percent reduction in the RHL coming ahead of us. If you assume that 2017 harvest is the same as 2016 and under status quo rules; that is looking more like a 30 percent reduction for next year. The comment was made that this 5 fish doesn't do anything for our reduction, but it does do something in terms of equity, in terms of the regulations.

Massachusetts has a five-fish bag limit year round. We've already initiated an addendum for next year to look at equity. We can begin that this year, by maintaining the five-fish bag limit for Wave 6 for these other states. There is some uncertainty in the data that this is based on, certainly. But the higher bad limits contribute to that uncertainty in the MRIP data. That is advice that our Technical Committee has given us before, so that's another reason to have a lower bag limit for this wave.

CHAIRMAN LUISI: Tom Fote.

MR. FOTE: If New Jersey had known that they were going to be cut back at 15 fish in the winter season, we would have fished the fishery different; as Massachusetts put it in the summer. As a matter of fact, we could have put it in September, since we're going to have nothing to fish on, because we closed our summer flounder season at September 4.

It was interesting, because we weren't part of the problem, yet we wound up taking the most brunt on this cutback, since we basically go from 15 fish to 5 fish; and because that's the way we worked out to stay within our target levels. I have to support this motion, because it's the only fair thing on the table.

CHAIRMAN LUISI: Roy Miller.

MR. MILLER: I believe I heard Nicola say, Nicola did you not say that if this motion passes we're looking at a 30 percent deficit for 2018? Did I hear you correctly?

MS. MESERVE: Yes, by my math if you assume that 2017 harvest is the same as 2016; we would have to reduce by around 30 percent next year.

MR. MILLER: Assuming that prediction comes true. What is our strategy here, Jim? I don't understand why we're setting ourselves up for a potential reduction of 30 percent the following year; in order to take more fish during Wave 6 this year.

CHAIRMAN LUISI: Roy, Jim before you go to them, I just want to make sure we're clear on this 30 percent that Nicola has brought up. We started out this year projecting, based on 2017 catch estimates that we were going to be 17 percent over; if we stayed equal, if we didn't change anything. We already have established the quota for 2018 as a joint body with the Council.

The 2018 RHL is 14 percent less than this year's RHL, already as a result of changes in the stock, and as it was suggested by the Council's SSC. The combination of an overage, if all is predicted to be the same this year and in addition to an already 14 percent cut next year, equals around 30 percent. That is how those numbers align.

MR. MILLER: Thank you for that clarification, but if this motion were to pass doesn't that put us in even worse shape for 2018?

CHAIRMAN LUISI: It depends on; I'll just answer it based on my opinion. It depends on whether you believe that 17 percent reduction was necessary at the beginning of all of this; because if it wasn't, and if it was just a paper exercise as a result of MRIP. Then if you truly believe that we're going to maintain the RHL this year, then this won't matter. I'll look to Kirby maybe to help clarify. It really depends on how much weight you put in the MRIP estimate as it resulted in the 17 percent reduction needed this year; Kirby.

MR. ROOTES-MURDY: Actually, I wanted to bring up a different point, which was regarding something I wanted to talk about on the next agenda item that the Board was aware of at the May meeting, which is that next week at the joint meeting.

You know the Council is right now also considering opening up Wave 1 in 2018; which is another factor that will complicate evaluating this year's harvest to the 2018 RHL, because there are other harvest factors that are going to go into 2018, aside from what the measures are this year. Whatever Addendum XXX, which I will talk to on the next agenda item propose.

MR. CLARK: Back in May when this came up I voted for, from a purely defensive standpoint, as you brought up, Mike that we were looking at states that had to match the federal water regulations seeing their regulations blown up; by not having regulations that would meet the reductions here. Having said that; I mean, I really didn't want to penalize the states of New York, New Jersey, and Connecticut on this, and Rhode Island.

But this whole exercise just seems so cynical at this point; that we take a motion, as Jim said, done in the heat of the moment, because we're presented with some information that is not good for certain states. These types of things happen, and now we're reacting and saying well, let's just let it go. I'm just commenting that it is hard not to come out of one of these Board meetings and feel like you need a shower.

CHAIRMAN LUISI: Rob O'Reilly.

MR. O'REILLY: I think I know what's been going on, but MRIP certainly had a response about this; because I know New York talked to MRIP. But what did MRIP finally say about the data in Wave 6 for New York? What was the final conclusion there?

MR. GILMORE: MRIP, if you talk to the MRIP, John Maniscalco is here, so he actually talked with them directly. But they essentially said that they found no error that they've checked in this whatever, so that the estimate is the estimate. We can try to find flaws in it; but the only thing that we kind of focused in on was that we took over the intercept, like all the other states did this year.

There was some extra effort in Montauk; from what I understand, in terms of our sampling. That is one of the inherent problems with MRIP. You essentially can get one intercept that blows this whole thing up. We tried to appeal back to maybe the scientific part of this; and I think everybody at this Board should think about this. Adam alluded to; you know was saying some of the earlier numbers. Those are all accurate, and they go back decades; so we're at 10,000, 12,000, 15,000 or whatever. It's pretty consistent. Then all of a sudden in 2016, 300,000, so if you were looking at this from a scientific standpoint and you were doing your PhD thesis or something, and said wow that's an outlier, I mean throw it in the garbage or not even put it on the graph.

But now we're taking that one number, and the best we should be doing is saying we need to look at this for two or three years; to see if we've got a different trend or maybe something with the data. But we're taking management actions now on that one data point; which is probably the worst science we could be doing right now.

It's really getting back to the two things. That point seems to be a big outlier. MRIP is going to defend it; because they just have their process, and they'll tell you that there is a lot of variability in the estimates within a year and going up and down the past few years. They're not going to come back and say no, we erred on it, unless they can point to something specifically that they found in their system, which is evolving.

They are trying to make it better, but it's still not there yet. The other consideration again is the health of this stock. We're chasing numbers again; we're not looking at this fishery in terms of where it's going. I think the other thing we tried to do at the May meeting; before this came up was we needed to look at maybe a comprehensive look at what we're doing with black sea bass, which we're going to discuss in a little while and next week.

We are just whip sawing everybody with these measures and whatever; and this is just another example of it. My plea to the Board right now is we need to stop doing this; and really just go back, let this thing ride for a while, and fix the overall management of black sea bass in particular.

This is probably the best species to do it with; because there is very little risk of really having an impact to the stock, as opposed to something like summer flounder or some of the other species, lobster yes. We essentially said 5 percent was irrelevant, in terms of what we were doing. It was really not doing anything. But that's a stock that is really in bad shape. This one is in phenomenal shape; but we're cutting back fishermen.

CHAIRMAN LUISI: Follow up, Rob?

MR. O'REILLY: Yes. Jim based on your comments about the Montauk sampling. Was 2016 the first time New York took on the sampling like other states did? Okay, because I've been wondering about those affects in Virginia as well.

I mean it is a different regime in some respects; not only with the design methodology that MRIP have gone through, but also the fact that you do have dedicated state officials out there trying to collect samples. I don't think that's been thought about on the impact yet either. I think that may be a contributing factor, you know one contributing factor. But thanks.

CHAIRMAN LUISI: Okay, I think we've had decent debate. I'm going to go to the audience quickly. Any members of the audience want to make any comment to the motion on the board? Arnold.

MR. ARNOLD LEO: Just very briefly. I feel that this motion should be passed; because as Jim Gilmore pointed out, it's not like we're dealing with sturgeon here. We're dealing with a stock which is so abundant that reducing it would be the wisest course of action. I think that if we allow this motion to go forward, and we wait for another couple of years of data. Then we'll see where this 300,000 count came from; and can there proceed after that. Thanks.

CHAIRMAN LUISI: Thanks, Arnold. Tom Fote. Tom, before you go, anybody else from the audience before I bring it back to the Board? All right, Tom, go ahead.

MR. FOTE: In 2003, I came to New York's defense; because all of a sudden in a three year period of time they went from a steady 400 to 600,000 anglers all of a sudden up to 900,000 anglers. My response to that is because they were doing a better job with picking up anglers, those anglers were there all the time; and we should have got an increase in the biomass, and we should have got an increase in New York's target. Of course we were ignored back then; and we've been looking at this problem.

This problem is going to happen when we basically look at all the MRIP figures, and we're going to pick up maybe a lot of people we haven't picked up before. How do we deal with it? We've been underestimating the population, underestimating the catch of that's what you're supposed to be doing over these years. We found out that numbers are out of whack. We need to be able to address that. We're not saying that everybody overfished; because that is the solution that we've been getting, and that puts us in this kind of trouble.

CHAIRMAN LUISI: Adam.

MR. NOWALSKY: There has been a lot of discussion this week about what happens when people feel disadvantaged by a certain decision, and when somebody else looks at it. I think the one takeaway we should have had from that is the question we should be asking ourselves, and making a decision; is this necessary for the conservation of the resource? When you look at the questions around this, there is no way given the abundance, there is any way I can justify this is needed for the conservation of this resource; and therefore I support the motion.

CHAIRMAN LUISI: Roy Miller.

MR. MILLER: Very quickly, Mr. Chairman. I just wanted to make sure that this particular motion, the geographical extent of what this motion covers. I gather it does not cover Massachusetts. They don't have to rescind their five-fish bag limit; am I correct?

CHAIRMAN LUISI: To my understanding the Massachusetts is not open in Wave 6; if I can look over to Massachusetts. The action did not impact Massachusetts. Bob Ballou.

MR. BALLOU: A very difficult issue. I appreciate the pros and cons that have been offered. Regretfully, I can't support this motion. Staring us in the face is this reduced 2018 RHL, and a 14 percent associated reduction. It just seems illogical to me to consider further impacting that; i.e. making a bad situation even worse.

I don't like it any more than anyone else does. Lastly I'll just note that Rhode Island was impacted by this. In response we went through the regulatory process of changing our regulations from seven down to five. They're in place. We took the hit and we implemented it, and to now, frankly this would just perpetuate the whip sawing. We would have to now go back and re-promulgate a more liberal regulation, or i.e. back to the seven fish. I get everything that everyone is saying; and I wish these issues were easier to resolve. But regretfully I can't support the motion.

CHAIRMAN LUISI: All right, I'm going to come down the table. I saw a bunch of hands. We'll start with Nicola Meserve.

MS. MESERVE: Quick point of order. Just wondering if this will be a two-third majority vote.

CHAIRMAN LUISI: It will be a two-third majority vote; since it's a change in final action from May. Raymond Kane.

MR. RAYMOND KANE: I can't support this motion. I mean we did this song and dance in May, and I keep hearing from New York; well let's blame MRIP. But what I'm not hearing in the conversation is how many intercepts did they have in Montauk the four prior years? Nobody can give me a definitive answer on that; they certainly didn't have 47.

Instead of being so negative about MRIP, as Jim said you know we have to let these numbers play out over the next couple of years. Our fishermen in Massachusetts have already taken the hit. We're at five fish, and I hear from them all the time. How can these other states take out their charters and give them 10 and 12 and 15 fish, and I'm limited to five; and I only get 100 days, or 110 days.

I would like to see those numbers prior to '16 for the number of MRIP intercepts in Montauk. I would like to see the numbers play out for the next couple of years. But we certainly didn't make that motion in May, because we don't have a fishery in Wave 6. Our fishermen would very much like to have a fishery in Wave 6.

But we've been so restricted over the years that they get like a 110 day season at five fish per day, a 15-inch-minimum size fish. We took the hit on fluke, we cut that back to four. I can't possibly support a motion like this. Let's see the numbers play out for another couple of years from MRIP; and see if their numbers are true or not.

CHAIRMAN LUISI: Lindsey.

MS. FULLENKAMP: I'm recalling from the last discussion on these Wave 6 numbers. Wasn't there some effort, either by the TC or someone else to sort of smooth the perhaps anomalous Wave 6 number, and if so did the results of that change the 17 percent reduction number at all?

CHAIRMAN LUISI: Kirby.

MR. ROOTES-MURDY: I'm going back through and looking at my presentation from May; and I'll get back to you. But I'm not aware of it at this point.

CHAIRMAN LUISI: Let's caucus; it's time to call the question. This is going to be a two-thirds majority vote. Let's caucus for a minute and we'll come back and take a vote. Before we take the vote, Kirby has an answer to the question about smoothing.

MR. ROOTES-MURDY: I looked back through and consulted with TC members; and we did not come up with a final estimate that takes into account smoothing for New York Wave 6 data.

CHAIRMAN LUISI: Okay, before I call the question, we haven't done a two-thirds vote at least while I've been around for quite a while. The way the two-thirds vote works is that any state's vote, whether it's in favor, in opposition, or a null vote, will count towards an actionable vote, which will go towards the two-thirds.

Any abstention by any of the federal agencies does not count as a vote to the two-thirds majority. I don't know if we'll need a calculator at some point; but I'm going to go ahead and read the motion into the record, and call the question, and this will be a roll call vote. Move to rescind the possession limit of five fish in Wave 6, for the 2017 black sea bass recreational fishery made at the May, 2017 meeting. States would maintain their 2016 Wave 6 measures; unless otherwise approved by the Board. Is the Commission ready? I'm going to ask Kirby to call the roll.

MR. ROOTES-MURDY: I'm going to start with the Services; National Marine Fisheries Service.

MS. FULLENKAMP: No.

MR. ROOTES-MURDY: U.S. Fish and Wildlife.

MS. SHERRY WHITE: No.

MR. ROOTES-MURDY: North Carolina.

MR. BATSAVAGE: Yes.

MR. ROOTES-MURDY: Commonwealth of Virginia.

MR. O'REILLY: Yes.

MR. ROOTES-MURDY: Potomac River Fisheries Commission.

MR. MARTY GARY: Yes.

MR. ROOTES-MURDY: Maryland.

MS. ALLISON COLDEN: Yes.

MR. ROOTES-MURDY: Delaware.

MR. CLARK: Yes.

MR. ROOTES-MURDY: New Jersey.

MR. NOWALSKY: Yes.

MR. ROOTES-MURDY: New York.

MR. GILMORE: Yes.

MR. ROOTES-MURDY: Connecticut.

SENATOR CRAIG A. MINER: Yes.

MR. ROOTES-MURDY: Rhode Island.

MR. BALLOU: No.

MR. ROOTES-MURDY: Commonwealth of Massachusetts.

MR. KANE: NO.

MR. ROOTES-MURDY: New Hampshire.

MR. DOUGLAS E. GROUT: Yes.

CHAIRMAN LUISI**: Okay the vote was 9 in favor, 4 opposed. The motion needed 9 in favor to pass; so the motion carries.** With that I've been told that lunch is ready. I think we should take about 20 minutes to go grab lunch. Please bring your lunch back to this room. In 20 minutes we'll go ahead and kick off the discussion about black sea bass; so twenty 'til one, we'll begin the meeting again; thank you.

(Whereupon a recess was taken.)

UPDATE ON THE BLACK SEA BASS RECREATIONAL WORKING GROUP

CHAIRMAN LUISI: I'll look to Kirby when he's ready to start the next presentation. What Kirby is going to be presenting to you is a little more straightforward than the last two discussions that we had. If you remember back at the May meeting there was an initiation of a black sea bass addendum.

Based on the language of the motion and discussions with the Recreational Working Group for black sea bass, staff has put together the outline and the framework of an addendum that has management alternatives in it. What Kirby is going to present to you today is what currently resides in that addendum.

We're going to be looking to the Board to determine whether or not what's in there now is what you would like to see further analyzed; whether we're missing something at this point, or if there is something in the addendum that you would like to either modify or delete. We're looking mostly for feedback at this point; as to what's currently in the addendum. With that said, Kirby if you're ready the floor is yours.

MR. ROOTES-MURDY: I'm going to, as Mike said, walk you all through this Draft Addendum XXX, give a little bit of background first, and then present what's in this document. It's a memo that was circulated through supplemental materials. We have printed copies in the back of the room. I'm going to highlight what the Rec Working Group comments were, and their recommendations.

I'll take any questions, and then to summarize if you have feedback regarding the current range of options, and what those options contain, it would be helpful. If there is something in there that you would like removed, we would want to know that now; or if you want more analysis on some of the options, we would like to know that now, because timetable wise we would like to be able to bring this document back to the Board at the annual meeting for consideration to go out to public comment.

For today's presentation, I'm going to just focus on the proposed management program. Regarding background, at the May meeting in 2017, there was a motion to initiate an addendum with options for regional allocation; regions with uniform regulations and other alternatives to the current north/south regional delineation for recreational black sea bass management.

I worked with Massachusetts staff to develop options currently in the document; and then got further feedback from the Black Sea Bass Recreational Working Group. Again, the aim is to begin the process earlier; so as to have more clarity on what management will be sooner in the year, and to improve fairness and equity in the fishery.

While that outlines how we got to this point, it is important to know that this is now a document of the Board; to further consider and help guide staff in developing. As we touched on regarding the 2017 RHL and 2018 RHL, for this year the Board and Council approved an approximate 52 percent increase in the RHL from previously specified in 2016.

For 2018 we are looking at an approximate 14 percent reduction in harvest in the RHL; and that coincides with a decrease in the projected biomass for 2018. We are coming down off of a peak biomass level; based on data through 2015. The proposed management options in the document are three main ones. They are the default management program, state allocation of the annual recreational harvest limit, with a sub-option that specifies how those allocations would be determined based on timeframes.

Then the third option is a regional allocation of the annual recreational harvest limit. There are sub-options that provide a range of options for what the regional alignment would be; what the timeframes would be for basing allocations on, and then a third sub-option that specifies what the management measures would have to be within those regions.

Option 1 is just our FMP default. What that means is that annually we have to set with the council a coastwide set of measures; minimum size, possession limit, and season to achieve the subsequent year's RHL. In recent years we've moved away from that in having a set of measures that the Board has approved for the northern region states; that would meet a reduction that we've been encountering, given the lower RHLs than what harvest has been in recent years.

Again, the default approach is to set a coastwide set of measures. This addendum is going to present options that move away from coastwide set of measures in state waters. Option 2 lays out what state allocation of the RHL would look like. The idea is similar to conservation equivalency in the summer flounder FMP; in that each state would allocated a share of the annual recreational harvest limit, and that states would constrain or be responsible for constraining their harvest to that allocation, and develop measures appropriately.

Under this option, state proposals for 2018 measures would need to be developed for Board approval no later than the 2018 ASMFC winter meeting, so late January, early February is when that Board meeting is set. It would mean that those proposals would need to be submitted in January, 2018.

Under this option there is a timeframe specifying state allocations. The document lays out an initial set of time series. I want to make clear that this was the first attempt. These have been perfected by the recreational working group suggestions; so I'm going to move on to the next slide and offer up in a little bit what those are.

The Rec Working Group regarding Option 2 recommended, or for the most part preferred, removing this option from the document. There were concerns about, similar to summer flounder discussion earlier today, having allocations on a state-by-state basis. Regarding the timeframes, if this option were to stay in the document, the Rec Working Group recommended that there should be alternative timeframes; and those are listed here on the slides, so A, B, C, and D.

Options A and C include 2016 data; and they are to be adjusted for New York Wave 6 data. As we noted in the previous Board discussion today, there has not been any final determination on how that smoothing or an adjustment to the Wave 6 numbers would be. But that is something that the Technical Committee and Plan Development Team for this document could further work on.

But the timeframe options would be 2007 to 2016, 2007 to 2015, 2012 through 2016, and then 2012 through 2015. Again, those options that have data through 2016 would be adjusted; based on concerns over New York's Wave 6 data. The Recreational Working Group wanted the Board to be aware of, generally speaking what the advantages and challenges are with having this option included in a document.

As I said before, each state, one of the advantages the group felt was important to make clear is that each state would have an annual allocation to work from; and then be evaluated against, in that states could then craft measures that would meet their states unique fishery needs. Regarding challenges, much of the same challenges for sea bass carry over for summer flounder and scup; looking at recreational data provided by MRIP.

The timetable for when we normally get current year data presents challenges. How to evaluate that data against the measures that are in place also presents a challenge. Other challenges would be how to handle neighboring state and shared water body regulations; that is something that we've struggled with for summer flounder and specifying that.

Choosing an appropriate timeframe for allocations that are based on MRIP data also present challenges. One of the reasons why the Recreational Working Group members were in favor of changing those initially proposed timeframes was so that anything further back than 10 years, many felt was not encompassing of the current population dynamics and stock status. Two last challenges would be regional recreational management in summer flounder has presented similar challenges in trying to evaluate regional performance. An important caveat is that when we're talking about conservation equivalency or something similar to what's in this summer flounder portion of the FMP.

We do not have in our joint management document with the Council the ability to wave federal water measures and have the same measures in state through federal waters for a vessel that has one home port. The challenge we would have with a state allocation is that you would effectively be having a state allocation in state waters; and still have separate measures, one in state waters for that state and then a federal set of measures.

The third option is moving to a regional allocation of the annual RHL. Under this approach each region would have an allocation, and would develop measures to constrain harvest at that collective allocation, and similar to Option 2, proposals would need to be provided for the Board to consider and approve at the ASMFC winter meeting.

They would need to be submitted by January of 2018. Option 3A lays out what the regional alignments could be under this option. For this sub-option there are four variations. The first two offer a two-region approach, and the last two build and develop a three or four-region approach.

Option A would have a region of Massachusetts through New Jersey as a northern region;

similar to what we've had in recent addenda. Then Delaware through North Carolina would be a southern region. Option B somewhat changes that regional breakdown; where the northern region would be Massachusetts through New York, and New Jersey through North Carolina, and that second region would be considered the southern region.

A three-region approach would be Massachusetts through New York; that would be the northern region. New Jersey would be a standalone region, and Delaware through North Carolina would make up the southern region. Part of the reason for why this option was put forward, this sub-option is because of the finding of the stock assessment that showed that there is a bit of a break in where we see a difference in abundance for black sea bass; based on the fishery independent data.

Option D presents a four-region approach; where you would have Massachusetts through Rhode Island as the north region, Connecticut through New York as a Long Island Region, New Jersey a standalone region, and then Delaware through North Carolina as a southern region. It further partitions out the three-region approach to try to get at regional differences in abundance.

For Option 3B, there are timeframes specifying how those regional allocations would be based. I'll just preface that again, similar to Option 2, these timeframes have been perfected by the Rec Working Group; and so a different set of timeframes have been proposed as what should be in the document.

Then Sub-Option 3C tries to specify what the management within each of the regions would be, tried to get at concerns of uniformity and equity regarding those measures. There are two versions of this. The first would be a uniform set of regulations within the region. Every state within that region would have the same size limit, the same possession limit, and the same season length. The other version would be to create uniform percent reduction liberalization within the region; whereas the measures would be similar, but they could not differ beyond a one-inch size limit, a one-fish bag limit, and for example an approximate 15-day difference in season length.

Getting on to the black sea bass Rec Working Group comments on this, the group indicated that this Option 3 of regional allocations was a preferred approach. Similar to Option 2, having a different set of timeframes to base those allocations was preferred; because of concerns of data going back further than 10 years not being reflective of the current resources, condition, as well as the 2016 data.

Timeframes would be again 2007 through 2016, with modifications, 2007 through 2015, 2012 through 2016, with data modifications, and 2012 through 2015. Regarding the regional allocation and comments from the Rec Working Group, they wanted to highlight some of the advantages and challenges again.

Each region, in terms of advantages each region would have the ability to annually allocate and work from a set number of fish; and craft measures off of that. Regional allocations in turn could better reflect regional abundance in the eyes of some of the Rec Working Group members. Regarding challenges, the same MRIP data concerns apply.

There was some discussion on how to handle regional allocation overages, versus a coastwide overage. It's something that we haven't truly perfected in other addenda; but it would be something that could be further clarified in this addendum. Then as I said before, for Option 2, similar regional recreational management challenges that have been in place with regional management for summer flounder apply to this approach.

Other considerations, there was an accountability sub-option that was discussed by the group; and nearly all were against a percent reduction or pound-per-pound payback, due to concerns about how the MRIP data's precision may be unreliable. One Rec Working Group member preferred using a total-catch approach to evaluate performance; as opposed to a harvest-based approach.

Another Rec Working Group member suggested the regional allocation should be based on the size of their angling population or their recreational population and the availability of sea bass to those anglers in turn; and not based on past harvest performance. Many Rec Working Group members prefer going to a multi-year averaging of MRIP data to evaluate harvest; rather than looking at one year at a time.

One member indicated that if allocations were to go into effect, they needed to be revised regularly; if not annually. Some were in favor of using a common set of measures to develop regional measures off of. An F-based management approach was also discussed as a way forward; given the status of the resource, and trying to move away from the hard RHL limit.

But it's not currently available in 2018 joint management, based on the Mid-Atlantic Council staff's feedback. One example of what a common set of measures that states could work off of would be Massachusetts through New York would have a five-fish possession limit at 15-inch minimum size, New Jersey at a 10-fish possession limit at 13-inch minimum size, and then Delaware through North Carolina would have a 15-fish possession limit at 12.5 inches minimum size; and all regions would have an open season of 365 and then from there it would be adjusting their measures to better hit at regional allocations.

Those lay out the major management components of the document. The other last thing would just be about the timeframe; how long this addendum would be in place for, similar to recent summer flounder and black sea bass recreational addenda. There could be the provision that it would only be in place for one year, or it could be in place for two years, 2018 through 2019, or for three years.

But it should be noted that currently we don't have a recreational harvest limit specified beyond 2018. The Board and Council voted back in February to only specify 2017 and 2018 RHLs, so that would need to be further clarified down the road. Last, in terms of additional considerations, similar to what we talked about earlier this morning on summer flounder.

Rethinking the annual timetable for evaluating the fishery; and the timeliness of when that data becomes available obviously presents challenges for trying to craft the following year's measures, for continuing to base that evaluation on the current year's preliminary data.

We have been also subjecting that to a lot of variability and changes through to the point where it's finalized; which as you all know, means we may be having data that is very different, in terms of setting measures at the beginning of the year versus what final data actually shows through the spring.

As I said before, F-based management is something that the group talked about; and black sea bass may be a better immediate candidate than summer flounder, given the condition of the stock. But trying to build that into the current practice of evaluating harvest to the RHL presents challenges.

I brought this up before, but it should be noted that in considering this addendum there is the possibility that the Council next week, as the Council and Commission meet jointly, is looking to open up the Wave 1 fishery in 2018 for all anglers. At our joint meeting in May, it was a discussion of an LOA; and at their subsequent council meeting in June, it changed to being an open fishery for that first wave, January and February.

Brandon Muffley is here from the Council; and can answer your questions if Board members have that regarding how that discussion may play out, based on analysis next week. But with that if there are any other questions that I can answer on the document, I would be happy to do so.

CHAIRMAN LUISI: Are there any questions on the addendum document as presented by Kirby? Rob O'Reilly.

MR. O'REILLY: Thank you, Kirby. Can these be comments or just questions?

CHAIRMAN LUISI: Let's get some clarification if you have a question right now, Rob, and then we'll go to actions if we need to take any actions or comments after that.

MR. O'REILLY: Okay, I'll make a comment in the form of a question, which is the time series approach. Beyond ten years I think Kirby you said a couple times, might have different stock dynamics, so I'm not really sure about that. I mean when you look at, just as a sort of surrogate look at the landings, the landings are pretty steady within 1.5 to 3 million pounds for quite some years. But if you go back in time to the nineties, they're quite high.

If you go into the two thousands, they're more consistently in the 3 million fish, talking about fish. There is even an entry I saw, which is quite remarkable, of 22 million fish in 1986 within the MRIP data. But aside from that the 2011 year class and now the 2015 year class a little less so; from what I've been reading anyway, can have an impact.

If you have a really short time series, you may be just looking at the way the stock biomass is now. I think Gary Shepherd told us that with the assessment that the biomass is definitely higher in the northern region. I think they cut it off at Hudson Canyon north and south. But the numbers of fish are still, you know there is still abundance in both the southern area and the northern area; again just using artificially the Hudson Canyon as the assessment did.

I think if you don't have enough years, this may get slanted more towards what's occurring right now; whereas once the 2015 year class gains some momentum there through the stock, it could be a pretty short-sighted idea. Two things with the time series, one maybe not think about the last five years, maybe think about the five years prior, and take a look at that.

I think it would be worth looking at back to ten years; so in other words don't worry about 2011 on, worry about before 2011 back to about 2002. That is one suggestion. The other suggestion is we really get in trouble when we start looking at having management measures, at a time when there's been regulatory changes.

From 2011 through the present, we've had many addenda. The only consistent area has been the southern region; using the federal measures. But the northern region has been quite variable at time; sometimes not. You know 2011 of course was when things were low; and there was liberalization for 2012.

Things are moving a little bit too much there; more so probably than the coastwide approach that was in affect before then. I hope you can think about that. Then the last comment/question is with fishing-mortality-based-rate management, can we get some pros and cons of that; because it seems that everyone wants to think that is a positive direction, and maybe it is.

But I think we need to know some of the other aspects of that. One aspect is you know a target used to be set by managers. A target of late is being set through the analytical approach. All of a sudden it's become quite in the vogue to say let's go to the target. Let's make sure we're at the target or less.

I guess I'm looking for thoughts about confinement; what are the confining aspects of F-based management compared to what we currently have in place? That might be a little bit of a thought process; but I think everyone needs to know that and not go pell-mell forward in that direction, without really getting a real insight on what's to involve there. Of course we do have on example with striped bass, and there are a couple other examples as well. But really I at least would like to know some of the pros and cons involved. I think that could be done.

CHAIRMAN LUISI: I think that will be done, Rob, also through the Council process with the exploration of the F-based management with fluke; just something to stay tuned for. But Kirby, did you have any other thoughts? No, all right thanks for your comment/questions, Rob. A little more inflection at the end of each sentence would have been better, but that's okay. You just had lunch, so I understand. Are there any other questions or comments for Kirby regarding the addendum? Bob Ballou.

MR. BALLOU: Thank you Kirby for your presentation. As you noted, one of the challenges under the state allocation approach is that because there is no provision in the FMP regarding conservation equivalency, there would have to be separate federal measures imposed in federal waters. Would the same be true under the regional approaches? That is not stated, but it does seem like it would likely carry over. You're nodding yes. Maybe on the record it would be good to note that would be a similar challenge.

MR. ROOTES-MURDY: As you point out correctly, the same challenge applies in both conditions; because the FMP requires a coastwide set of measures; which we have been deviating from, in terms of setting state-water-specific measures for northern states. It would still apply in a regional approach; Option 3 in the document right now, so I'll make that note in the document.

CHAIRMAN LUISI: One of the things, Bob. Because this differs from how we manage summer flounder; where we establish the precautionary default measures, and it would go into place if the states don't take up the action that is prescribed through an addendum process. When I read this for the first time and looked through; that's what came to my mind too.

How are we going to be able to blend together state or regional allocations with federal waters measures; that the southern states have been using as their measures for the last however many years? Rob probably knows exactly how many years. I think that's one of the challenges that we face. This conversation will be had again next week with the Council; and I think it will be a good first step to try to figure out how we might be able to sync those two things together.

If we are considering black sea bass management to be similar to how we manage summer flounder; either by state or by region. We're going to have to figure out what happens in federal waters as a result of that; because it will have to be somewhat different, so we don't have a discrepancy between the federal waters and the state waters measures, especially for those states that have abided by that federal measure for so long. Are there any other questions for Kirby? Adam Nowalsky.

MR. NOWALSKY: As we're all aware, the last assessment gave us a much larger quota to work off of than what we had previously; and also informed us that the quotas that we had been working off of were probably far too low, relative to what the stock status was when we go back four to five years.

I haven't found my time machine yet, can't take us all back and change that. But moving forward, and one of the ideas I've brought up many times is the need to look at some type of reset on these measures. The reality is that the stock reached its current level abundance when we fished under much more liberal regulations than where we are at today. What can we do to move in that direction? If anything in this addendum towards looking at some set of measures that just say hey, we're going to go back here. Here is the harvest. We expect this is going to be without only comparing to our last year of harvest. Is there anything we could do now, and if not is there anything we can start doing to potentially move to that in the not too distant future?

MR. ROOTES-MURDY: I think you've brought up, as you said before, this issue and your concern. From a staff standpoint it would be helpful to know what you would like to see in the document to make that clear; in terms of how it would be a reset, if you want it to be an option.

MR. NOWALSKY: I think I would love to see a set of coastwide measures, 12.5-inches, and 15 fish, based on some other methodology than just looking at the last year's harvest level, not to use that as the estimation tool for what those measures might be. Again, thinking about this in terms of what do we need to provide conservation of the resource, when we look at one of the huge problems we're dealing with now with the size limits and the low bag limits are discards.

You get people out there, you go out there, and you catch fish that you can bring home. Okay, there are some people that are still going to spend a full day of fishing. But I can promise you, it is going to get a lot of people off the water much sooner, and really get at the discard issue. That would be what I would like to see; some type of coastwide measure, a fixed bag limit, something that gets us back to where we were a number of years ago, using some other evaluation methodology other than what we know doesn't work.

We know using the last year's harvest estimate to predict next year's catch doesn't work. We know that. Let's seriously try to use something else, and let's get back. We're so far behind the eight ball. I look at these measures. Rhode Island, Massachusetts, Connecticut and New York, we're so far behind. Why are we there; because we missed a year class of fish?

We didn't have the appropriate quota. Now we're paying around this table with the hair we've got to try to pull out of our heads. Our fishermen are paying. People all around the country are paying the economic price for that. I would like to think we could do better. That would be my suggestion; is some type of coastwide measure with some other type of method for estimating what the harvest might be, looking at past performance of the fishery. I would be very interested in seeing that.

MR. ROOTES-MURDY: I guess to get more clarity. As I pointed out, Option 1 provides a coastwide set of measures in the plan. What would be more helpful in developing this document further would be how this approach would be different than Option 1.

MR. NOWALSKY: My expectation would be that if you took Option 1 as it is, you would look at the 2017 harvest and use that for calculating your predicted harvest in 2018. That would be the basis for determining whether or not those set of measures would pass muster. I'm suggesting we need to put in place an alternative mechanism. We talked about a number of them earlier today; with summer flounder.

I think a lot of those same arguments carry water in other recreational fisheries. Whether it's total fishing mortality, you know we've got a lot of the working group and TC comments here about multi-year averaging. Again, the idea of going back and just looking at how the measures performed, there has got to be something better we can do than just looking at the one year worth of harvest that could help correct, get us back somewhere. We are so far off the highway on black sea bass recreational management right now. That is the reality. I'm not sure there is anybody around this table that can realistically say yes, we are on the right path to successful black sea bass management. If we were, we wouldn't be having these hard discussions on a stock that is 230 percent over targets; we wouldn't be.

There is something else wrong. I've said it before. Southern New England lobster that's a hard decision, winter flounder, northern shrimp, it shouldn't be this hard. Let's look at what we're doing wrong and this element of continuing to go down the road of we're already in a huge deficit recreational measures-wise. Let's creatively find a way to pull back to something that makes more sense.

CHAIRMAN LUISI: Okay, I think we've got the message. Kirby has told me we'll look into it. But let me look around the table for any other thoughts regarding the addendum. Chris Batsavage.

MR. BATSAVAGE: Yes, discards are certainly a problem in the black sea bass fishery; when you consider this is a fishery that is really not a catch and release fishery, this is one where people go out with the expectation of taking some home for dinner. But as a result you have some fish get thrown back; and they don't survive.

One of the biggest challenges we have with black sea bass, and the same goes for summer flounder, is the size availability of fish differs throughout the coast and even in a state; depending if you're fishing in deep water or shallow water. I don't know if we have the information to put this forward in this addendum, but for the regional approach or maybe a coastwide approach.

Instead of focusing on just a set minimum size limit, and saying our minimum size limit is this, bag limit is that. Provide some sort of allowance for a couple fish undersize to get to this issue of dead discards. Perhaps you have fishermen at least bring something home, or hit their bag limit a little quicker.

They either move on to some other species or call it a day, as opposed to still fishing on these same spots, throwing back 20 fish for every keeper or whatever the ratio might be; which is I think causing some of the problems that we have with the total mortality, which then limits what we can set aside for the recreational harvest limit.

CHAIRMAN LUISI: Emerson Hasbrouck.

MR. HASBROUCK: I agree with what Adam said. If we're going to take a look at moving in that direction, is that something that we can just go ahead and do; or is it complicated by the Council's accountability measures with sea bass? Do we need to think about that as we go forward?

CHAIRMAN LUISI: You know Emerson, I think it is going. The fact that this fishery is managed through the Council process as well is going to complicate things. But it doesn't mean we can't find some workable solution. As I mentioned before, actions that have been taken over the past six months have, in my mind, opened the door for some creative thinking. While I somewhat disagree with the approach that we'll ever find ourselves back with just a straight up coastwide measure. I think there are differences in the regionality of the stock; and it's even analyzed that way. I think there is an opportunity here, and we can certainly have more of that discussion at the Council meeting next week; to try to find out where the hang-ups might be and what actions might need to be taken in connection with this addendum for some future action to sync everything together. Kirby or Toni, did you have anything else to offer?

Okay looking around the table, does anybody have anything else they would like to bring up regarding the addendum? Is everybody comfortable at this point leaving all of the options, whether they are state-by-state allocations or regional allocations in the document for further analysis? The plan would be for this to be further developed and presented at the October meeting; or the annual meeting for support to go out to the public with, prior to the winter meeting of the Commission. Adam.

MR. NOWALSKY: The only other specific change I might consider is under the 3C Management Measures Within a Region. I agree with the concept of providing some continuity in the measures. I don't think the one-fish possession limit is enough. I would look at something maybe up to five; just because of the variances that might allow in this fishery, and the 15 days I might recommend look at up to 30 as well.

That size limit is really what a lot of anglers look at; in terms of am I going to go to that state and be successful that way. I think that is the key part, but I think the one fish, given the wide variety of bag limits we already have, is too restrictive; as well as the large number of days we have between states right now. Something to work to get us closer, but let's move there, and smaller increments would be my suggestion to at least have that option. Leave 1 and 15 in, but I would suggest maybe having a 5 and 30 option as well.

MR. ROOTES-MURDY: Yes, I just want to make sure I understand it correctly, because we're talking about the consistency in measures between states within a region. You're saying that you want there to be the flexibility of neighboring states within a region to have possibly the difference of five fish in their possession limit, and possibly the difference of 30 days within their season for states within a region.

MR. NOWALSKY: I would like that to be considered as we move forward from right now.

CHAIRMAN LUISI: Yes, and if I understand your point correctly, Adam, you're suggesting that because there are such varying differences right now between the states, it may be unreasonable to think that they can get within one fish and get within 15 days of one another. The step-wise approach, which was what you offered, might be a better alternative.

MR. NOWALSKY: Again, where we are with the idea that we would come back with a draft document for public comment in October. I'm just suggesting we look at that between now and then for consideration.

CHAIRMAN LUISI: Okay, any other thoughts? Are there any other discussion points? Roy Miller.

MR. MILLER: I just kind of want to go on record opposing the inclusion of state-by-state conservation equivalency proposal options; probably for the same reasons many of the Working Group members opposed including that. I think there are some lessons learned here. We saw what that resulted in for summer flounder. I would hate to go down that road again for black sea bass. It just makes us vulnerable to low sample sizes and chance events, with regard to parsing apart the state estimations of total catch with MRIP. That would just continue to make us vulnerable to potentially erroneous or not necessarily erroneous, but potentially anomalous results in the MRIP survey. I favor deleting the state-by-state conservation equivalency.

CHAIRMAN LUISI: Thanks for that point, Roy. Let's stay on that topic for just a second. Let me look around the table to see if anybody has any thoughts about leaving it in. Nicola.

MS. MESERVE: Thank you to Kirby and the Working Group for getting this document together. I think we're setting ourselves up, hopefully to be a little bit ahead of the normal schedule for setting sea bass regulations for next year; which is something that a lot of our anglers have been asking for.

Regarding the state-by-state allocation option that is also something that at least in Massachusetts, we're hearing a lot of interest in at least considering, I disagree with removing it from the document at this point. I think it will help with the public discussion. One of the major benefits to it, which Kirby mentioned is the accountability that it provides.

It's the only option that provides individual state accountability for the performance of the regulations the state puts in place. That has been one of the major criticisms of the ad hoc regional approach; that there has not been the same level of accountability for all the states implementing regulations.

Whether it's true or perception as to how we got there, the view from a lot of our constituents is that we've been cutting and cutting. We've been on a diet; and other states have not been. That option addresses that concern about how ad hoc regional management has affected states over time.

CHAIRMAN LUISI: Matt Gates.

MR. MATTHEW GATES: Yes, I was just going to speak to the removing the state-by-state allocation option also, for most of the reasons that Roy brought up. Additionally, on a state-by-state accountability front, I can draw an example from summer flounder; where we had consistent rules, and supposedly a declining stock.

But in 2015 we harvested 93,000 fish. Then supposedly in 2016, 218,000 fish, so I'm not sure how accountability would be applied in a situation like that; where we did our best and still the harvest estimates come out to be something we just couldn't account for. In addition to that I think any of these options need to have, where we have set an allocation we should reevaluate those allocations frequently; so they don't become stale, and that's all.

CHAIRMAN LUISI: Thanks, Matt. In addition to that point, I think it's important that given the work that's being done to recalibrate past catch estimates with the MRIP work is going to be something that may ultimately change the allocation scenarios for the future. I think it's important to understand that if allocation is to become the focus of this addendum that there might be changes in the very near future that would need to be considered. This is not in any way setting and chiseling into stone state by state or regional allocations as we move forward. I thought I saw another hand over this way. Was that yours, Bob?

MR. BALLOU: But not on the particular topic, so when you're ready to switch, I have another comment.

CHAIRMAN LUISI: Okay, so there have been a couple comments as to not being supportive of the state by state; but we also have comments regarding the continued support. We're not at a point in time right now where we need to eliminate anything. I would feel better if we had a consensus opinion on the state-by-state allocations.

Understanding that that is not going to be the case, I think for now we just allow staff to continue to develop that option; and take a harder look at it when we sit down in October, to further evaluate whether or not we want to put that off to the public. But that would be what I would like to do at this time right now; Bob, on another topic.

MR. BALLOU: I want to turn to those timeframe options. The Working Group did suggest a refinement, and I do support the Working Group recommendations. I'm wondering if there is Board consensus on the Working Group recommendations. I do support those.

CHAIRMAN LUISI: Is there any opposition to the Working Group recommendations on the timeframe options? Rob.

MR. O'REILLY: I am not in opposition to what the Working Group said. But since that time I have given thought to the idea that if we're trying to characterize the stock, for more than the short term, I'm not sure even the ten-year approach does that. What I said earlier I still think is important; that the regulatory period of the last six years does play into that time period.

How does that look compared to a ten-year-time period that ends in 2010 let's say? I don't know how much more difficult it is to assess that. But clearly we're looking, once I hear the word allocation, clearly we're looking to make sure we have a sort of homogeneous look at the distribution of the stock.

Not just the last five years, and maybe not even the last ten years. I'm not promoting the 20 year, I understand that. But I am sort of thinking that 2001 to 2010 might be worth looking at. I hope that is not a lot more work. That doesn't counteract what the Working Group came up with.

MR. ROOTES-MURDY: I think just building on the good work that Megan did yesterday on menhaden; to kind of illuminate how these become very complicated, depending on how many different timeframe options you throw in there. I just want to make clear that you're suggesting one additional refinement; so instead of an A through D, we have an additional fifth timeframe option of 2001 to 2010, understanding that then affects – that's another five variations on regional alignments, as well as state-by-state allocations.

MR. O'REILLY: Sorry about that but yes, I do think that might be worth a look; perhaps it may help out a little bit.

CHAIRMAN LUISI: Are there any other thoughts on that? Nicola Meserve.

MS. MESERVE: I think the Working Group's comments about the timeframe is really focused on the impact of climate change on distribution of sea bass. Thus far that seems to be a one-way trend; ignoring the most recent six years and landings data that is heavily influenced by the distribution of sea bass, seems contradictory to the science.

MR. O'REILLY: I'm definitely not suggesting ignoring what the Working Group came up with, I'm just asking for a look at 2001 to 2010. You know we've glommed on to climate change, and decidedly so. We should. But I don't think we're at a point where the models have been able to forecast the near time affects.

I mean we've got the velocity effects that were done by Malin Pinsky, do I have that right, at the Council presented that? We've got Jon Hare's work, we've got other work. We never really decided, except for black sea bass that maybe both in spring and in fall it does show a northward movement, so I'll agree to that.

You also compounded that with the regulatory framework since 2011. At the same time the southern area has been status quo with federal measures; with no Wave 1. We're not going to gain any information on Wave 1, even if there is a positive result there. In looking at the landings, I'm just going by the landings. There is definitely some information that the Working Group did not consider. I don't mind if everyone doesn't want to do that. I at least wanted to bring it up. That's the only question there.

CHAIRMAN LUISI: We've taken note, and I'll look to staff to further comment or prepare information for review at some point along in our process on that. Rob.

MR. O'REILLY: One small follow up. I heard earlier there is a 15-inch size limit in Massachusetts. You know you get down in the southern area, we're 12.5. Then I also know from Gary Shepherd that the abundance in the southern area or I'll say south of Hudson Canyon, is still there. I just don't want to leave something out; that if we narrow ourselves down too much on the time periods.

CHAIRMAN LUISI: Matt Gates.

MR. GATES: My concern with including an option that goes back, an allocation period that ends seven or eight years ago; is that now we're setting the tone that we're looking to set in stone allocations for the long term. I would really hope that we would not go back down that path, like we did with summer flounder, where we're working with 30 year old allocations still. It seems that including that option in there would set that tone in a way we wouldn't want to. We could look at things like total catch; instead of harvest, to help look at addressing some issues that Rob brought up.

MR. ROOTES-MURDY: Matt, building on, I think a previous comment someone made about setting allocations in stone. It would be helpful on the staff side, to better understand if this Board would like to have something specific in the document that lays out how often something like allocation would be revisited; assuming that you would set this addendum in place for a longer period of time. By default you could specify that this document would only be in place a year, or two, and therefore those allocations would be fixed for that amount of time. As we know for summer flounder that can become problematic; if every year we're going out and changing, or at least proposing the option of changing that. If you want something specific in the document that outlines how often this would be revisited, I can put that together.

CHAIRMAN LUISI: All right, I think we got some good feedback regarding the continued development of this addendum; and we'll look forward to seeing the analysis as it is developed in October.

OTHER BUSINESS

RSA PROGRAM

That completes our species or action items for our agenda, and I'm going to move on to Other Business. I know Emerson brought up a point earlier. Emerson, do you want to speak to the RSA Program under Other Business?

MR. HASBROUCK: Thank you for the agenda request. Yes, I wanted to raise the RSA issue; to get us thinking about how we might make it operational again. The Commission shares management responsibility with the Council on several RSA species, most notably the ones this Board manages; scup, sea bass and summer flounder.

As I recall the Council voted to suspend the RSA program a couple years ago; not to eliminate it, with the intent to take a look at what the problems were, what didn't work, what did work, and to perhaps put together a plan to restructure the RSA program differently from what it was previously, to attempt to eliminate the problems that were present in that previous program.

I just wanted to initiate some discussion on that so that this issue of RSA and taking a look at it again doesn't continually fall to the back burner and get forgotten about. I don't know if the Council has had any recent discussions about RSA or the Collaborative Research Committee of the Council has had any discussion. But I would like to somehow move the discussion forward; and as part of that I would suggest that we perhaps think about putting together a working group, to examine previous problems with RSA, and to come up with a plan to move forward.

That working group should probably include, obviously people from the Mid-Atlantic Council, people from the Commission, GARFO, Northeast Fisheries Science Center, certainly law enforcement should be involved, so that we can know the details of what some of the problems were with the previous program, researchers who were involved in RSA in the past, and maybe even some industry members.

I'm not sure what I need to do to try to move that forward. Do you need me to make a motion? Is the fact that I'm just suggesting this now sufficient to move this forward? I don't know if anybody else around the table has any thoughts or input as well. Thank you.

CHAIRMAN LUISI: I can answer just a couple questions from what I know as being part of the Mid-Atlantic Council and the current Chair. The RSA in my knowledge has not been discussed recently through the Collaborative Research Committee that kind of had considered taking up that task.

We do have a committee, the Collaborative Research Committee and a Law Enforcement Committee that we could work with the Commission in establishing some form or a working group; to consider changes to the RSA program. I know the one thing that the Council has discussed is that I don't believe the Council would be very open to just turning off the suspended switch, and flipping the switch to just reestablishing RSA as it was in the past. It is going to need a facelift of some kind; due to the problems associated with it. I would be comfortable with having this discussion at the Council meeting, if we can somehow maybe fold it in next week. There may not be the opportunity, given that conversation regarding black sea bass and summer flounder often hit the end of the line at some point with agenda discussions. But we can certainly keep an open dialogue, and come up with a plan to maybe have this on an agenda item for a future joint meeting.

Our next joint meeting with the Council will be in December, and there is an opportunity there for the discussion about how we can get the two groups together, perhaps form a working group; to begin to evaluate how an RSA program could become a program again. But with all of that said, I'll just look around the table to see if there is any opposition by the Board to taking that under consideration for future work down the road. Seeing none; Adam.

MR. NOWALSKY: I'll just offer that I think that could actually be led by the Collaborative Research Committee. We did have some conversation about this at the last Council meeting. That Committee already has a number of the individual types you've talked about on it already; like we did with the last Demersal Committee meeting, brought in some additional people here from the Commission as well. I would certainly be open to doing that at that level, I think. But I agree that the right place would be at a joint meeting to have that discussion.

CHAIRMAN LUISI: With that in mind, we will be reestablishing the Committee memberships in October; after the new members of the Council take their seats. Keeping that in mind, we could consider how the Collaborative Research Group could be formed; to make sure that all the necessary elements and all the necessary folks are represented. Any other thoughts on future work on the discussion regarding the RSA program? Emerson.

MR. HASBROUCK: Then with your permission as both the Board Chair and the Council Chair then, what I might do next week is suggest that we add that as an additional agenda item under additional business or new business; if time permits, similar to what we did at our last Board meeting, and time didn't permit. If time permits we can initiate a discussion. If time doesn't permit then we've got that opportunity in December.

CHAIRMAN LUISI: Yes and the difficulty with that Emerson is that at the Council we do other business at the conclusion of the entire meeting. Unless you're planning to stick around for all the report outs on Thursday, which I know nobody wants to sit around for. We might have a challenge there, in having you bring that issue up to the Council. But, we'll talk with Chris and Warren and we can get it on an agenda for an upcoming joint meeting. I think that's a good idea. Okay, any other business to come before the Board. Bob Ballou.

MR. BALLOU: With a view to giving credit where credit is due, I want to acknowledge and credit the state of New Jersey. I'm picking up off of a recent media release, for launching a campaign called if you can't keep it save it; which focuses on the proper methods and gear to use to reduce unintentional mortalities that can occur when summer flounder that do not meet minimum length requirements are returned to the water.

It's the DEP working with the American Sport Fishing Association and Eagle Claw Fishing Tackle Company; that are distributing the larger sized J hooks to help anglers land bigger fish and reduce the potential for discards. The hooks can make a difference by reducing the number of smaller fish that are caught; as well as risk of serious injury to these fish. I understand about 20,000 hooks have already been distributed. Irrespective of all the other issues going on, this in and of itself is a really impressive program. I don't know of any other state that is doing it; and I just want to credit New Jersey for doing it.

CHAIRMAN BALLOU: Okay thanks, Bob. Is there any other business to come before the Board? Okay before we adjourn, I just want to remind the Board that as we've mentioned a few times, next week this Board will be meeting with the Mid-Atlantic Fisheries Management Council to discuss specifications on scup, summer flounder, black sea bass, as well as developments with the summer flounder commercial side of the Comprehensive Amendment.

The Bluefish Board will be there as well. If you're on the Bluefish Board, we'll cover the bluefish specifications as well. That meeting will convene on Tuesday, August 8, at one o'clock.

ADJOURNMENT

CHAIRMAN LUISI: With all of that said; seeing no other business, this meeting is adjourned and I will see you all next week.

(Whereupon the meeting adjourned at 1:50 o'clock p.m. on August 3, 2017)

2017 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR THE 2016 BLACK SEA BASS FISHERY
Black Sea Bass *(Centropristis striata)*

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October 2017

2017 Review of the Atlantic States Marine Fisheries Commission
Fishery Management Plan for Black Sea Bass

I. Status of the Fishery Management Plan

Atlantic States Marine Fisheries Commission (ASMFC or Commission) management of black sea bass was initiated as one component of a multi-species fishery management plan (FMP) addressing summer flounder, scup, and black sea bass. In 1990, summer flounder was singled out for immediate action under a joint ASMFC and Mid-Atlantic Fishery Management Council (MAFMC or Council) plan. Further action on the scup and black sea bass plan was delayed until 1992 to expedite the summer flounder FMP and subsequent amendments. The joint Black Sea Bass FMP was completed and approved in 1996. The MAFMC approved regulations for black sea bass as Amendment 9 to the Summer Flounder FMP in May 1996.

The management unit of the Black Sea Bass FMP includes all black sea bass in U.S. waters in the western Atlantic Ocean from Cape Hatteras, North Carolina north to the Canadian border. Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina have declared an interest in black sea bass; Maine and New Hampshire declared interest most recently, in 2014. The Commission's Summer Flounder, Scup, and Black Sea Bass Management Board (or Board) and the MAFMC Demersal Species Committee guide development of the FMP. Technical issues are addressed through the Summer Flounder, Scup, and Black Sea Bass Technical Committee and the Black Sea Bass Monitoring Committee. The Black Sea Bass Plan Review Team conducts annual reviews and monitors compliance and the Scup and Black Sea Bass Advisory Panel provide industry input and advice.

The objectives of the FMP are to reduce fishing mortality to ensure overfishing does not occur, reduce fishing mortality on immature black sea bass to increase spawning stock biomass, improve yield from the fishery, promote compatible regulations among states and between federal and state jurisdictions, promote uniform and effective enforcement, and to minimize regulations necessary to achieve the stated objectives. The initial black sea bass FMP was designated to reduce fishing mortality by a coastwide commercial quota allocated into quarterly periods beginning in 1999, and a recreational harvest limit constrained through the use of minimum size, possession limit, and seasonal closures.

Amendment 12 to the Summer Flounder, Scup, and Black Sea Bass FMP was approved by the Commission in October 1998 and established revised overfishing definitions, identification and description of essential fish habitat, and defined the framework adjustment process.

Addendum IV, approved on January 29, 2001, provides that upon the recommendation of the relevant monitoring committee and joint consideration with the Council, the Board will decide state regulations rather than forward a recommendation to NMFS. Addendum IV also made the states responsible for implementing the Board's decisions on regulations.

Starting in 1998, the fishery was subject to lengthy closures and had some significant quota overages in the commercial sector. Fishery closures occurring as a result of exceeded quotas resulted in increased discards of legal sized black sea bass in mixed fisheries for the remainder of the closed period. A significant financial hardship for the fishing industry resulted from a decrease in market demand caused by a fluctuating supply. To address these issues, the Board enacted a series of Emergency Rules in 2001 that established initial possession limits, triggers, and adjusted possession limits. These measures helped reduce the length of fishery closures, but the rapidly changing regulations confused fishermen and added significant administrative burden to the states. To simplify the process for all parties, the Board approved Addendum VI to provide a mechanism for initial possession limits, triggers, and adjusted possession limits to be set during the annual specification setting process without the need for further Emergency Rules.

Amendment 13, approved by ASMFC in May 2002, implemented a federal, coastwide annual commercial quota that is managed by ASMFC using a state-by-state allocation system. The Amendment was implemented in 2003 and 2004. State-specific commercial shares are listed in Table 1.

Amendment 13 also removed the necessity for fishermen who have both a Northeast Region (NER) Black Sea Bass permit and a Southeast Region (SER) Snapper Grouper (S/G) permit to relinquish their permits for a six-month period prior to fishing south of Cape Hatteras during a northern closure.

Addendum XII, approved in 2004, continued the use of a state-by-state allocation system, managed by the ASMFC on an annual coastwide commercial quota.

Addendum XIII approved in 2004, modified the FMP so that Total Allowable Landings (TALs) for the summer flounder, scup, and/or black sea bass can be specified for up to three years.

Addendum XIX continued the state-by-state black sea bass commercial management measures, without a sunset clause. This addendum also broadened the descriptions of stock status determination criteria contained within the Summer Flounder, Scup, and Black Sea Bass FMP to allow for greater flexibility in those definitions, while maintaining objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. It establishes acceptable categories of peer-review for stock status determination criteria. When these specific peer-review metrics are met and new or updated information is available, the new or revised stock status determination criteria may be incorporated by the Commission directly into the annual management measures for each species, rather than requiring a modification to the FMP.

Addendum XX, approved in November 2009, set policies to reconcile commercial quota overages to address minor inadvertent quota overages. It streamlined the quota transfers process and established clear policies and administrative protocols to guide the allocation of transfers from states with underages to states with overages. It also allowed for commercial quota transfers to reconcile quota overages after year's end.

Addendum XXV continued the use of ad-hoc regional recreational management measure options—originally allowed by Addendum XXI in 2011—to alleviate the differences in state measures for adjacent states along the coast. It was approved in February 2014 and was in place for 2014 and 2015. A northern and southern region were defined, Massachusetts through New Jersey and Delaware through North Carolina (North of Cape Hatteras), respectively. The addendum allowed northern states to adjust management measures annually to best meet the needs of their state while constraining harvest to the overall coastwide recreational harvest limit (RHL). In years of overages, the northern states- which harvest the largest percentage- adjust their management measures to account for harvest reductions in subsequent years. The southern region states set their management measures consistent with the federal measures. In recent years these measures have also been adjusted as federal open season dates have been modified.

Addendum XXVII was approved in February 2016. The addendum continued to allow ad-hoc regional management measures for the 2016 black sea bass recreational fishery and the option to continue this management approach in 2017. All states are to agree to the regulations implemented within the region, but those regulations do not need to be consistent across the region. Based on performance in 2015, the northern region was required to reduce harvest through state regulations in order to achieve the required coastwide harvest reduction of 23%.

II. Status of the Stock

The most recent benchmark stock assessment for black sea bass was completed in January 2017 (SAW-62). The assessment found black sea bass was not overfished nor experiencing overfishing in 2015, the terminal year of the assessment. The assessment used an age-structured assessment model (ASAP) that partitioned the resource into north and south spatial sub-units separated at approximately Hudson Canyon; this approach was accepted as the best scientific information available for determining stock status for black sea bass.

With improved recruitment and declining fishing mortality rates since 2007, spawning stock biomass (SSB) has steadily increased. SSB in 2015 was estimated at 48.9 million lbs (22,176 mt), 2.3 times the SSB target of 21.3 million lbs, and fishing mortality (F) was estimated at 0.27, well below the F target ($F_{40\%}$) of 0.36. To account for the fact that black sea bass are protogynous hermaphrodites, changing sex from female to male, the assessment defined SSB as the combined male and female mature biomass. Recruitment at age 1 averaged 24.3 million fish from 1989 to 2015, with peaks in 2000 (1999 cohort) at 37.3 million and at 68.9 million in 2012 (2011 cohort). The large 2011 cohort, which is currently moving through the fishery, was dominant in the northern area and less so in the south. Since 2012, recruitment has been average with a 2014 cohort estimated at 24.9 million fish. The 2017 data update indicates that the 2015 cohort is above average for both the north and south spatial sub-units, but a final recruitment estimate has not yet been generated. The distribution of black sea bass continues to expand northward into the Gulf of Maine.

III. Status of the Fishery

The commercial fishery is allocated 49% of the total allowable landings (TAL) for black sea bass. The principle gears used in the fishery are fish pots (or traps), otter trawls and handline. After peaking at 21.8 million lbs in 1952, commercial landings markedly decreased in the '60s and have since ranged from 1.17 to 3.6 million lbs since 1981. In 1998 a commercial quota system was incorporated into management and state-by-state shares were introduced in 2003. From 2005-2016 commercial landings have remained stable, with a range from 2.87 million lbs in 2005 to 1.17 million lbs in 2009 (Table 2 and 3). In 2016 commercial landings were approximately 2.49 million lbs, under the coastwide quota of 2.71 million lbs by approximately 8% (Tables 2 and 3). Prior to the start of the 2018 fishing year, NOAA will review final 2016 catch estimates and determine if any overages occurred. NOAA will publish a notice with final 2018 specifications prior to the start of the fishing year that would account for any overages, if applicable, after considering the best scientific information available provided by the recent assessment. Commercial discards are generally less than 441,000 lbs per year, equal to 16% of the 2016 landings.

The recreational fishery is allocated 51% of the TAL for black sea bass. After peaking in 1985 at 12.35 million lbs, recreational harvest averaged 3.75 million lbs annually from 1988 to 1997. Recreational harvest limits were put in place in 1998 and harvest ranged from 1.1 to 3.88 million lbs from 1998 to 2014 (Table 4). From 2012-2015, the recreational harvest limit has been exceeded annually- by 142%, 9%, 59%, and 67% respectively. In 2016 the recreational harvest was 5.19 million lbs, exceeding the harvest limit by 84%. Recreational live discards are significantly higher than commercial, ranging from 3 to 10 million fish per year (1.2 million to 12.4 million lbs, respectively). Assuming 15% hook and release mortality, estimated mortality from recreational discards was projected to be 105,000 lbs, equal to 2% of recreational harvest in 2016.

IV. Status of Research and Monitoring

Commercial landings information is collected by the Vessel Trip Reporting system and dealer reports. States are also required to collect and report landings data. Sea sampling data from the NEFSC observer sampling program are used to estimate discards for the trawl and gill net fisheries, and VTR data is used to estimate discards from pots and hand lines. The NEFSC weigh-out program provides commercial age and length information. Recreational landings and discards were estimated through the Marine Recreational Fisheries Statistics Survey (MRFSS) until it was replaced by the Marine Recreational Information Program (MRIP), which has provided recreational landings and discards from 2008 to present.

Fishery-independent surveys are conducted in Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Maryland, Virginia, and North Carolina. The Virginia Game Fish Tagging Program has targeted black sea bass since 1997. Recruitment and stock abundance data are also provided by the NEFSC spring, autumn, and winter trawl surveys.

V. Status of Assessment Advice

The next benchmark stock assessment has not been scheduled, but an operational benchmark stock assessment or assessment update may be completed in 2018.

VI. Status of Management Measures and Developing Issues

Draft Addendum XXX was initiated by the Board and Council in May 2017. Draft Addendum XXX will be considered by the Board for public comment at the 2017 ASMFC Annual Meeting.

VII. Black Sea Bass Compliance Criteria

2016 Commercial Fishery Requirements
Minimum size of possession: 11”
Minimum mesh: larger nets are required to possess a minimum of 75 meshes of 4.5” diamond mesh in the codend or the entire net must have a minimum mesh size of 4.5” throughout; smaller nets must have 4.5" mesh or larger throughout
Threshold to trigger minimum mesh requirements: 500 lbs for January-March and 100 lbs for April-December
Maximum roller rig trawl roller diameter: 18”
Pot and trap escape vents: 2 ½” for circular, 2" for square, and 1-3/8 x 5-3/4" for rectangular. Must be 2 vents in the parlor portion of the trap
Pot and trap degradable fastener provisions: a) untreated hemp, jute, or cotton string 3/16” (4.8 mm) or smaller; b) magnesium alloy timed float releases or fasteners; c) ungalvanized, uncoated iron wire of 0.094” (2.4mm) or smaller. The opening covered by a panel affixed with degradable fasteners would be required to be at least 3” x 6”.
Commercial quota: 2.71 million lbs
Pot and trap definition: A black sea bass pot or trap is defined as any pot or trap used by a fisherman to catch and retain black sea bass.

2016 Recreational Fishery Requirements
See Table 6.
Recreational harvest limit: 2.82 million lbs

Other Measures
Reporting: States are required to submit an annual compliance report to the Chair of the Black Sea Bass Plan Review Team by June 1st. The report must detail the state’s management

program for the current year and establish proof of compliance with all mandatory management measures. It should include landings information from the previous year, and the results of any monitoring or research programs.

Black Sea Bass FMP Compliance Schedule

Commercial	
11” Size Limit	1/1/02
4.5” diamond minimum mesh throughout codend and threshold provisions	1/1/02
Pot and trap escape vents and degradable fasteners	1/1/97
Roller diameter restriction	1/1/97
States must report to NMFS all landings from state waters	1/1/98
Recreational	
Size Limit	1/1/97
Harvest Limit	1/1/98
Ability to implement possession limits and seasonal closures	1/1/98
General	
Annual compliance report	Annually, 7/1

This summary of compliance criteria is intended to serve as a quick reference guide. It in no way alters or supersedes compliance criteria as contained in the Black Sea Bass FMP and any Amendments thereto. Also please note that the management measures may change annually.

VII. PRT Review

States and jurisdictions required to comply with the provisions of the Black Sea Bass FMP are: Maine, New Hampshire, Massachusetts**,** Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Potomac River Fisheries Commission, Virginia, and North Carolina. All states implemented regulations in compliance with the requirements approved by the Board.

All states appear in compliance with the FMP provisions for fishing year 2016, however, the PRT made the following recommendations:

- *State compliance reports should explicitly list all required regulations and whether they are in compliance with the FMP.*
- *New Jersey should separate pots/traps from other types of gear in the commercial harvest by gear table.*

Table 1. State by state allocation for annual quota.

State	% Allocation
Maine	0.50%
New Hampshire	0.50%
Massachusetts	13%
Rhode Island	11%
Connecticut	1%
New York	7%
New Jersey	20%
Delaware	5%
Maryland	11%
Virginia	20%
North Carolina	11%

Table 2. Black Sea Bass Commercial Landings by State (2006-2016) in pounds.
Source: State Compliance Reports (October 2017) & ACCSP. 2015-2016. Commercial Landings Summaries (Dealer Reports)-Confidential; generated by C.Starks; using ACCSP Data Warehouse, Arlington, VA.

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016**
ME											
MA	596,480	442,136	316,722	148,470	260,181	287,666	248,463	329,223	277,276	347,820	353,864
RI	273,161	356,542	226,925	128,053	241,892	185,709	187,806	237,951	245,268	238,647	294,618
CT	10,445	10,123	15,554	17,854	21,422	20,485	17,677	22,735	27,036	24,591	28,854
NY	295,078	265,940	201,222	123,287	200,463	177,997	153,347	180,947	188,436	151,311	186,870
NJ	494,352	480,112	424,667	204,213	305,294	293,609	310,427	494,075	486,073	468,248	523,118
DE	87,381	63,431	60,700	50,259	76,913	82,436	82,351	104,937	102,279	111,508	96,794
MD	350,385	170,909	159,453	125,643	203,088	182,711	140,861	219,321	235,689	234,707	271,809
VA	305,871	189,875	211,500	164,524	263,563	274,446	391,384	493,153	410,162	422,333	511,608
NC*	777,659	472,931	484,507	614,734	400,879	272,189	61,187	88,242	210,989	241,538	224,372
Coastwide	3,190,812	2,451,999	2,101,250	1,577,037	1,973,695	1,777,248	1,593,503	2,170,584	2,183,208	2,240,703	2,491,906

** Landings are statewide from 2006-2011, and from north of Cape Hatteras from 2012 forward*
***2016 Landings are still preliminary*

Table 3. 2015 Landings and 2016 Black Sea Bass Commercial State by State Quotas (pounds)

State	% Allocation	Final 2015 Landings	2016 ASMFC Initial Quota
Maine	0.005	0	13,559
New Hampshire	0.005	0	13,559
Massachusetts	0.13	347,820	352,525
Rhode Island	0.11	238,647	297,598
Connecticut	0.01	24,591	26,520
New York	0.07	151,311	187,986
New Jersey	0.2	468,248	536,558
Delaware	0.05	111,508	135,591
Maryland	0.11	234,707	298,289
Virginia	0.2	422,333	542,375
North Carolina	0.11	241,538	298,305
Coastwide Total	100%	2,240,703	2,702,867
2015 Coastwide Quota		2,212,923	
Overage		27,780	

* Landings from North Carolina are from North of Cape Hatteras

Table 5. Black Sea Bass Recreational Landings by State (2006-2016) in pounds.

Source: "Personal Communication with National Marine Fisheries Service September 2017"

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NH							4,587	18,060			
MA	149,993	153,869	365,108	626,082	999,914	318,379	1,049,251	675,563	1,087,847	718,101	891,440
RI	67,076	59,566	82,072	50,290	238,039	85,912	226,130	148,417	370,531	444,337	564,370
CT	4,684	41,941	99,848	1,025	23,029	13,758	261,163	252,602	586,113	495,675	914,014
NY	455,213	563,199	528,613	844,746	965,767	399,030	542,688	682,867	847,181	1,531,493	2,211,292
NJ	140,931	136,564	26,378	36,190	28,357	46,609	993,093	30,273	631,457	428,319	398,481
DE	690,651	1,086,652	827,511	763,593	779,105	181,695	49,967	471,442	30,962	26,893	31,939
MD	136,064	49,002	32,603	40,681	41,386	51,714	42,173	9,928	87,086	78,052	103,995
VA	105,134	64,954	51,974	112,339	28,987	26,753	2,599	31,339	24,433	63,694	70,187
NC*	28,352	21,863	11,489	7,043	16,265	47,310	7,153	9,992	1,180	3,887	1,249
Coastwide	**1,778,098**	**2,177,610**	**2,025,596**	**2,481,989**	**3,120,849**	**1,171,160**	**3,178,804**	**2,330,483**	**3,666,790**	**3,886,710**	**5,186,967**

**Landings are from north of Hatteras from 2006 to 2016.*

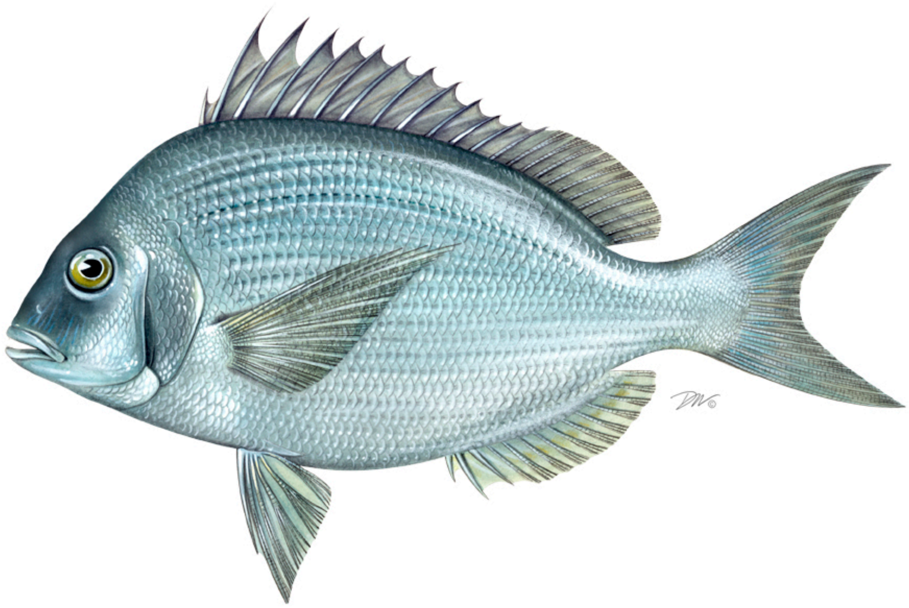
Table 6. 2016 recreational management measures for black sea bass by state

State	Minimum Size (inches)	Possession Limit	Open Season
Maine	13	10 fish	May 19-September 21; October 18- December 31
New Hampshire	13	10 fish	January 1-December 31
Massachusetts	15	5 fish	May 21-August 31
Rhode Island	15	3 fish	June 24- August 31
		7 fish	September 1-December 31
Connecticut (Private & Shore)	15	5 fish	May 1-December 31
CT (Authorized party/charter monitoring program vessels)		8 fish	
New York	15	3 fish	June 27-August 31
		8 fish	September 1-October 31
		10 fish	November 1-December 31
New Jersey	12.5	10 fish	May 23-June 19
		2 fish	July 1-August 31
	13	15 fish	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
Minimum Federal Measures	**12.5**	**15 fish**	**May 15-September 21; October 22-December 31**

Table 7. 2017 recreational management measures for black sea bass by state

State	Minimum Size (inches)	Possession Limit	Open Season
Maine	13	10 fish	May 19-September 21; October 18-December 31
New Hampshire	13	10 fish	January 1-December 31
Massachusetts	15	5 fish	May 21-August 31
Rhode Island	15	3 fish	May 25-August 31
		7 fish	October 22-December 31
Connecticut (Private & Shore)	15	5 fish	May 1-December 31
CT Authorized Party/Charter Monitoring Program Vessels		8 fish	May 1-December 31
New York	15	3 fish	June 27- August 31
		8 fish	September 1-December 31
		10	November 1-December 31
New Jersey	12.5	10 fish	May 26-June 18
		2 fish	July 1-August 31
		15 fish	October 22-December31
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
Minimum Federal Measures	**12.5**	**15 fish**	**May 15-September 21; October 22-December 31**

2017 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN for the 2016 SCUP FISHERY
SCUP *(Stenotomus chrysops)*



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October 2017

2017 Review of the Atlantic States Marine Fisheries Commission

Fishery Management Plan for Scup for the 2016 Fishing Year

I. Status of the Fishery Management Plan

States with a declared interest in the Scup FMP are Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. The Commission's Summer Flounder, Scup, and Black Sea Bass Management Board serves as the species management board, and the Demersal Species Committee guides plan development for the MAFMC. The Summer Flounder, Scup, and Black Sea Bass Technical Committee addresses technical issues. Industry advice is solicited through the Scup and Black Sea Bass Advisory Panel, and annual review and monitoring is the responsibility of the Scup Plan Review Team.

Atlantic States Marine Fisheries Commission (ASMFC or Commission) management of scup was initiated as one component of a multi-species Fishery Management Plan (FMP) addressing summer flounder, scup and black sea bass. The Commission approved the FMP for scup in March 1996. Amendment 12 to the Summer Flounder, Scup, and Black Sea Bass FMP, which established revised overfishing definitions, identification and description of essential fish habitat, and defined the framework adjustment process, was approved by the Commission in October 1998.

The FMP included a seven-year plan for reducing fishing effort and restoring the stock. The primary concerns were excessive discarding of scup and near collapse of the stock. Management measures implemented in the first year of the plan (1996) included: dealer and vessel permitting and reporting, 9-inch commercial minimum size, 4-inch mesh restriction for vessels retaining over 4,000 pounds of scup, and a 7-inch recreational minimum size. The biological reference point to define overfishing when the plan was initially developed was F_{MAX}, or F=0.25. To allow flexibility in addressing unforeseen conditions in the fishery, the plan contained provisions that allow implementation of time and area closures. The plan also specified the option for changes in the recreational minimum size and bag limit, or implementation of a seasonal closure on an annual basis. The original FMP also implemented an annual coastwide Total Allowable Catch (TAC) limit, effective in 1997, from which an annual commercial quota and recreational harvest limit would be derived.

Addendum 1 to the Summer Flounder, Scup, and Black Sea Bass FMP established the quota management procedure for management and distribution of the annual coastwide commercial quota. Addendum 1 also details the state-by-state quota system for the summer period (May through October) that was implemented in 1997. Each state receives a share of the summer quota based on historical commercial landings from 1983-1992.

In June 1997, the Commonwealth of Massachusetts filed a lawsuit against the Secretary of Commerce stating that the historical data used to determine the quota shares underestimated the commercial landings of scup. Massachusetts also stated that the resulting quota share discriminated against Commonwealth of Massachusetts residents. On April 27, 1998, the U.S. District Court voided the state-by-state quota allocations for the summer quota period in the federal fishery management plan, and ordered the Secretary of Commerce to promulgate a regulation that sets forth state-by-state quotas in compliance with the National Standards. The Summer Flounder, Scup, and Black Sea Bass Management Board developed three Emergency Rules to address the quota management during the summer quota period during 1999, 2000 and 2001.

Amendment 12 to the Summer Flounder, Scup and Black Sea Bass FMP established a biomass threshold for scup based on the maximum value of the 3-year moving average of the Northeast Fisheries Science Center spring bottom trawl survey index of spawning stock biomass. The Amendment stipulated that the scup stock was considered overfished when the spawning stock biomass index fell below this value. Amendment 12 also defined overfishing for scup to occur when the fishing mortality rate exceeded the threshold fishing mortality. Subsequent addenda modified the reference points.

In 2002, the Board developed Addendum V to the FMP in order to avoid the necessity of developing annual Emergency Rules for summer period quota management. Addendum V established state shares of the summer period quota based on historical commercial landings from 1983-1992, including additional landings from Massachusetts added to the National Marine Fisheries Service (NMFS) database in 2000. State shares implemented by this addendum will remain in place until the Board takes direct action to change them.

Another significant change to scup management occurred with the approval of Addendum VII in February 2002. This document established a state specific management program for the states of Massachusetts through New York for the 2002 recreational scup fishery based on the average landings (in number of fish) for 1998-2001.. Due to the extremely limited data available, the Board developed specific management measures for the states of New Jersey, Delaware, Maryland, Virginia, and North Carolina. The addendum had no application after 2002. The same addendum language was used verbatim to set management measures for the states of Massachusetts through New York for 2003 through Addendum IX.

Addendum XIX, approved in August 2007, broadened the descriptions of stock status determination criteria contained within the Summer Flounder, Scup, and Black Sea Bass FMP to allow for greater flexibility in those definitions, while maintaining objective and measurable criteria for identifying when stocks are overfished. It established acceptable categories of peer-review for stock status determination criteria. When these specific peer-review metrics are met and new or updated information is available, the new or revised stock status determination criteria may be incorporated by the Commission directly into the annual management measures for each species.

Addendum XX sets policies to reconcile quota overages to address minor inadvertent quota overages. It was approved in November 2009. It streamlines the quota transfers process and establishes clear policies and administrative protocols to guide the allocation of transfers from states with underages to states with overages. It also allows for quota transfers to reconcile quota overages after the year’s end.

II. Status of the Stock

The most recent stock assessment update for scup took place in 2017. Based on information through 2016, the scup stock was not overfished or experiencing overfishing relative to the reference points defined in the 2015 SAW 60 benchmark assessment. The stock assessment model for scup changed in 2008 from a simple index-based model to a complex statistical catch at age model. The model now incorporates a broader range of fishery and survey data than was used previously.

Since 1984, recruitment (i.e., the number of age 0 scup) estimates are influenced mainly by the fishery and survey catches-at-age, and averaged 121 million fish during 1984-2016. The 1999, 2006, and 2015 year classes are estimated to be the largest of the time series, at 222, 222, and 252 million age 0 fish. Below average recruitment occurred in 2012-2014 and in 2016 (65 million fish).

The fishing mortality reference point is $F_{MSY} = F_{40\%} = 0.220$. $F_{40\%}$ is the rate of fishing that will result in 40% of the spawning potential of an unfished stock. The spawning stock biomass (SSB) target is $SSB_{40\%}$ = 87,302 mt or 192.47 million pounds. The 2017 stock assessment update indicates the F in 2016 was 0.139 and SSB was 397 million pounds, therefore overfishing is not occurring and the stock is rebuilt.

III. Status of the Fishery

Commercial scup landings, which had declined by over 33% to 13.1 million pounds in 1988 from peak landings (approximately 49 million lbs) in 1960, increased to 15.6 million pounds in 1991, then steadily dropped to the lowest value in the time series, 2.7 million pounds in 2000. Since 2001, commercial landings have continued to increase nearly every year to about 17.87 million pounds in 2013. From 2011-2015 commercial landings varied, ranging from 14.88 million lbs in 2012, to 17.87 million pounds in 2013. In 2016, commercial landings were 15.74 million lbs, about 77% of the commercial quota (Table 3). Since 1979 approximately 80% of the commercial landings have been landed in Rhode Island (38%), New Jersey (26%), and New York (16%). Otter trawl is the principal gear, accounting for 65%-90% of commercial landings since 1979.

The recreational fishery for scup is significant, with the greatest proportion of the catches taken in states of Massachusetts through New York. Since 1981, recreational harvest has averaged 32% of total landings (commercial and recreational). From 2005 to 2015, recreational harvest has ranged from 2.69 million lbs in 2005 to 5.11 million lbs in 2013. In 2016, recreational harvest was 4.26 million lbs, about 70% of the recreational harvest limit (Table 4).

IV. Status of Assessment Advice

The 2015 Benchmark Stock Assessment indicated that while the scup biomass is over 200% of the biomass target, the trend moving forward is likely a decreased from a recent year's peak. As such, the Board and Council moved to decrease commercial quotas and recreational harvest limits from 2015 levels in 2016 and 2017 based on the biomass projections outlined in the stock assessment. The 2017 Stock Assessment Update indicated the biomass still remains 200% above the biomass target and resource is not experiencing overfishing. Quotas were increased for 2018 and 2019. The Board and Council originally set these quotas based on the 2015 numbers and will update them based on the 2017 update.

V. Status of Research and Monitoring

Commercial landings data are collected by the NMFS Vessel Trip Report system and by state reporting systems. The NEFSC sea sampling program collects commercial discard information. Biological samples (age, length) from the commercial fishery are collected through the NEFSC weighout system and by the state of North Carolina. Recreational landings and discard information is obtained through the Marine Recreational Information Program. The Commonwealth of Massachusetts collected length frequency information for the recreational fishery in 2001 as part of a federally funded effort to monitor the recreational and commercial directed fisheries. One non-directed fishery assumed to have substantial scup bycatch was also monitored. This monitoring effort decreased substantially in 2002 as the study received funding for one year. Fishery independent abundance indices are available from surveys conducted by the NEFSC, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, and the Virginia Institute of Marine Science. All surveys, with the exception of Delaware's, are included in the species stock assessment.

VI. Management Measures and Developing Issues

Addendum 1 to the Scup FMP specifies the commercial quota management scheme. The annual coastwide quota is divided among three periods. The Winter I period is January through April, the summer period is May through October, and November and December make up Winter II. During the winter periods, the quota is coastwide and is limited by federal trip limits. The summer allocation is divided into state shares. There is no federal possession limit during the summer period; however, various state possession limits are in effect. When a winter period allocation is landed, the states and NMFS must prohibit landings. When a state lands it summer allocation it is expected to close its fishery. The quota, as well as accompanying trip limits, will be set annually. [Note: The Federal FMP currently contains a coastwide commercial quota during the summer period due to the court decision described in Section I]. The Board expressed interest in exploring alternative quota programs for scup. In December 2015 the Board recommended that the Technical Committee develop an analysis to support future considerations related to possibly changing the length of each of the three quota periods. Addendum XXIX was initiated in fall 2016 and was approved by the Board in May 2017. The Addendum shortens the length of the commercial scup summer period and extends the length of the winter II period.

Scup FMP Compliance Criteria:

<u>COMMERCIAL FISHERY for 2016</u>

The following management measures may change annually.

<u>Minimum size of possession</u>: 9” Total Length
<u>Minimum mesh</u>: Otter trawls must have a minimum mesh size of 5” for the first 75 meshes from the terminus of the net and a minimum mesh size of 5” throughout the net for codends constructed with fewer than 75 meshes.
<u>Threshold to Trigger Minimum Mesh Requirements:</u> Trawl vessels are subject to the minimum mesh requirements if possessing 1,000 pounds or more of scup from November 1 through April 30, or 200 pounds or more of scup from May 1 through October 31.**
<u>Maximum roller rig trawl roller diameter</u>: 18”
<u>Pot and trap escape vents</u>: 3.1” round, 2.25” square
<u>Pot and trap degradable fastener provisions</u>: a) untreated hemp, jute, or cotton string 3/16” (4.8 mm) or smaller; b) magnesium alloy timed float releases or fasteners; c) ungalvanized, uncoated iron wire of 0.094” (2.4mm) or smaller
<u>Commercial quota</u>: 20.47 million pounds (adjusted for overages)
<u>ASMFC Summer Quota:</u> 7,972,176 lbs (State by State Shares in Table 1)
<u>Winter I and II Quotas and landing limits:</u> Winter I = 9,232,987 lbs; 50,000 lb trip limit, 1,000 lbs trip limits when the quota reaches 80%; Winter II = 3,262,554 lbs, 12,000 pounds initial possession limits; if the winter I quota is not reached, the winter II possession limit increases by 1,500 pounds for every 500,000 pounds of quota not caught during winter I
**Starting in 2016, the threshold to trigger minimum mesh requirements increased from 500 pounds to 1,000 pounds.
The following required measures are not subject to annual adjustment:

<u>Vessel and dealer permitting requirements:</u> States are required to implement a permit for fishermen fishing exclusively in state waters, and for dealers purchasing exclusively from such fishermen. In addition, states are expected to recognize federal permits in state waters, and are encouraged to establish a moratorium on entry into the fishery.

<u>Vessel and dealer reporting requirements:</u> States are required to implement reporting requirements for state permitted vessels and dealers and to report landings from state waters to NMFS.

<u>Scup pot or trap definition</u>: A scup pot or trap will be defined by the state regulations that apply to the vessels principal port of landing.

<u>Quota management requirements:</u>
Winter I and II: States are required to implement landing limits as specified annually. States are required to notify state and federal permit holders of initial period landing limits, in-period adjustments, and closures. States are required to prohibit fishing for, and landing of, scup when a period quota has been landed, based on projections by NMFS. States must report landings from state waters to NMFS for counting toward the quota

Summer: States are required to implement a plan of trip limits or other measures to manage their summer share of the scup quota. States are required to prohibit fishing for, and landing of, scup when their quota share is landed. States may transfer or combine quota shares. States must report all landings from state waters to NMFS for counting toward the state shares.

RECREATIONAL FISHERY for 2016

Addendum IX (2003) established a state-specific management program for Massachusetts through New York (inclusive), and specific management measures for the states of New Jersey, Delaware, Maryland, Virginia, and North Carolina. The states have continued this approach since 2004.

The following measures may change annually: **2016 Recreational Measures**

2016 Minimum size, possession limits and seasonal closure: Table 5

2016 Recreational Harvest Limit: 6.09 million pounds

2017 Minimum size, possession limits and seasonal closure: Table 5

OTHER MEASURES

Reporting: States are required to submit an annual compliance report to the Chair of the ASMFC Scup Plan Review Team by June 1 of each year. This report should detail the state's management program for the current year and establish proof of compliance with all mandatory management measures. It should include landings information from the previous year, and the results of any monitoring or research programs.

De minimis: States having commercial landings during the summer period that are less than 0.1% of the summer period quota are eligible for *de minimis* consideration. States desiring *de minimis* classification must make a formal request in writing through the Plan Review Team for review and consideration by the Scup Management Board.

This summary of compliance criteria is intended to serve as a quick reference guide. It in no way alters or supersedes compliance criteria as contained in the Scup FMP and any Amendments thereto.

Compliance Issues

The PRT found the following compliance issues. Massachusetts did not maintain the 5" minimum diamond mesh size or the threshold to trigger minimum mesh requirements (1,000 lbs 11/1 – 4/30; (mid-year increase to 1,000 lbs effective Nov/Dec 2016); 200 lbs from 5/1 – 10/31), allowing squid mesh (1 7/8") vessels to retain directed fishery possession limits for scup from April 23 – June 9 (or longer by Director's declaration). Rhode Island allowed a 4.5" minimum mesh size for the entire net of 4.5" diamond mesh in codend (for large trawl nets), which was below the 5" minimum required. Rhode Island also allowed 2.5" circular escape vents, 2" square escape vents, or 1.375" X 5.75" rectangular escape vents for pots/traps, which were smaller than the required minimum of 3.1” round or 2.25” square vents. See state compliance reports for more information.

De Minimis

The state of Delaware requests *de minimis* status. The PRT notes Delaware meets the *de minimis* requirements.

VII. State Compliance with Required Measures

Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina are required to comply with the provisions of the Scup FMP. The PRT found Massachusetts to be out of compliance with the minimum mesh size and trigger for minimum mesh size requirements. The PRT also found Rhode Island to be out of compliance with the minimum mesh and escape vent size requirements. All other states implemented regulations in compliance with the requirements approved by the Board.

<u>Scup FMP Compliance Schedule</u>

Commercial Fishery

Management Measures	
Ability to implement and enforce period landing limits	1/1/97
Ability to notify permit holders of landing limits and closures 1/1/97	5/1/97
Ability to close the summer fishery once the state share is harvested	5/1/97
Ability to close the winter fisheries once the period quota is harvested	5/1/97
9” total length minimum size limit	6/30/96
Minimum mesh size of 5” diamond mesh throughout codend	1/1/05
Pot and trap escape vents (min 3.1” square/rectangular; each side at least 2.25” in length), degradable fasteners	6/30/96
Roller diameter restriction	6/30/96
Vessel permit and reporting requirements, state	1/1/97
Dealer permit and reporting requirements, state	1/1/97

Recreational Fishery

Management Measures	
Size limit	6/30/96
Possession limit	6/30/96

General

States submit annual monitoring and compliance report	6/1 annually

Annual Specifications

Commercial		
Winter I Landing Limits	11/1/05	1/1/16
Winter II Landing Limits	11/1/05	11/1/16

Recreational

Massachusetts– New York (inclusive)	
State specific minimum size, possession limit and season	3/16
New Jersey – North Carolina (inclusive)	
Federal coastwide minimum size, possession limit and season	12/15

Table 1. 2016. State by State Quota (Summer Period)

State	Share	2016 ASMFC Final Quota
ME	0.00121	9,646
MA	0.21585	1,720,842
RI	0.56189	4,479,580
CT	0.03154	251,422
NY	0.15823	1,261,471
NJ	0.02916	232,504
MD	0.00012	949
VA	0.00165	13,154
NC	0.00025	1,985
Total	0.99991	7,971,553

Table 2. Summary of scup management measures, 2006-2016.

Harvest Limits and Measures	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
ABC (m lbs)	-	-	-	-	-	-	40.88	38.71	35.99	33.77	31.11
TAC (m lbs)	19.79	13.97	9.9	15.54	17.09	31.92	-	-	-	-	-
Commercial ACL (m lbs)	-	-	-	-	-	-	31.89	30.19	28.07	26.35	24.26
Commercial quota-adjusted (m lbs)*	11.93	8.9	5.24	8.37	10.68	20.36	27.91	23.53	21.95	21.23	20.47
Commercial landing (m lbs)	9.00	9.24	5.22	8.20	10.73	15.03	14.88	17.87	15.93	15.85	15.76
Recreational ABC (m lbs)	-	-	-	-	-	-	8.99	8.52	7.92	7.43	6.84
Recreational harvest limit-adjusted (m lbs)*	4.15	2.74	1.83	2.59	3.01	5.74	7.55	7.55	7.03	6.8	6.09
Recreational landing	3.72	4.56	3.79	3.23	5.97	3.67	4.17	5.11	4.12	4.61	4.26
Commercial fish size (in)	9	9	9	9	9	9	9	9	9	9	9
Min. mesh size (in, diamond)	5	5	5	5	5	5	5	5	5	5	5
Mesh threshold	500/ 200	500/ 200	500/ 200	500/ 200	500/ 200	500/ 200	500/ 200	500/ 200	500/ 200	500/ 200	1,000/200

*2006-2014 commercial quotas and recreational harvest limits were adjustted for the Research Set Aside (RSA) program. The RSA program was suspended for 2015 and beyond.

Table 3. Scup commercial landings by state 2006-2016 in pounds.
Source: ACCSP. 2015-2016. Commercial Landings Summaries (Dealer Reports) - Confidential; generated by J. Kuesel; using ACCSP Data Warehouse, Arlington, VA. & State Compliance Reports (October 2017)

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016**
MA	1,088,148	1,104,316	527,325	718,751	1,030,688	1,243,810	2,005,268	1,094,975	1,185,816	1,380,262	1,535,947
RI	3,671,250	3,892,671	2,133,001	1,785,994	4,298,595	6,335,391	6,309,321	4,689,540	6,932,462	6,793,853	6,815,227
CT	297,912	255,884	283,101	203,607	323,757	644,030	905,060	1,194,949	811,106	983,041	946,182
NY	2,305,161	2,280,112	1,203,661	1,845,908	2,689,443	3,542,538	4,306,621	4,407,231	3,190,433	3,174,868	3,505,824
NJ	1,392,868	1,575,144	773,829	1,528,545	1,550,249	1,966,479	978,531	2,033,083	1,925,591	2,981,572	2,332,900
DE	0	3	0	0	0	9	1	4	4	8	52
MD	--	--	--	9,000	27,183	54,229	8,263	--	230,104	25,892	53,535
VA	80,292	22,579	95,939	211,576	371,376	620,480	339,868	913,113	660,324	509,334	441,257
NC	139,420	66,856	205,703	244,337	102,745	308,907	4,098	28,394	159,930	229,696	111,901
Total	9,065,404	9,259,713	5,222,559	6,547,718	10,394,036	14,715,873	14,857,031	14,361,289	15,095,770	16,078,526	15,742,825

**2016 Landings are still preliminary

Table 4. Scup recreational landings, 2006-2016, by state in weight.
Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. September 2017.

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MA	218,996	75,860	150,031	874,952	1,023,248	836,156	1,795,634	1,850,909	1,634,104	1,286,537	1,051,147
RI	470,286	353,450	632,839	139,576	398,178	567,697	497,505	816,837	975,812	591,693	606,528
CT	107,479	108,528	115,821	359,845	1,346,631	1,194,680	921,010	2,126,257	561,182	497,495	843,267
NY	1,677,998	1,596,391	1,450,861	1,460,314	1,990,339	714,789	592,238	978,444	1,132,448	2,211,709	1,533,402
NJ	241,567	86,073	72,697	141,861	610,660	42,223	113,332	100,419	45,847	29,501	210,727
DE	319	2,365	1,338	821	0	40	86	0	35	589	1
MD	58,386	157,360	89,729	36	11	7	0	0	0	204	126*
VA	0	586	3,920	527	5,284	10,413	1,425	1,238	0	1,846	14,157*
NC	0	0	0	0	0	27	148	0	769	87	0
Total	**2,775,031**	**2,380,613**	**2,517,236**	**2,977,932**	**5,374,351**	**3,366,032**	**3,921,378**	**5,874,104**	**4,350,197**	**4,619,661**	**4,259,355**

*State estimates for Maryland and Virginia had PSE>50.

Table 5. 2016 and 2017 State Scup Recreational Measures

State	Minimum Size (inches)	Possession Limit	Open Season
Massachusetts For Hire	10	45 fish from May 1- June 30; 30 fish from July 1- Dec 31	May 1- December 31
Private Angler	10	30 fish; private vessels with 6 or more persons aboard are prohibited from possessing more than 150 scup per day	May 1- December 31
Rhode Island For Hire	10	30 fish from May 1-Aug 31 and Nov 1-Dec 31; 45 fish from Sept 1-Oct 31	May 1- December 31
Private Angler	10"; and 9" or greater for shore mode at 3 designated sites	30 fish	May 1- December 31
Connecticut For Hire	10	30 fish from May 1-Aug 31 and Nov 1-Dec 31; 45 fish from Sept 1-Oct 31	May 1- December 31
Private Angler	10; and 9" for shore mode at 46 designated sites	30 fish	May 1- December 31
New York For Hire	10	30 fish from May 1-Aug 31 and Nov 1-Dec 31; 45 fish from Sept 1-Oct 31	May 1- December 31
Private Angler	10	30 fish	May 1- December 31
New Jersey	9	50 fish	Jan 1-Feb 28 and July 1 – December 31
Delaware	8	50 fish	All Year
Maryland	8	50 fish	All Year
Virginia	8	30 fish	All Year
North Carolina	8	50 fish	All Year

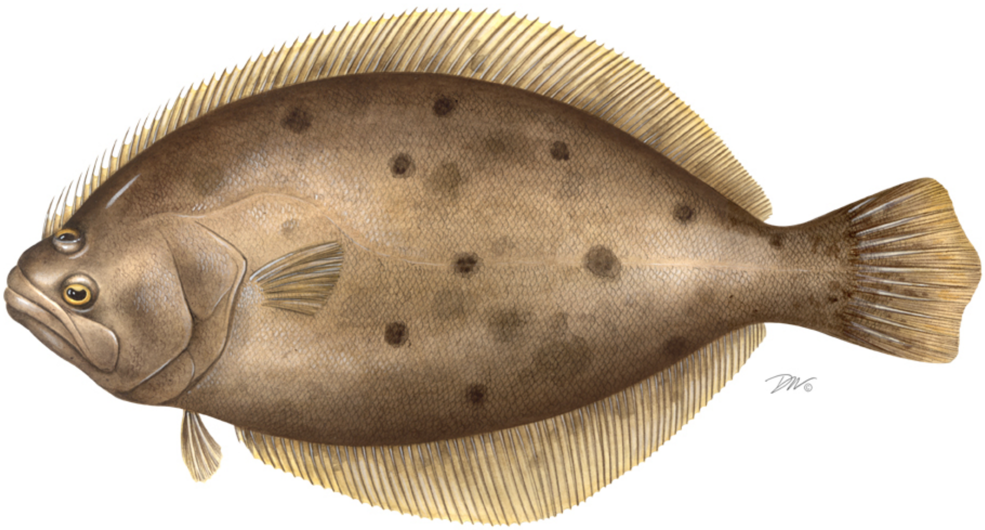
Table 6. Scup Landings by period.

Year	Period	Commercial Quota	Trip Limits	Landings (lbs)	Date Closed	% of Quota Landed
2005	Winter I	5,518,367	15,000/1,000	3,684,768	--	66.8
	Summer	4,764,806	--	4,001,662	--	89.5
	Winter II	1,987,718	1,500	1,380,444	--	74.6
2006	Winter I	3,554,991	30,000/1,000*	3,626,237	--	102
	Summer	4,647,569	--	3,219,929	--	69.3
	Winter II	3,729,581	2,000/1,000	2,115,323	--	56.7
2007	Winter I	4,012,895	30,000/1,000*	3,400,934	--	84.8
	Summer	3,464,914	--	4,254,987	21-Sep	122.8
	Winter II	1,417,991	2,000/1,000	1,590,747	--	112.2
2008	Winter I	2,291,699	30,000/1,000*	2,356,716	--	102.8
	Summer	1,437,558	--	1,935,074	16-Jul	134.6
	Winter II	940,948	2,000/1,000	892,318	--	94.8
2009	Winter I	3,777,443	30,000/1,000*	3,774,583	--	99.9
	Summer	2,930,733	--	3,072,340	--	104.8
	Winter II	1,334,791	2,000/1,000	1,356,961	--	101.7
2010	Winter I	4,964,716	30,000/1,000*	4,740,681	--	95.4
	Summer	4,286,759	--	4,175,206	--	97.4
	Winter II	1,754,325	2,000/1,000	1,482,669	--	84.5
2011	Winter I	6,897,648	30,000/1,000*	5,648,867	--	81.9
	Summer	7,930,504	--	6,349,749	--	80.1
	Winter II	3,245,500	2,000/1,000	2,556,214	--	78.8
2012	Winter I	12,589,558	50,000/1,000*	5,190,370	--	41.2
	Summer	10,870,390	--	6,326,576	--	58.2
	Winter II	11,635,321	8,000	2,484,470	--	21.4
2013	Winter I	10,613,157	50,000/1,000*	7,431,296	--	70.0
	Summer	9,163,877	--	7,684,995	--	83.9
	Winter II	6,932,998	8,000	2,324,250	--	33.5
2014	Winter I	9,900,000	50,000/1,000*	5,833,858	--	58.9
	Summer	8,548,364	--	7,146,612	--	83.6
	Winter II	7,232,471	12,000	2,318,732	--	32.1
2015	Winter I	9,578,008	50,000/1,000*	6,681,081	--	69.8
	Summer	8,269,322	--	7,703,455	--	93.1
	Winter II	5,468,726	12,000	1,904,529	--	34.8
2016	Winter I	9,232,987	50,000/1,000*	5,873,769	--	63.6
	Summer	7,972,176	--	7,063,389	--	88.6
	Winter II	3,262,554	18,000	2,502,146	--	76.7

*The first number indicates the trip limit until 80% of the quota is caught; the second number is the trip limit after that threshold is exceeded.

2017 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR THE 2016 SUMMER FLOUNDER FISHERY

SUMMER FLOUNDER
(Paralichthys dentatus)



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October 2017

2017 REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN FOR SUMMER FLOUNDER *(Paralichthys dentatus)*

I. Status of the Fishery Management Plan

The summer flounder (*Paralichthys dentatus*) fishery of the Atlantic Coast is managed jointly by the Atlantic States Marine Fisheries Commission (ASMFC) Summer Flounder, Scup, and Black Sea Bass Management Board (Board) and the Mid-Atlantic Fishery Management Council (MAFMC or Council). The original ASMFC Fishery Management Plan (FMP), established in 1982, recommended a 14" minimum size limit. The MAFMC Plan, prepared in 1988 and based on the ASMFC plan, established a 13" minimum size limit. Since then, fourteen amendments have been developed and approved, except Amendment 1 which would have required a 5–1/2" minimum mesh size in the codend of trawls and Amendment 11 which would have reallocated commercial quota shares.

The objectives of the FMP have not changed and are to: 1) reduce fishing mortality of summer flounder to assure overfishing does not occur; 2) reduce fishing mortality on immature summer flounder to increase spawning stock biomass; 3) improve yield from the fishery; 4) promote compatible management regulations between State and Federal jurisdictions; 5) promote uniform and effective enforcement of regulations; and 6) minimize regulations to achieve the stated objectives.

The management unit includes summer flounder in US waters in the western Atlantic Ocean from the southern border of North Carolina northward to the US - Canadian border. States and jurisdictions with a declared interest in the summer flounder FMP include all those from North Carolina through Massachusetts except Pennsylvania and the District of Columbia, as well as the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS). An ASMFC Plan Review Team, Technical Committee, species board, and the MAFMC Demersal Committee are actively working on this plan. A joint ASMFC-MAFMC Technical Monitoring Committee provides annual management advice.

Amendment 2 (approved in August 1993) provided a strategy for reducing fishing mortality to Fmax, while avoiding unreasonable impacts on fishermen. Commercial management measures included a federal (EEZ) moratorium on entry into the commercial fishery, vessel and dealer permitting and reporting requirements, an annual commercial quota, and minimum mesh requirements (5.5" diamond or 6" square mesh in the net's codend) with an exemption program. Recreational fishery measures include open access for-hire permit requirements, minimum size limits, possession limits, and seasonal closures.

The management system established under Amendment 2 has been modified by the following amendments, framework actions, and addenda. Amendment 3 (approved in July 1993) revised the mesh requirement exemption program and modified the poundage thresholds for the mesh requirements (change to two seasonal thresholds instead of year-round 100 lbs). Amendment 4 (approved in September 1993) revised the state-specific shares of the coastwide commercial quota allocation in response to a reporting issue in Connecticut. Amendment 5 (approved in December 1993) allows states to transfer or combine their commercial quota shares. Amendment 6 (approved in May 1994) allows properly stowed nets with a cod end mesh size less than that stipulated in the plan to be aboard vessels in the summer flounder fishery. Amendment 7 (approved May 1995) adjusted the stock rebuilding schedule and capped the 1996-1997 commercial quotas at 18.51 million pounds. There is no Amendment 8 or 9 to the ASMFC FMP. The Council adopted Scup management measures as Amendment 8 and Black Sea Bass measures as Amendment 9, while the Board adopted separate Scup and Black Sea Bass Management Plans.

Amendment 10, approved by the Board in May 1997, initially sought to examine the commercial quota management system. Its scope was expanded to address a number of federal and state issues in the fishery, including: 1) allow framework adjustments to the minimum mesh for any portion of the net; 2) require 5.5” diamond or 6” square mesh in the entire net of trawls; 3) continue the federal moratorium on commercial entry; 4) remove the requirement that federally permitted vessels must land summer flounder every year; 5) modify the federal vessel replacement criteria; 6) implement state *de minimis* criteria; 7) prohibit transfer at sea; 8) require states to report summer flounder landings from state waters to the NMFS; and 9) allow states to implement a summer flounder filet at sea permit system. The amendment also considered alternative commercial quota schemes, including 1) a trimester quota with state-by-state shares during summer, 2) a trimester coastwide quota of equal periods, and 3) a revision to the existing state-by-state allocation formula. Ultimately, the Board and Council decided to maintain the current state-by-state quota allocation system.

Amendment 12, approved by the Board in October 1998, was developed to bring the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan in to compliance with the new and revised National Standards and other required provisions of the Sustainable Fisheries Act. Specifically, the amendment revised the overfishing definitions (National Standard 1) for summer flounder, scup and black sea bass and addressed the new and revised standards relative to the existing management measures (National Standard 8-consider effects on fishing communities, National Standard 9-reduce bycatch, National Standard 10-promote safety at sea). The Amendment also identified essential habitat for summer flounder, scup and black sea bass. Finally, Amendment 12 added a framework adjustment procedure that allows the Council to add or modify management measures through a streamlined public review process. Amendment 12 was partially approved by NMFS on April 28, 1999, with the disapproved measures mostly relating to concerns with essential fish habitat measures that were later addressed.

In December 2000, the Board approved Amendment 13. Although there were some management alternatives included in public hearing drafts of the document that could have resulted in changes to summer flounder management measures, none were approved for implementation. As a result, Amendment 13 had no impact on the summer flounder fishery.

Framework Adjustment 2 to the Summer Flounder, Scup and Black Sea Bass FMP, adopted in January 2001, provided the information and analyses necessary to implement a system of conservation equivalency for the recreational summer flounder fishery. Based on a coastwide recreational harvest limit, Framework 2 allows states to customize summer flounder recreational management measures to address issues associated with the availability of summer flounder on spatial and temporal scales.

Addenda III and IV were approved on January 29, 2001. Addendum IV provides that, upon the recommendation of the relevant monitoring committee and joint consideration with the Council, the Board will make a decision concerning what state regulations will be rather than forward a recommendation to NMFS. The states will then be responsible for implementing the Board’s decision. Addendum III established specifications for the 2001 recreational summer flounder fishery.

The Board approved Addendum VIII in December of 2003. Under this addendum, state-specific targets for recreational landings are derived from the coastwide harvest limit based on each state’s proportion of landings reported in 1998, which was the last year in which states were under a common set of management measures.

The Board approved Addendum XIII in August of 2004. This addendum modifies the FMP such that, within a given year, landings limits for the summer flounder, scup, and/or black sea bass can be specified for up to three years. Multi-year limits do not have to be constant from year to year, but instead are based upon expectations of future stock conditions as indicated by the best available scientific information during the year in which specifications are set.

The Board approved Addendum XV in December of 2004. The addendum was developed to allow for a change in the allocation scheme for the increase commercial quota from 2004 to 2005, approximately 1.3 million pounds, as well as the additional quota from 2004 to 2006, approximately 1.6 million pounds. For the fishing years 2005 and 2006, the associated quota increases were allocated to the following states as a bycatch allocation: 75,000 pounds of summer flounder were allocated each to Maryland, New York, Connecticut, and Massachusetts; 15,000 lbs were allocated to Delaware, 5,000 lbs to Maine, and 90 lbs to New Hampshire.

The Board approved Addendum XVII in August of 2005. Addendum XVII established a program wherein the Board could combine state-by-state allocations into voluntary regions. This is an additional management tool in the management toolbox. This addendum also allowed the averaging or combination of multiple years of data (i.e. landings-per-angler, length-frequency distributions) in analyses to determine the impacts of proposed recreational management programs. The programs also included minimum fish sizes, possession limits, and fishing seasons. The averaging of annual harvest estimates is not allowed if the approach is used (i.e. the 1998 based allocations cannot be averaged across multiple years to create new allocations, multi-year averaging can be used to assess management measures).

The Board approved Addendum XVIII in February of 2006. The addendum sought to stabilize fishing rules close to those that existed in 2005, in part, to minimize the drastic reductions that the three states were facing at the time. The addendum allowed the three states (NY, CT, and MA) facing large reductions in their harvest targets to capitalize on harvest opportunities that are foregone by states that chose to maintain their 2005 recreational fishing rules in 2006.

Addendum XIX, approved in August 2007, broadened the descriptions of stock status determination criteria contained within the Summer Flounder, Scup, and Black Sea Bass FMP to allow for greater flexibility in those definitions, while maintaining objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. It establishes acceptable categories of peer-review for stock status determination criteria. When these specific peer-review metrics are met and new or updated information is available, the new or revised stock status determination criteria may be incorporated by the Board directly into the annual management measures for each species, rather than requiring a modification to the FMP.

The Board approved Addendum XXV in February of 2014. The addendum implemented regional conservation equivalency for the 2014 fishing year, and sought to respond to the unintended consequence of using conservation equivalency (e.g., state-specific recreational management measures) to stay within the annually established coastwide recreational harvest limit for summer flounder through regional management. For 2014, the regions were the following: Massachusetts; Rhode Island; Connecticut through New Jersey; Delaware through Virginia; and North Carolina. All states within a region have same minimum size, bag limit, and season length. A continuation of Addendum XXV was codified in Addendum XXVI by the Board in February 2015. Addendum XXVI continued the regional management measures established in 2014 through 2015.

The Board approved Addendum XXVII in February 2016. The addendum addressed 2016 recreational summer flounder and black sea bass fisheries management, continuing regional management measures for 2016 and addressing discrepancies in summer flounder management measures within Delaware Bay. The 2016 recreational fishery was divided into six management regions, the same five regions as under Addendum XXV and XXVI, but with New Jersey separated out from New York and Connecticut into its own region, with states within the same region required to implement the same bag, size limits, and season length. By separating New Jersey into its own region, the addendum allowed the state to make regulations different in Delaware Bay than in the rest of the state. Outside of the Delaware Bay, New Jersey regulations stayed consistent with those in New York and Connecticut. Within the Bay, New Jersey regulations consisted of a similar size limit as in Delaware, the same possession limit as Delaware, and the same season as rest of New Jersey. The line of demarcation for regulation implementation was the COLREGS Demarcation Line. Addendum XXVIII, initiated in 2016, was approved by the Board in February 2017 and seeks to adjust the 30% reduction in the annual RHL from 2016 to 2017 through broad changes to size limits and possession limits across the coast.

II. Status of the Stock

The most recent summer flounder assessment was the June 2016 Stock Assessment Update.

Relative to the biological reference points established during the 2013 benchmark assessment, the stock is not overfished and but overfishing is occurring. Fishing mortality (F) on fully selected age 4 fish ranged between .793 and 1.776 from 1982-1996 and then decreased to .284 in 2007. Since 2007, the fishing mortality has increased to .390 in 2015, 26% above the SAW 57 maximum fishing mortality threshold (F Threshold= F_{MSY}=$F35_{\%}$ = 0.309).

Spawning stock biomass (SSB) decreased from 55.16 million lbs in 1982 to 15.58 million lbs in 1989 and then increased to peaks of 101.48 million lbs in 2003 and 104.73 million lbs in 2010. SSB was estimated to be 36,240 metric tons (mt) = 79.90 million lbs in 2015, 58% of the biomass target reference point = SSBMSY = SSB35% = 62,394 mt = 137.555 million lbs, and 16% above the biomass threshold reference point of ½ SSB_{MSY} proxy = ½ $SSB_{35\%}$ = 31,197 mt =68.78 million lb. NMFS previously declared the summer flounder stock rebuilt based on the 2011 assessment update, which included stock status determinations using data through 2010. A new rebuilding plan would be triggered in the event that estimated biomass falls below the minimum stock size threshold.

Average recruitment from 1982 to 2015 is 41 million fish at age 0. The 1983 and 1985 year classes are the largest in the assessment time series at 75 and 62 million fish, while the 1988 year class is the smallest at only 10 million fish. The update assessment shows that recruitment of age 0 fish was below the time series average each year from 2010 through 2015. The 2015 year class is estimated to be below average at 23 million fish.

III. Status of the Fishery

Commercial landings peaked in 1984 at 37.77 million lbs, and reached a low of 8.8 million lbs in 1997. From 2005 through present commercial landings have been variable, with two peak years (16.91 million lbs in 2005 and 16.57 million lbs in 2011) that have been followed by steady declines. Over the last five years landings have continued to decline in part due to annual quota limits. From 2012-2014, landings exceeded the commercial coastwide quota. 2015 commercial landings declined to 10.6 million pounds, approximately 96% of the coastwide quota. In 2016, landings further decreased to 7.76 million pounds, once again approximately 96% of the coastwide quota. The principle gear used in the fishery is the otter trawl. Commercial discard losses in the otter trawl and scallop dredge fisheries are estimated from observer data and recently accounted for 5 to 10% of the total commercial catch.

Recreational harvest from 2005 to present have also shown steady declines in part due to declines in the coastwide recreational harvest limit. From 2009 through 2013 harvest was below the recreational harvest limit (RHL); in 2014 coastwide harvest exceeded the RHL by 5% at 7.39 million lbs. In 2015, the coastwide harvest of 4.72 million lbs was significantly lower than previous years despite similar regulations. In 2016, the coastwide harvest increased to 6.42 million lbs, exceeding the RHL by 19%. Recreational discard losses have recently accounted for 15 to 20% of the total catch.

IV. Status of Assessment Advice

The 2016 assessment updates indicates that while catch in recent years has not been substantially over the Acceptable Biological Catch, the projected fishing mortality rates have been exceeded and projected spawning stock biomass has not been achieved. These results appear to be largely driven by poor recruitment, an underestimation of the fishing mortality level in the last years of the assessment, and declining biomass indices. Harvest limits were adjusted for 2016 and beyond to address overfishing.

Biological Reference Points (SSB and F estimates updated by the 2016 Stock Assessment Update)

- F Threshold= F_{MSY}=$F35_{\%}$ = 0.309
- Current (2015) F=0.390 overfishing is occurring
- Spawning Stock Biomass (SSB) threshold = 68.8 million lbs
- SSB target = 137.6 million lbs
- Current SSB (2015) =79.9 million lbs stock is not overfished

V. Status of Research and Monitoring

Several states and NMFS conduct seasonal sampling cruises using an otter trawl to assess the condition of summer flounder populations inshore and in the Exclusive Economic Zone (EEZ). Massachusetts collects sex and maturity samples and local abundance indices from spring and fall otter trawl surveys, as well as young of the year information in its winter flounder juvenile seine survey. The Commonwealth monitored the commercial fishery through the observation of six directed trawl fishery trips, as well as through dealer Integrated Voice Response (IVR) systems and mandatory fishermen's logbook. Rhode Island monitors the commercial quota for summer flounder using an automated IVR system and dealers are required to provide weekly reports through the IVR of summer flounder landings. Connecticut commercial summer flounder landings are monitored through monthly commercial fishermen logbooks, and weekly and monthly dealer reports. These reports contain daily records of fishing and dealer purchase activity. New York conducts a survey of recreational anglers on open boats throughout the marine district to collect additional data on size composition of kept and discarded fish and also conducts a small mesh otter trawl survey in the Peconic Bays that samples summer flounder. New York requires trip level reporting from all of its commercial fishermen and monitors quota through a combination of trip reports and dealer reports. New Jersey collects data from the commercial trawl fishery and conducts an ocean trawl survey from which data on summer flounder are collected and catch-per-unit-of-effort and distribution information are generated for juveniles and adults. Delaware's commercial landings are monitored through a mandatory monthly harvest report from all state-licensed fishermen. Maryland constructs a juvenile index from trawl data collected in the ocean side bays and is also compiling data on population age, sex, and size from summer flounder taken in pound nets. A statewide voluntary angler survey is conducted that records location, time spent fishing, number of fish caught, number kept, and lengths of the first 20 fish caught. Virginia prepares a young-of-the-year index from data collected from beach seine and trawl surveys. North Carolina conducts two otter trawl surveys for juvenile fluke, conducts tagging programs to determine migrations and to assess mortality, and collects information on age and growth and catch-per-unit-of-effort for the winter trawl fishery, estuarine gill net fishery, pound net fishery, the ocean gill net fishery and the long haul seine fishery.

VI. Status of Management Measures and Issues

Management measures imposed upon harvesters of summer flounder include an annual commercial quota and recreational harvest limit, minimum sizes, minimum mesh requirements for trawls, permits and administrative fees for dealers and vessels, a moratorium on entry into the fishery, mandated use of sea samplers, monitoring of sea turtles in the southern part of the management unit, and collection of data and record keeping by dealers and processors. Fishing mortality has been controlled by a Total Allowable Landings (TAL) since 1983, allocated into a commercial quota (60% of the TAL) and a recreational harvest limit (40% of the TAL). The commercial quota is allocated to each state based on landings during a baseline period (1980-1989), and any overages are subtracted from a state's quota for the following year. The state allocations of the commercial quota are included in Table 1.

Summer Flounder Compliance Criteria

The PRT found no compliance issues.

De Minimis

Delaware requests *de minimis* status. The PRT notes that they meet the requirement of *de minimis*.

COMMERCIAL FISHERY

The following measures may change annually. The 2016 measures are indicated.

Minimum size: 14"
Minimum mesh and threshold: 5.5" diamond, 6" square
Thresholds: 200 lbs in the winter (Nov 1-Apr 30) and 100 lb in the summer (May 1-October 31)
Regulation of mesh beyond the codend: 5.5" diamond or 6" square throughout the mesh
2016 Commercial quota: 8.12 million pounds

The following measures are not subject to annual adjustment.

Quota management provisions: States are required to adopt appropriate measures to manage their quota shares. States may transfer or combine their quota shares as specified in Amendment 5. States must document through a vessel and dealer reporting system all landings that are not otherwise included in the federal monitoring of permit holders. States are required to forward all landings information to the NMFS for inclusion in quota reporting.

Transfer at Sea: States must prohibit permitted summer flounder vessels from transferring summer flounder from one vessel to another at sea. (As specified in Amendment 10)

De minimis status: States having commercial landings less than 0.1% of the coastwide total will be eligible for *de minims* status. (As specified in Amendment 10). Delaware has requested de minimis status and meets the requirements.

RECREATIONAL FISHERY

The Management Board chose to adopt regional management through conservation equivalency for the 2016 recreational fishery under the provisions of Framework 2 (see table 3 for state measures). As such, the Federal recreational bag limit and minimum fish size were waived and the fishing season and vessel owners were subject only to the regulations in their states.

2016 recreational harvest limit: 5.42 million lbs.

OTHER MEASURES

Filet at sea permit: Party or charter vessels in state waters will be allowed to filet at sea if they obtain a state issued permit allowing such activity. (As specified in Amendment 10)

Reporting:

1. States must submit a commercial fishery management proposal by October 1 of each year. The proposal must detail the specific management measures that the state intends to use to manage their commercial quota allocation. The proposal must be reviewed and approved by the Management Board.

2. States must submit an annual compliance report to the Chairman of the Summer Flounder Plan Review Team by June 1 of each year. The report must detail the state's management program for the current year and establish proof of compliance with all mandatory management measures and all framework changes specified for the current year. It should include landings information from the previous year, and the results of any monitoring or research program.

This summary of compliance criteria is intended to serve as a quick reference guide. It in no way alters or supersedes compliance criteria as contained in the Summer Flounder FMP and Amendments thereto.

VI. Current State-by-State Implementation of FMP Requirements

The PRT notes that after reviewing state compliance reports, all states are compliant with the FMP requirements. The PRT does note that moving forward, state compliance reports should be adjusted in the following three ways:

1) Better language indicating whether all FMP requirements have been implemented, and if not applicable, for them to be noted up front. Many state compliance reports do indicate this clearly.
2) Move a more standardized format of indicating changes to current and future management measures as reflected in state regulations. Many states include more regulatory information than is needed.
3) Landings and survey indices information should be submitted in an excel spreadsheet and compliance reports should be submitted in word documents; this does not preclude a state from including current table or figure of this information, but without the data in a more accessible

format, it creates additional work to remove confidential data and update other management documents.

1993 - 2016 Summer Flounder FMP Compliance Schedule

COMMERCIAL:

14" minimum size	3/1/97
5.5" codend mesh	1/1/98
Ability to regulate mesh in any portion of the net	1/1/98
5.5” diamond or 6” square mesh, body	6/3/98
Prohibition of transfer at sea	1/1/98
Mandatory reporting to NMFS of landings from state waters	1/1/98
Small mesh exemption program	1/21/93
Flynet minimum mesh size exemption	1/21/93

RECREATIONAL:

Regional Management Measures under conservation equivalency	2/2016

GENERAL

Submission of annual commercial management plan	10/1/97, annually thereafter
Submission of annual landings and compliance report	6/1/98, annually thereafter

Table 1. State by state allocation for annual commercial quota

State	Allocation (%)
Maine	0.04756%
New Hampshire	0.00046%
Massachusetts	6.82046%
Rhode Island	15.68298%
Connecticut	2.25708%
New York	7.64699%
New Jersey	16.72499%
Delaware	0.01779%
Maryland	2.03910%
Virginia	21.31676%
North Carolina	27.44584%
Total	100%

Table 1. Summer Flounder Commercial Landings by State (2006-2016) in pounds.
Source: ACCSP. 2016. Commercial Landings Summaries (Dealer Reports) – Non-confidential; generated by J.Kuesel; using ACCSP Data Warehouse, Arlington, VA. & State Compliance Reports (2017)

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016**
MA	920,549	659,784	644,404	731,174	851,889	1,132,192	891,495	859,150	694,777	748,433	585,637
RI	2,122,528	1,515,684	1,473,439	1,793,891	2,289,379	2,824,032	2,064,076	1,799,394	2,054,951	1,716,095	1,303,001
CT	316,533	205,115	220,510	256,768	308,341	401,377	298,849	280,652	253,442	286,890	185,592
NY	1,219,842	929,132	832,415	1,119,093	1,330,015	1,483,785	1,237,126	999,206	833,577	829,929	602,527
NJ	2,379,733	1,697,472	1,540,811	1,798,903	2,165,325	2,830,686	2,268,793	1,995,298	1,826,455	1,681,962	1,294,308
DE	4,376	2,261	1,213	2,952	1,858	836	677	913	1,687	1,349	2,236
MD	247,743	228,809	208,219	213,564	263,302	259,392	139,824	165,134	164,384	187,811	158,970
VA	2,756,952	1,853,693	1,651,575	1,978,754	2,589,786	4,050,998	4,111,708	4,868,842	2,049,045	2,273, 593	1,560,927
NC	3,981,430	2,670,122	2,406,611	2,859,048	6,622,004	5,708,254	1,087,427	543,247	2,906,789	2,878,753	2,066,026
Total	13,949,754	9,774,075	9,002,613	10,774,754	16,455,427	18,724,801	11,801,702	11,511,836	10,785,107	10,601,633	7,759,224

**2016 Landings are preliminary.

Table 2. Recreational Summer Flounder Harvest by State (2006-2016) in weight (pounds).
Source: "Personal Communication with National Marine Fisheries Service, Statistics Division September 2017"

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MA	608,499	368,084	635,196	121,120	137,611	202,665	175,110	64,365	238,604	146,532	124,411
RI	783,010	553,056	831,062	348,603	458,873	511,544	335,506	372,672	636,207	600,597	269,412
CT	424,539	371,907	567,132	195,883	132,013	186,834	191,119	888,906	391,168	337,194	678,479
NY	2,343,908	3,249,126	2,738,108	1,449,759	1,612,298	1,718,121	1,760,650	1,954,821	1,668,848	1,569,139	2,281,086
NJ	3,860,756	2,727,838	2,113,217	2,466,799	1,614,357	2,116,951	3,063,723	3,286,543	3,608,939	1,442,827	2,323,874
DE	247,811	330,307	147,895	259,169	159,976	182,733	141,935	159,185	227,913	114,638	230,925
MD	71,625	206,522	169,323	168,025	91,834	55,686	61,514	108,690	179,313	103,613	52,303
VA	2,005,412	1,311,429	883,168	917,153	789,856	880,639	658,476	449,002	370,230	342,545	191,555
NC	156,842	218,441	64,571	103,867	111,539	100,543	101,642	70,874	67,791	64,065	30,355
Total	10,502,402	9,336,710	8,149,672	6,030,378	5,108,357	5,955,716	6,489,675	7,355,058	7,389,013	4,721,150	6,057,989

Table 3. 2016 recreational management measures for summer flounder by state.

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 (46 designed shore sites)	16		
New York	18	5 fish	May 17- September 21
New Jersey*	18	5 fish	May 21- September 25
NJ Shore program site (ISBSP)	16	2 fish	May 21-September 25
New Jersey/Delaware Bay COLREGS**	17	4 fish	May 21-September 25
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

*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.

Table 4. 2017 recreational management measures for summer flounder by state.

State	Minimum Size (inches)	Possession Limit	Open Season
Massachusetts	17	4 fish	May 22-September 23
Rhode Island	19	4 fish	May 1-December 31
Connecticut*	19	3 fish	May 17-September 21
*At 41 designated shore sites	17		
New York	19	3 fish	May 17-September 21
New Jersey*	18	3 fish	May 25-September 5
*NJ Pilot shore program 1 site	16	2 fish	May 25-September 5
New Jersey/Delaware Bay COLREGS**	17	3 fish	May 25-September 5
Delaware	17	4 fish	All year
Maryland	16/17	4 fish	January 1-March 31/April 1-December 31
PRFC	16	4 fish	All year
Virginia	17	4 fish	All year
North Carolina	15	4 fish	All Year

*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.

Atlantic States Marine Fisheries Commission

Atlantic Striped Bass Management Board

October 19, 2017
8:00 – 9:15 a.m.
Norfolk, Virginia

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 May 2017	8:00 a.m.
3.	Public Comment	8:05 a.m.
4.	Consider 2017 Fishery Management Plan Review and State Compliance Reports (*M. Appelman*) **Action**	8:15 a.m.
5.	Recommendations for the 2018 Benchmark Stock Assessment **Possible Action** • Technical Committee Report on Management Objectives of Different Biological Reference Points (*N. Lengyel*) • Provide Guidance on Reference Points	8:30 a.m.
6.	Elect Board Chair and Vice-Chair **Action**	9:10 a.m.
7.	Other Business/Adjourn	9:15 a.m.

The meeting will be held at the Waterside Marriott Hotel; 235 East Maine Street; Norfolk, Virginia 757.627.4200

Vision: Sustainably Managing Atlantic Coastal Fisheries

MEETING OVERVIEW

Atlantic Striped Bass Management Board Meeting
October 19, 2017
8:00 – 9:15 a.m.
Alexandria, Virginia

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: May 9, 2017
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 May 2017

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 Consider the 2017 Fishery Management Plan Review and State Compliance (8:15 a.m. – 8:30 a.m.) Action
Background • Annual state compliance reports for Atlantic striped bass are due June 15th • The Plan Review Team reviewed the reports and drafted the 2017 Fishery Management Plan Review **(Briefing Materials)**
Presentations • 2017 FMP Review and State Compliance by M. Appelman
Board Actions for Consideration • Consider the 2017 Fishery Management Plan Review and State Compliance

5. Recommendations for the 2018 Benchmark Stock Assessment (8:30 a.m. – 9:10 a.m.) Action
Background • There has been debate regarding the current biological reference points (BRPs) (i.e., fishing mortality and spawning stock biomass targets and thresholds) for Atlantic striped

bass, and the 2018 benchmark stock assessment provides an opportunity to explore a variety of BRPs with varying management objectives (e.g., aim to maximize yield versus maximizing fishing opportunity). • The type of reference points pursued is ultimately a policy-based decision and should reflect the direction of management. Accordingly, the Technical Committee (TC) and Stock Assessment Subcommittee (SAS) needs direction from the Board regarding the types of BRPs to pursue. • The TC and SAS have prepared a presentation highlighting the management objectives of various types of reference points to guide the Boards discussion.
Presentations • N. Lengyel will review the objectives of different types of biological reference points

6. Elect Management Board Chairman and Vice-chairman

7. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC STRIPED BASS MANAGEMENT

The Westin Alexandria
Alexandria, Virginia
May 9, 2017

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 2017** by consent (Page 1).

3. **Move to approve Draft Addendum V for Public Comment** (Page 11). Motion by John Clark; second by Mike Luisi. Motion failed (Page 20).

4. **Move to approve the 2018 Atlantic Striped Bass Benchmark Stock Assessment Terms of Reference as presented today** (Page 24). Motion by John Clark; second by Russ Allen. Motion carried (Page 24).

5. **Move to adjourn** by consent (Page 26).

ATTENDANCE

Board Members

Patrick Keliher, ME (AA)
Steve Train, ME (GA)
Sen. Joyce Maker, ME, proxy for Sen. Langley (LA)
Sen. David Watters, NH (LA)
Dennis Abbott, NH, Legislative Proxy
G. Ritchie White, NH (GA)
Doug Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Rep. Sarah Peake, MA (LA)
Raymond Kane, MA (GA)
David Pierce, MA (AA)
Mike Armstrong, MA, Administrative proxy
David Borden, RI (GA)
Mark Gibson, RI, proxy for J. Coit (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Mark Alexander, CT (AA)
James Gilmore, NY (AA)
Steve Heins, NY, Administrative proxy
Emerson Hasbrouck, NY (GA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Russ Allen, NJ, proxy for L. Herrighty (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)
John Clark, PA, proxy for D. Saveikis (AA)
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)
Rob O'Reilly, VA, proxy for John Bull (AA)
Catherine Davenport, VA (GA)
Michelle Duval, NC, proxy for B. Davis (AA)
Doug Brady, NC (GA)
David Bush, NC, proxy for Rep. Steinburg (LA)
Martin Gary, PRFC
Derek Orner, NMFS
Sherry White, USFWS

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

Ex-Officio Members

Nicole Lengyel, Technical Committee Chair

Staff

Robert Beal
Toni Kerns
Katie Drew
Max Appelman

Guests

Alex Aspinall, VMRC
Robert Brown, Sr., MCBA
Victoria Brown, MCBA
Benson Chiles, Chiles Consulting
Matthew Gates, CT DEEP
Colleen Giannini, CT DEEP
Robert Glenn, MA DMF
Zach Greenberg, PEW
Ken Hastings, Ships Forever
Ken Hinman, Wild Oceans
Mike Jarbeau, Save the Bay
Aaron Kornbluth, PEW
Wilson Laney, USFWS
Phil Langley, MD Charterboat Assn.
Arnold Leo, E. Hampton, NY
Chip Lynch, NOAA
Jason McNamee, RI DEM
Mike Millard, USFWS
Robert Newberry, DelMarVa Fishermen Assn.
Patrick Paquette, MA SBA
Stacie Ross, Malkin & Ross
Alexei Sharov, MD DNR
Jack Travelstead, CCA
Paul Eidman, Anglers Cons. Network
John Bello, VA Saltwater Sportfishing Assn.

The Atlantic Striped Bass Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, May 9, 2017, and was called to order at 1:35 o'clock p.m. by Chairman James J. Gilmore, Jr.

CALL TO ORDER

CHAIRMAN JAMES J. GILMORE, JR.: Let me jump right into it.

APPROVAL OF AGENDA

CHAIRMAN GILMORE: First off we have our first agenda item, approval of the agenda. You've got them in your briefing package. Does anybody have any additions or changes to the agenda? Seeing none; we'll adopt those by consensus.

APPROVAL OF PROCEEDINGS

CHAIRMAN GILMORE: Second is the approval of the proceedings from February, 2017.

Are there any changes or modifications to the proceedings? Seeing none; we'll adopt those by consensus.

PUBLIC COMMENT

CHAIRMAN GILMORE: Before each meeting we have the opportunity for public comment for issues not on the agenda. I did not see anyone sign up for this part of it; but is there any public comment for issues not on the agenda? Oh, sorry, Des. You can grab a microphone right there Des, any open one is fine.

MR. DESMOND KAHN: My name is Desmond Kahn; for you who do not know me. My background is I have a PhD in Population Ecology, and I have 25-years experience in stock assessment and marine fisheries management. I was on the Striped Bass Technical Committees for about 15 years or so.

I just have some sort of broad comments at this point on the overall direction of striped bass management. I'm currently thinking of fisheries management as the balance between two goals; one is conservation, the other is utilization. I think we need both in my opinion. In my opinion, striped bass management currently lacks balance.

It is tilted very far toward the conservation end, and it is denying people the utilization of this resource. There are some tradeoffs that occur when that happens that I would just like to briefly outline for you. One thing that causes this is the current reference points. I am very aware that the 1995 biomass level is the current overfishing threshold.

Now I know and you know there is no scientific basis for that choice. It was just something that the Board, as I remember, said they liked that biomass level that was the level they declared the stock restored, so that's going to be our overfishing threshold, we're not going to let the stock fall below that. But that's not a scientific choice.

Then the target is so high that it's really in the realm of the carrying capacity of the stock. I would like to request that the Board ask the Technical Committee to develop a set of reference points based on maximum sustainable yield; which is the Magnuson-Stevens standard and what the federal fisheries used for their management. Now I'm not saying that should be automatically the reference points for this management process, but I think it would be something that would give you a valuable perspective on your current reference points; which are extremely conservative. I have seen a maximum sustainable yield modeling approach; surplus production modeling of the striped bass stock. What it found was that the biomass that would produce maximum sustainable yield.

Now that is in many of the federal fisheries that is the target. The biomass that would produce maximum sustainable yield is below the current overfishing threshold for striped bass. That is how high the reference points are. Now, if you remember under the usual federal system they frequently will set the overfishing.

CHAIRMAN GILMORE: Des, we're actually going to be talking about this later on for some of the later on discussion. This is stuff for really not on the agenda.

MR. KAHN: Excuse me, okay. I wasn't sure about what your discussion was going to involve. Okay. Well let me just talk about the conservative nature real quickly, okay. The tradeoffs for that are two. One is when we have a very high density, this is known from ecology, we will get negative feedback; density dependent mortality due to interspecific competition.

That has been documented extensively in the Chesapeake Bay. There has been a great waste of striped bass due to very high mortality; due to disease and starvation. This has been published in scientific papers. I'm not sure the management board realizes that by setting the biomass target so high, they've caused that waste and mortality.

Second off, the impact of a very high abundance of very large fish on other species, is well documented; although the Board's don't seem to have seen this information, and I'm talking about particularly American shad and river herring. In the Delaware River the spawning stock is negatively correlated with the abundance of striped bass.

That tells me, and there are extensive dive studies in the Connecticut River that striped bass are eating even adult male shad, and they definitely eat the juveniles. There is a lot of published information indicating striped bass predation is depressing the abundance of shad and river herring now, at these high levels.

Now on the one hand you're wearing a hat of a striped bass manager, and on the other many of you are on the Shad and River Herring Board. What you're doing is you're working at cross purposes. I'm not sure you're even aware of this or have been informed of this. I would like to request some investigation of these issues. Thank you very much.

CHAIRMAN GILMORE: Thanks, Des. I have two others for comments. But I understand they're going to be reserved until later on if we get into motions. Unless there is anyone else that has a public comment on things not on the agenda; we're going to move on.

CONSIDER DRAFT ADDENDUM V FOR PUBLIC COMMENT

CHAIRMAN GILMORE: Okay, next agenda item is Consider Draft Addendum V for public comment. As you are all aware that we have an addendum before us that was essentially brought up by the Chesapeake Bay states for a consideration of maybe some liberalization and Max is going to lead us through that discussion.

MR. MAX APPELMAN: Yes, today I'm going to walk the Board through Draft Addendum V. The proposed options themselves are relatively simple; but there is a lot of important background information I need to get through, so bear with me. At the end I'll take any questions on the document before Nichole, our TC Chair takes us through the TCs comments on those options. A look at the timeline, today the Board will consider approval of Draft Addendum V for public comment. If approved the public comment will be May through July.

Then in August the Board will review public comment, select final options and take final action on the addendum. This is a look at the outline of the document. We have a statement of the problem. There is an overview of management history, stock status, fishery status, there is a section on the performance of Addendum IV, which bleeds into the management options and then wraps up with the compliance schedule.

Draft Addendum V was initiated to consider a relaxation of the coastwide commercial and recreational regulations, to bring fishing mortality to the target level based on the 2016 stock assessment update. This action came in response to concerns raised by Chesapeake Bay jurisdictions regarding the continued economic hardship endured by its stakeholders, since the implementation of Addendum IV; but also following information coming from the 2016 stock assessment update indicating that fishing mortality in 2015 was below the target.

You'll also see throughout my presentation, Chesapeake Bay abbreviated as C. Bay. I just wanted to let folks know that that is what that stands for. Okay so as we know, Atlantic striped bass has a very impressive management history. In the interest of time I'm just going to highlight those management documents and decisions most relevant to this draft addendum.

With the implementation of Amendment 4 in 1990, the foundation of this management plan has been to maintain fishing mortality at or below an F target. Currently Atlantic striped bass is managed under Amendment 6, and its Addenda I through IV. Aside from phasing in new commercial and recreational regulations, Amendment 6 also modified the F reference points.

The coast operated under a single set of F reference points while the Chesapeake Bay and other producer areas operated under a lower F target. Amendment 6 also put in place a new set of biological reference points; based on the 1995 estimate of female spawning stock biomass. In addition to all this, Amendment 6 put in a set of management triggers that are based on those biological reference points.

Fast forward into Addendum IV, which was implemented just prior to the 2015 fishing season, a lot of things happened with Addendum IV; one of which is that it implemented a single set of F reference points for all areas. Now the coast, the Chesapeake Bay, all the other producer areas operate under a single set of F reference points.

Additionally the addendum required a reduction in removals, to reduce fishing mortality to a level at or below this new target. To achieve this, fisheries implemented regulations to reduce removals by 25 percent along the coast; relative to 2013, and 20.5 percent in the Chesapeake Bay, relative to 2012.

This is a quick reference of those Addendum IV measures. I'm not going to waste the time on this slide now. I'll come back to this in a little more detail, when we go over the proposed management options. This is a figure of spawning stock biomass relative to its reference points. What you can see here is a decline in SSB that has been observed since about 2003; and in 2015 was estimated at 58,853 metric tons, which is just above the threshold of 57,626 metric tons. I would like to remind the Board at this point that if biomass falls below the threshold it will trigger management action, requiring the Board to adjust the program to rebuild biomass to the target. This is a figure of fishing mortality relative to those reference points.

You can see F reaching a peak around 2006, and then becoming somewhat variable since then. In 2015, F was estimated at 0.16; which is below the threshold and below the target, the threshold being 0.22 the target is 0.18. However, the TC has noted that the assessment may not be able to distinguish between point estimates of 0.16 and 0.18; essentially that the confidence intervals around these two point estimates would overlap.

Okay, moving on to fisheries status, so starting with the commercial sector. From 2003 to 2014, under the Amendment 6 quota system, commercial harvest has been relatively stable. Coastal fishery harvest estimates have ranged from 2.4 to 3.1 million pounds over that time period, and Chesapeake Bay estimates have ranged from 3.3 to 4.4 million pounds.

In 2015, following the implementation of the Addendum IV regulations, so cutting back on the quotas; the coastal fisheries harvested an estimated 1.9 million pounds, and the Chesapeake Bay 2.9 million pounds. Just a couple more points on the commercial sector. First off commercial dead discards continues to be a source of uncertainty in stock assessment.

Estimates do vary considerably from year to year, which has made it difficult to account for these when developing alternative management measures. In any event, in 2015 commercial dead discards were estimated at just shy of 300,000 fish; which is a 68 percent decrease from the 2014 estimates, so a pretty big difference there.

Another point is that the coastal commercial fishery under achieves its quota by 20 percent annually. Some of that can be attributed to striped bass being designated as game fish in some states; those being Maine, New Hampshire, Connecticut and New Jersey. Collectively those states account for 9 percent of the annual quota.

But in addition in recent years, striped bass have not been available to the ocean fisheries in North Carolina, resulting in minimal harvest there and I think that North Carolina holds 10 or more percent of the annual quota. Moving on to the recreational sector from 2003 to 2014; again under the Amendment 6 regulations harvest has been somewhat variable, but it has been trending down since about 2006.

Coastal fishery harvest estimates have ranged from 16.7 to 26.6 million pounds; with 77 percent of that coming from Massachusetts, New York, and New Jersey. Then Chesapeake Bay harvest estimates ranging between 2.5 to 6.4 annually. In 2015, following implementation of Addendum IV, again harvest reductions measures were put in place; coastal fisheries harvesting 13.3 million pounds in 2015 and Chesapeake Bay 3.5 million pounds.

From 2003 to 2008, recreational releases averaged 17 million pounds, I'm sorry million fish. That equates to roughly 1.5 million dead discards annually. Now from 2009 to 2015 that number of fish released has been much lower; averaging only 7.1 million fish, which equates to just shy of 640,000 dead discards a year. There is a couple theories out there as to why we're seeing those declines in fish released. This list is by no means inclusive. There are certainly other factors that are probably at play. But just to list off a couple; reduced biomass or abundance, it could be the reduced availability of fish in nearshore waters or simply just changes in angler behavior due to management changes. Building on the last few slides, just want to take a look at what happened in 2015 under Addendum IV.

In early 2015, after states had implemented those measures to comply with Addendum IV, the TC predicted an overall reduction of 25 percent relative to the reference periods. In 2015, what we saw was something very close to that predicted on a coastwide scale; I think it was off by maybe a tenth of a percentage point.

However, harvest from the recreational fisheries in the Bay and along the coast diverged significantly from that predicted value. The TC was tasked to investigate this a little bit further. What they concluded is that changes in effort, changes in the size and age structure of the population, and the distribution of the 2011 year class, were the most significant variables contributing to that large difference between the observed harvest and that predicted by the Technical Committee.

A couple more points on this 2011 year class, so remember that this was the largest recruitment event since 2004; and the TC noted, looking at the catch data that these fish were nearly fully available to the Chesapeake Bay fisheries in 2015, but only partially available to ocean fisheries. Due to the age at first migration, these fish are anticipated to become increasingly available to coastal fisheries in the coming years; and a proportion of which are already of harvestable size.

After receiving this information the Board tasked the Technical Committee to calculate how many fish it would take to increase fishing mortality from that 2015 point estimate of 0.16 to the target, 0.18 in 2017. To do those the TC ran projections through 2017 and determined that F target in 2017 equates to a removal estimate of roughly 3.3 million fish or approximately 10 percent increase relative to 2015.

Accordingly, Draft Addendum V proposes measures to increase removals; so this is your commercial-directed harvest, your recreational-directed harvest and dead discards by roughly

330,000 fish, which is a 10 percent increase relative to 2015. Keep in mind that the proposed options were developed using 2015 catch data; and the Plan Development Team focused on applying those increases to both the recreational and commercial fisheries equally.

Also Draft Addendum V does not propose any changes to the commercial size limits or quota transfer provisions, nor does it propose changes to North Carolina's FMP for the Albemarle Sound and Roanoke River. These are the proposed recreational options first. Option A here is status quo.

For coastal fisheries this maintains the Addendum IV measures, with a 1-fish bag limit and a 28-inch minimum size limit, and any approved conservation equivalency programs. For the Chesapeake Bay, jurisdictions would implement a program that is subject to TC review and Board approval; and that program has to meet the requirements of Addendum IV.

It is important to note that status quo has the potential to increase harvest by more than 10 percent. Coincidentally MRIP came out with their final 2016 estimates last night, and I was able to incorporate those into this PowerPoint. These numbers up on the screen are slightly different than what are in the draft document in front of you. But in 2016, recreational removals, so this is your directed harvest plus your dead discards, are estimated at over 2.5 million fish, which is a 22 percent increase relative to 2015; just talking recreational. But this difference is actually also greater than the 330,000 fish that the addendum is set out to achieve.

Not only does status quo have the potential to increase recreational removals by more than 10 percent, but it also has the potential to increase total removals, commercial and recreational by more than 10 percent. Option B for the recreational sector would be to relax recreational fishery regulations.

These options were developed based on 2015 catch data and 2015 state-specific regulations accounting for any conservation equivalency. For Option B1, states would maintain a 1-fish bag limit and reduce the minimum size limit to 27-inches. This represents a 1-inch decrease in the minimum size; and based on 2015 information this would achieve roughly a 12 percent increase in removals relative to 2015.

By choosing B1, states would essentially implement those measures that were in place in 2015, including any conservation equivalency programs and adjust the minimum size to 27-inches. Option B2 is a conservation equivalency-type option, where states would go through that process to implement a program that achieves a 10 percent increase relative to 2015.

For the Chesapeake Bay, Options B3 and B4 are very similar to the coastal option. They were also developed based on 2015 catch data and 2015 state-specific regulations; including conservation equivalency that was in place. The difference here is that these measures would only apply to the specific dates listed.

Both B3 and B4 maintain a 2-fish bag limit and decrease the minimum size to 19-inches from September 1st to October 31st for Option B3, or during May 16 to August 31, under Option B4. Also under both of these options, one of the 2-fish bag limit can be greater than 28 inches. This represents a 1-inch decrease in the lower bound of that current slot limit.

Then also based on 2015 information, these options each achieve roughly a 9 percent increase in total Chesapeake Bay removals relative to 2015. Option B5 is again the conservation equivalency type option, where jurisdictions would go through the process to implement a program that achieves a 10 percent increase relative to 2015.

Moving on to the commercial options, so again Option A is status quo. Coastal fisheries would maintain that Addendum IV quota and the state-specific allocations. Chesapeake Bay fisheries would similarly maintain the Addendum IV quota of just over 3 million pounds. Option B is a 10 percent increase to the Addendum IV quota.

For coastal fisheries the quota would be bumped up to a little over 3.1 million pounds, and would be allocated based on those same allocation percentages used in Amendment 6 and Addendum IV. The Chesapeake Bay commercial quota would be bumped up to a little over 3.4 million pounds. This is a table of the proposed quota options in pounds.

I know the numbers might look small upon the screen there. But I'm going to walk you guys through this. At the top, working top to bottom we have the Bay and coastal total quota numbers; and then followed by the state-specific-coastal allocations, and then there are two rows at the bottom, which I'll get into. From left to right we have 2015 harvest for reference. In the middle is Option A, status quo, which is the Addendum IV quota. Option B applies a 10 percent increase to the Addendum IV quota.

At the bottom there are two rows, and in some of those cells you see two numbers; a top number and then a bottom number in parentheses. These are two different total estimated harvest scenarios. The top number assumes no harvest for Maine, New Hampshire, Connecticut and New Jersey; these are your gamefish states.

It also assumes no harvest for North Carolina, which we recall that North Carolina hasn't recorded any harvest in recent years. The bottom number in parentheses only assumes no harvest for the gamefish states. What this is saying is that under status quo, even after accounting for no harvest from those states, there is potential to increase harvest by 11 to 18 percent relative to 2015.

Under Option B that potential increases to 22 to 30 percent. Also these estimates do not account for commercial dead discards, which would add to that potential increase. The PDT also wanted to note that what you're not seeing is an option that applies a 10 percent increase to 2015 harvest; which is what the projections say is needed, but that would be an effective reduction in the coastal and state-specific quotas, when the addendum aims to liberalize.

For that reason the PDT removed that potential option from consideration. Lastly the compliance schedule, so this is something the Board would need to decide on sometime between now and final action. If the addendum moves along, final action would take place in August; and presumably these three dates would occur sometime after that.

Just as a reminder, the projections only go through 2017, so the Board should keep that in mind as it considers the compliance schedule. That is the end of my presentation. I'm happy to take any questions. Remember Nichole is going to go over the TCs comments, but that's it for me.

CHAIRMAN GILMORE: Okay, I've got Rob O'Reilly and Tom Fote. Rob.

MR. ROB O'REILLY: I'm wondering with these projections of how much increase there could be. The 2011 year class, I think it was in the document part of the management effort, was to conserve the 2011 year class while it was in Chesapeake Bay. Are there any projections for 2017 and even 2018 with these 2011 year class fish that are recruiting to the coastal fishery; as to what that might be? Nothing like that okay?

DR. KATIE DREW: To correct that sorry, to go back. The projections that were done included moving that 2011 year class forward through the population. The reductions that we're seeing are taking into account the fact that the 2011 year class will be recruiting to these fisheries; and will be available for harvest overall.

MR. O'REILLY: Right, okay so I may follow up, sir? Does that mean there is a probability associated with that; as far as what that increase might be or how does that work? I'm just asking.

DR. DREW: For the way we calculated the projections is essentially to move that population forward and to figure out if you fish at that level, how much fish can you take? If you fish at the target, how much fish can you take given the 2011 year class moving through the population? There is a certain amount of uncertainty associated with that with the uncertainty coming from the assessment. I don't have those numbers in front of me, but we could go back and look at how much uncertainty there is around that.

MR. THOMAS P. FOTE: Could you put back the numbers of the commercial harvest back up again? I noticed on this table you project that New Jersey will not catch any fish. We're not catching a lot. I think it's about 10 percent of our quota. But we do have the tagging program, the bonus tag program; which basically is fish that come under that number there. It is not at zero harvest, there is a harvest of fish. It's a very small amount. I think it's about 8 percent or 10 percent of what our quota is. But there is a harvest.

MR. APPELMAN: Yes, I think it was the PDTs understanding that those fish that are caught in that bonus program actually are modeled recreationally.

MR. FOTE: That's not true. They are modeled in with the commercial catch, because it goes with the commercial catch quota. That is what the program is set up by legislation; and that's why we always keep it that way. It's a different quota altogether.

MR. APPELMAN: These percentages would go up slightly more.

MR. FOTE: Slightly more. Not dramatically, because we don't harvest a lot.

MR. APPELMAN: I think it's somewhere around 15 to 20,000 fish.

MR. FOTE: That's right. Which is less than 8 percent or something like that but it's there and we want to make sure it is always there.

CHAIRMAN GILMORE: John McMurray.

MR. JOHN G. McMURRAY: Rob already asked part of my question, but I guess I could go a little farther with those 2011s in there; the briefing material is pretty clear that they're going to recruit this year or next year, or a lot of them will recruit this year and next year. I wasn't quite sure what your answer was.

Are we accounting for those in 2017 and 2018, because given where we are now, we're already, just based on the 2016 numbers; we're already likely to be over or right around F target. I think just intuitively that the availability of those 2011s will probably put us way over; and may even put us below that SSB threshold, because we're already pretty close to that now.

DR. DREW: The answer is they are accounted for in the projections; but they are not accounted for in the methods that we use to calculate how you get that increase. The increases are based on looking at how the fishery was performing in 2015; and if you drop that size limit down, people can catch fish that they threw back. But we don't have a way to project that data forward to say in 2017 what percentage of the catch would be in that slot? But the projections to say you can catch this many fish and be at the target, accounted for that 2011 year class moving in. But the methods to say you can reduce your size by 1-inch, or you can go up in your bag limit. That does not take into account the effects of the 2011 year class; which is a source of uncertainty, and you can see how much it affected our reduction calculations. We believe certainly, I'm sorry the TC comments will get into this a little bit. But that is certainly a source of uncertainty; in terms of calculating is this 10 percent on paper versus what we will see if this was implemented.

CHAIRMAN GILMORE: Go ahead, John.

MR. McMURRAY: Thanks. That sort of availability and angler behavior, and as somebody that does that's part of this business I know. If the fish are around people will target them. That is really not taken into account in any of this right now. That is a big uncertainty area.

DR. DREW: Certainly, in trying to calculate how much you'll see an increase or a decrease or a change in the harvest that you could see with these regulations. That is a very large source of uncertainty.

MR. G. RITCHIE WHITE: I want to understand the numbers you provided in terms of why we are here with this addendum. I understand the reason being that a number of charterboat fishermen in the Chesapeake Bay have been experiencing a drop in their business. Help me understand that; 2015 recreational anglers had a 58 percent increase in harvest from 2014. Did I hear that correctly or see that correctly?

MR. APPELMAN: The percentage that you are thinking of is relative to 2012; which were the reference period for the Addendum IV measures. They experienced a 50 something percent increase relative to 2012; which I think that number would be a lot lower if we looked at 2014.

MR. WHITE: Follow up. Okay so from 2012 they had a 58 percent increase. Then in the preliminary 2016 numbers are 22 percent increase over 2015. Is that correct?

MR. APPELMAN: Yes, and that is total recreational harvest and dead discards; so total recreational removals in 2016 is 22 percent higher than what it was in 2015.

MR. WHITE: Additional follow up, Mr. Chair.

CHAIRMAN GILMORE: Go ahead, Ritchie.

MR. WHITE: Then this addendum would account for an additional 9 percent increase; which if I total those up that is an 89 percent increase of recreational harvest since 2012. To me it seems like, I'm not disputing that there aren't some charterboat captains that are experiencing some difficulty. But the recreational angling population in the Bay seems to be doing extremely well. I know we would love to see numbers like that along the coast.

CHAIRMAN GILMORE: John Clark.

MR. JOHN CLARK: Thank you for the presentation. It is good to see the stock is increasing as it was projected to do; even before we took the 25 percent decrease in our harvest with Addendum IV. I just wanted to make a comment on the socioeconomic impacts part of this addendum. Glad to see it's in there, but I think it is pretty thin; considering I know just from Delaware our netters have given up over a half-million dollars over the past three years, by having 25 percent less harvest. We took this cutback on a stock that was not overfished, overfishing was not occurring. Even when we put these much more conservative reference points in. I find the last line of this socioeconomic impacts section particularly gratuitous, in that on an increasing stock it says we have to be aware of the uncertainty in these projections.

Well, there is nothing uncertain about the economic hit that netters in Delaware have taken and the Chesapeake charter fishermen that have been here for the last three or four meeting we've had here. I don't think they're here just because they want a few extra bucks. They're here because they see a real threat to their business. I think this addendum at least gets us on the right track to correcting an over action that we took a few years ago.

MR. MICHAEL LUISI: I just wanted to make a comment regarding Ritchie's comment, and just to provide a little clarification. The 2012 estimate in Chesapeake Bay was I believe to be the lowest recreational estimate in a very long time series. It became the baseline for which we were judged. The year before that estimate came out; the 2011 year class was born.

By the time the 2011 year class recruited to the fishery, we were being judged based on Addendum IV, as it related to a very low recreational harvest estimate in Chesapeake Bay that year. Therefore, the 58 percent increase is an inflated value based on the comparison of those two years. These aren't new issues.

We've discussed these to this point today, and I'll just add one more comment that all of the background materials, which Max, you did a great job getting it all, bringing it all together, getting all the background materials in place. There was a comment early on that this was a Chesapeake Bay issue.

Well, it is not a Chesapeake Bay issue, this is a coastal allowance for increase; which has been supported for the past year and a half by a majority of this Board, to get to the point we are today. I just want to clarify for the record to the audience and the members of the Board that this is not just a Chesapeake Bay thing. We're not looking to just catch as many fish as we can with this addendum. Thank you for allowing me to clarify that, Mr. Chairman.

TECHNICAL COMMITTEE REPORT

CHAIRMAN GILMORE: Okay, I think we're going to go to the TC report now. Nichole.

MS. NICHOLE LENGYEL: My name is Nichole Lengyel; I work for the Rhode Island Department of Environmental management. Max already hit on some of these, and we've had some brief discussion on some of these as well. But today I'm going to be presenting comments from the Technical Committee on the proposed options in Draft Addendum V to Amendment 6.

Again, some of this will be overlap, so I'll try to be quick for time as well. Here is just a list of topics that the TC had comments on; but in particular the TC population projections, preliminary 2016 removals and as Max just said we have the final estimates now available. Discard data sources, the 2011 year class, angler behavior and performance of Addendum IV.

I'm going to hit on the comments that the TC had on each one of these topics. The TC presented the Board with population projections at their February, 2017 meeting, which showed that an approximate 10 percent increase in removals from 2015 levels would increase F to the target of 0.18 in 2017. However, management options adopted by the Board through Draft Addendum V, will most likely not be implemented until late 2017, early 2018; adding an additional year of uncertainty. Regarding the preliminary 2016 removals, the 2016 stock assessment update and the TC population projections used data through 2015 only.

The preliminary 2016 removals were estimated to be approximately 18 percent greater than 2015 removals under Addendum IV with no additional changes; and as Max just noted, the final estimates that came out showed that was more closely 22 percent not 18. Discard data was an important data element that went into the options presented in Draft Addendum V.

These data came from the American Littoral Society or ALS Fish Tagging Program and the MRIP program. These data sources can be variable year to year regarding the number of fish tagged and the level of sampling; and there has also been recent changes in MRIP methodology that the TC just wanted the Board to be aware of.

We've already touched on the 2011 year class a little bit, but we all know it's had a strong presence in the Chesapeake Bay in recent years. A larger proportion is expected to migrate to the coastal fishery in 2017 and in 2018. This will result in changes in catch, harvest and dead discards on the coast and in the Chesapeake Bay; which are not accounted for in Draft Addendum V options.

Angler behavior can be quite variable from year to year, and with changing regulations. It cannot be accounted for and therefore was not considered in Draft Addendum V. When the TC evaluated the performance of Addendum IV, we found that on a coastwide scale the 2015 harvest estimate was very close to the predicted harvest.

For the recreational fishery on the coast and in the Chesapeake Bay, harvest estimates differed significantly from those predicted. Recreational fisheries in the ocean saw a greater reduction than that was predicted; and recreational fisheries in the Chesapeake Bay experienced an increase in harvest relative to the reference period.

The most significant variables found to contribute to these large differences were changes in effort, changes in the size, age structure and distribution of the 2011 year class along the coast, relative to the Chesapeake Bay.

The proposed options in Draft Addendum V make very similar assumptions to those used in developing Addendum IV. The estimated increases therefore could be significantly under or over predicting harvest, and that's it. I would be happy to take any questions.

CHAIRMAN GILMORE: Questions for Nichole. Ritchie White.

MR. WHITE: Does the Technical Committee have any concern over coastal fishery harvesting 27-inch striped bass? We've always operated under 28-inches kind of being a minimum level in that I think it is 60 some percent of 28-inch fish are bred. Does this raise a higher risk if the coast starts harvesting a large number of 27-inchers that seem to be available in the 2011 year class this year and next year?

MS. LENGYEL: The Technical Committee didn't specifically talk about what biological implications could occur from reducing the minimum size. That happened to be one of the only options that came close to that 10 percent.

CHAIRMAN GILMORE: John McMurray.

MR. McMURRAY: I think there is a lot of confusion about what size those 2011s that are flooding the coast this year are. Are they 24 inches or are they 28 inches? I know there is some variability there. But it really makes a difference in the context of this addendum; because if we go down to 27-inches and really anecdotally that is what I'm seeing now, a lot of 27 and 28-inch fish.

If we go down to that 27-inches, we're really going to pound that 2011 year class as it floods the coast. I think to some extent we're already seeing that this year; and one inch probably does make a difference. Anyway, back to my question. What size are those 2011s? What is the range?

MS. LENGYEL: It's a little hard to give you a specific size. The age-length keys can vary not only regionally on the coast and then the Chesapeake Bay, but also state to state and year to year. We know that they have recruited partially to the coastal fishery; and they're going to continue to do so in the next couple of years. An approximate guess without looking at the data, 25 to 30 inches right now, there is going to be a proportion that falls in one of those inch length bins. But it does vary quite a bit.

CHAIRMAN GILMORE: Other questions for Nichole. Go ahead, Michelle.

DR. MICHELLE DUVAL: I don't know if this is for Nichole or for Max. But the 2016 harvest estimates, were you able to break those down into coastal harvest versus Bay harvest?

MR. APPELMAN: Yes. I don't have it at my fingertips right now, and I can get those to the Board as soon as possible.

CHAIRMAN GILMORE: Any other questions before we start getting into motions? Michelle.

DR. DUVAL: Just one more question. The calculated 10 percent liberalization of the 327,000 fish, so that is just broadly calculated across all fleets; so that applies to both the coastal fleet and the Bay fleet, it is not taking into account I guess, the different size limits that are in those different jurisdictions. It is just sort of a "standard size striped bass" is how those 327,000 fish were calculated. Is that correct?

DR. DREW: The selectivity function of the separate fleets and weighted by how much each fleet takes out, was included in that affect. It does take into effect the different effects of the fishing fleet.

MR. APPELMAN: You were asking for the 2016 numbers in the Bay versus the coast. It is 1.18 million fish for the Bay, and 1.38 million for the coast.

CHAIRMAN GILMORE: Any other questions? Loren.

MR. LOREN W. LUSTIG: Thank you for the report that relates to the relative abundance of striped bass for legal fishing. Do we have any updated information regarding illegal take of fish and the impact on the species?

MR. APPELMAN: I don't have like a great number to give you or anything like that that. There is definitely some information that comes in our compliance reports for last year. The reports covering the 2016 season aren't due until a little later this month. Our LEC Chair to the Striped Bass Board is in the other room right now. Hopefully if he becomes available we might get you some more insight on that.

CHAIRMAN GILMORE: Any other questions? Go ahead.

MR. ANDY SHIELS: Just a quick question. The term angler behavior was used, and it was stated that it varies and it wasn't accounted for. Could you just elaborate on what you meant by angler behavior; and what that means?

MS. LENGYEL: Sure, so angler behavior is the behavior of an individual fisherman, how many trips they're going out for, is it worthwhile for them to go out and target two fish versus one fish. They have to account for their time, the money they're spending on gear, on fuel. Changes like that are not accounted for in any of these options; and it's very difficult to account for those. It's more socioeconomics. Does that answer your question?

MR. O'REILLY: I guess I just wanted to ask the Technical Committee. The idea of everything being in pounds, so fishing mortality rates are calculated based on numbers usually. Is there any similarity here with the pounds? In other words, how did you back everything out to pounds as the currency instead of numbers? How does that work?

MR. APPELMAN: You make a good point and thanks for that question. The removals are estimated and fishing mortality I believe, it is estimated in numbers of fish. The recreational options that you saw in C are based on number of fish. The quota options for the commercial sector are in pounds. There is a disconnect when we talk about a total number of fish that we can remove to achieve F target; and using one currency for the commercial quotas and a separate one for the recreational fisheries.

We thought about a lot of different ways to address that. But the more we got into the weeds it became more and more complex and confusing to try to estimate numbers of fish from the commercial sector. To keep things simple, and the way that it was done for Addendum IV as well. This it he approach that the Plan Development Team took with those two sectors.

CHAIRMAN GILMORE: Any other questions? Okay this is an action item, so if we're going to move this along we kind of need to get a motion up on the board. John Clark.

MR. CLARK: I would like to move that the Board approve Draft Addendum V for public comment.

CHAIRMAN GILMORE: Motion by John Clark and second by Mike Luisi; discussion on the motion. Go ahead, John.

MR CLARK: As stated, as was seen by Delaware's action in appealing Addendum IV, this 25 percent reduction in harvest; I understand why it was taken. I understand your perspective. The status of the striped bass stock depends on where you are on the coast. But we've seen the stock do what it was expected to do. It has definitely increased. Our fishing public has taken a big reduction in this, and the stock is showing all the signs of recovery that we expected. I would hope that at this point the Board can start giving some of that reduction in harvest back to the public.

CHAIRMAN GILMORE: Mike Luisi.

MR. LUISI: Unlike the last two addenda that we discussed this week, with lobster and then tautaug. This one is relatively simple; as far as what the main issue is, and that main issue is whether or not to allow for a 10 percent liberalization in harvest coastwide, both commercial and recreationally.

I've had a couple tacos and I've had about 15 cups of coffee today; so if we need to go back into all the details in the background information of the document, let's do it. It's not the first time we've had to do that. But I think at this point in time I don't need to talk any more, and we need to give the public an opportunity to weigh in on these issues.

We heard based on the report that the 2016 final estimates were made available yesterday. I think that is coming into play here; as far as what board member are thinking about, and how this is going to move forward. But let's let the process complete itself. The Board initiated this addendum, the issues brought up regarding variability and uncertainty, the issues brought up about harvest as compared to Addendum IV in current years has been discussed.

But the Board approved the initiation of this addendum, and I know for certain that my public stakeholders in Maryland want the opportunity to weigh in on this. Once we have all of that information, once we have the Technical evaluation, the public's comment both in opposition and in support. I think as a Board we have all the ingredients we need to make a final decision in August. I would hope that other Board members will also support taking this out to the public.

MR. WHITE: I'm not going to support this motion. I think it is risky on a number of levels. I think there is not enough room in the mortality to implement this. I think it is a knee jerk in that we've got a 2018 stock assessment, so this could be one year and then we'll probably have to go in to a management measure in reaction to the stock assessment.

There are a lot of unknowns. I think there clearly is going to be a change in anglers along the coast with the 2011 year class being available this year. There is going to be a lot of 27, 28-inch fish, as John has mentioned, that he is presently seeing. I think that is going to increase mortality substantially along the coast. I think that it makes no sense to take this risk at this time for one year, and put the Technical Committee and the Commission through the expense and the effort that it takes to go out to public hearing.

I think we all know; I don't think there is anybody at this table that doesn't know what the results of the public comment is going to be. I would be astounded if one person would raise their hand and said; gee I don't know how the public is going to weigh in on this. We know what the public is going to say. Going through all that exercise, to me is a waste of our resources; and I hope we vote this down.

CHAIRMAN GILMORE: I've got Mark Gibson next.

MR. MARK GIBSON: I'm conflicted on this question. On the one hand, you know we're a Commission and we have an obligation to be sympathetic and responsive when members of the Commission come forward with a perception of a problem in one of our FMPs. The Bay jurisdictions have made impassioned arguments about this.

We've had people come to the meetings and speak in favor of this action. But I'm also a fan of the precautionary principle. The foundational element to that is that when you have signs of an improvement you're slow to open the valve. But when you have signs of a problem, you're quick to close the valve. That's the essential element of the precautionary principle.

Unfortunately I'm a fan of both principles, the cooperative and collaborative nature we're supposed to have here to be responsive to jurisdictions needs; but also to deal with the uncertainty. This stock is perilously close to the biomass threshold at this point. I may have some issues about the biomass threshold itself; and we'll talk more about that in the reference points. But I'm conflicted at this point, leave it at that.

CHAIRMAN GILMORE: You're going to have to get un-conflicted, because we're going to have to have a yes or a no. John McMurray.

MR. McMURRAY: Probably not terribly surprising that I don't support the motion. Frankly, I think it's reckless. There is very little biological justification for doing it. We are just a hair over that SSB threshold; and sure we had a couple of good young-of-the-year indices, but when you look at that average over the last ten years it is not great, because we also had two of the worst.

Yes, we're operating below F target, based on the 2015 removals. But when you look at 2016, not so much, and when you project out to 2017 and 2018, and you consider those 2011s recruiting. It seems almost a certainty to me that we're going to go over that F target; and an increase shouldn't be on the table at this point, in my opinion.

Frankly, there has been some impact with Addendum IV, but I'm not convinced that it is as catastrophic as it is being made out to be. When you look at the effort numbers in the Bay, they're up. I don't doubt that there is not some impact in some regionally significant areas, but it's not broad and it is not catastrophic in my opinion.

It's not worth the risk we would be taking with this. Lastly there is the timing issue. Do we really want to go out to public comment for this? Make all these guys to show up to public meetings and inevitably the halls will be filled, at least where I am and to the north, the halls will be filled with angry surf casters not wanting to see this happen.

We're going to have a new stock assessment in 2018, and we're likely going to have to do new management measures once we have the information from that. The next year we're likely going to have to do this all over again; and that just doesn't really make sense to me. For those reasons I'm opposed.

CHAIRMAN GILMORE: Doug Grout.

MR. DOUGLAS E. GROUT: We have heard for three or four meetings since Addendum IV was put forward, the harsh economic impacts that the Maryland Charterboat Fleet and the Chesapeake Bay Charterboat Fleet, as well as other Mid-Atlantic state's businesses have been impacted. I was sympathetic. We saw, if you look at some of the harvest numbers, and they were down in 2015 significantly, about 40 percent.

But that's not the only places we saw this. We saw reductions in New York that were over 50 percent, Massachusetts was over 50 percent, and probably about a 40 percent reduction in Rhode Island. Now as you would expect with a management measure that increased the size limit in the Chesapeake Bay, the reductions were temporary.

If you look at 2016 estimates, they are back up to the second highest levels of estimate of harvest they've had in the past seven years. That didn't occur on the coast. In those three states, all Rhode Island, Massachusetts, and New York, where a large portion of these charterboat harvests take place, continued in 2016 to see reductions.

My concern here is if you remember the reason we, if we were to move forward with this, if you remember the reasons that we took action in 2014 with our Addendum IV, was because we were required to under our management plan. The trigger that was hit was Number 3, the fishing mortality target is exceeded in two consecutive years, and the female spawning stock biomass was also below the target at the time.

As a result, our plan says the management board must adjust the striped bass management program to reduce the fishing mortality rate to a level that is below the target. Now as you all know, we have a bunch of other triggers. My concern here is the Technical Committee has already indicated that just in 2016 we've already experienced a 22 percent increase; that is more than double the 10 percent buffer we had in between there. People talk about the uncertainty with MRIP estimates. They are an estimate, they have variation around it.

But they are, as I say, outside of the confidence intervals here. We are pushing forward without even this action. We are at risk of starting to exceed the target again. My fear is after we've taken these painful cuts coastwide, and had them in place for at least three years, maybe a fourth by the time we get any kind of management action; depending on what we see on our stock assessment next year that we're going to have to take additional cuts.

If we were to implement an additional 10 percent increase here, those cuts would be even more painful. Not to mention that our public would look at us saying, what are you doing here? You have scientific information that says you're approaching the target again; and yet you're trying to increase it even further?

I think the Commission has to take a long, hard look before we make any further adjustments. We need to at least wait until we get the assessment; and then make a rational decision as to whether we need to make any further management adjustments. I'm hoping when this assessment comes that we can go back to what the pre Addendum IV levels are, because we've taken the pain for a few years and now we've got our spawning stock biomass on the way up, and we're continuing to keep our fishing mortality around the target. Thank you very much for my opportunity here.

CHAIRMAN GILMORE: Rob.

MR. O'REILLY: I think one thing that should be obvious to everyone is there was a lot of talk about 2012 being a low point. When you look through the data it certainly is. But everyone should understand that since 2012 the Bay will be faced with those types of conditions again. From now until the next few years the 2011 year class, which did have conservation attached to that year class in the Bay management measures.

That is not going to be available. There should be empathy with the plight of the charterboat/headboats going forward; because we're going to return to that situation. We're going to return to somewhere near 2012. It is not to say that the Chesapeake Bay, if you cobble together both the Virginia and the Maryland young of the year, that you can't come close to average or a little bit less in some of the years.

There is going to be some fish, but apparently over the years, you know from 2007 forward up until 2011, you can sort of trace what has happened to the stock. I do want to remind everyone to think about what goes around with the Bay is definitely going to turn; starting in 2017. The other thing that has been interesting to me, as I thought about it a lot the last few days, is when Amendment V started the work that was done in 1994, and Mark Gibson was one of the architects of the overall harvest control model, along with Lou Rugulo and Vic Crecco.

At that time there was a pretty equal distribution of harvest between the Bay and the coastal fishery. It was set up that way to have somewhat of an equal distribution. It seems to me that in the intervening years it's been sometimes not working out that way; you know feast or famine type of situation, depending on where you are.

Even with the Amendment 6 process, if you remember. Amendment 6 was delayed because there was a hiccup in that. There was a proposal to have everyone at 24 inches, which everyone thought would be great. We'll have one uniform size. Until it was pointed out that if that happens you shift allocation. You know you take exploitable stock biomass away from the Bay.

I think you have to think about the differences, as well as the similarities when you look at striped bass management. But clearly the most important thing is we can't solve some of these issues until we have a stock assessment. I understand that. I will have comments about that later. But for right now, consider not 2016. Start thinking about 2017, '18, and '19; and what it is going to be like in the Bay, because you have the information before you that should tell you exactly how it's going to be.

CHAIRMAN GILMORE: Matt.

MR. MATTHEW GATES: I can certainly sympathize with the frustration that the Bay anglers must have with so many fish available to them, that are below the minimum size, and the discard issue that that could create. That is why back in February I supported initiating the addendum; because it seemed fair to develop the analysis, and give an opportunity for this concept to be discussed at this meeting. But it seems that liberalization in management measures, based on this very small difference between the 2015 F and the target F, and for other reasons that we've all talked about here. It doesn't seem prudent to me to take this out at this time.

CHAIRMAN GILMORE: I have Marty Gary.

MR. MARTIN GARY: The Chesapeake for-hire fleet has been brought up a few times, but it's not just them it's our commercial sector as well. You've noticed at several meetings in the past, I count three, that we had multiple bus-loads of our for-hire sector and other fishery constituents that have taken the time to come up to these meetings.

Not that we haven't seen that in other areas up in New England, and seen all the passion on both sides of this issue. But I just wanted to say that they are not here today, because they're in the throes of their most important part of their season right now; the opening of the spring striped bass season. Their leadership is here today. But I think I respectfully disagree with a couple of comments that I heard that it would be a waste of our resources to take this out to public comment.

Those folks took a lot of their time over multiple iterations. You've seen them yourselves show up here. Their leaders are here. They may say something today. But I do think we owe it to the public, our fishing constituencies and the constituencies up and down the coast, to let this go out to public comment. I appreciate that and hopefully folks can support that.

DR. DUVAL: I'll be brief. I'm not going to echo all the comments that I made at the last meeting; with regard to my own conflicted views on this. I definitely am sympathetic to the unique nature of the Bay fishery. We have the same thing with Albemarle/Roanoke stock in North Carolina.

I really do truly think that the only way to address these is through the upcoming stock assessment, and looking at the reference points again; and coming out with a solution that addresses the unique characteristics of the Bay fishery. I am concerned about timing on this. You know we heard some public comment prior to the start of our deliberations today; with regard to the reference points, which we will get into a discussion about next. It is not 1995 anymore, and I think we would support a different approach.

CHAIRMAN GILMORE: Okay, I think I'm going to go to the public now. We had a couple folks sign up for comment. Phil Langley, would you like to come up and make a comment?

MR. PHIL LANGLEY: Good afternoon. My name is Phil Langley; I'm President of Maryland Charterboat Association. I set on the Potomac River Fisheries and Maryland's Sport Fish Advisory. I would like to thank you, Mr. Chair, for the opportunity to make public comment; and I would like to thank the Board as well.

We are now entering our third year of Addendum IV reductions. Some of the things I was going to speak of have already been said here today. I'm going to be kind of brief. But I can assure you that it is difficult to get charterboat captains to local meetings, versus getting them to Alexandria for a public meeting. If it had not been an issue of concern for these guys, they would have not made the trip. Most of the 2011 year class has now entered the coastal migration. The 2015 stock update assessment showed that we were fishing below the Addendum IV target. I'm here this afternoon just I would like to ask the Board to approve Addendum V for public comment; and allow the process to continue.

There are hundreds and thousands of individuals who would like the opportunity to comment, whether being for or whether being against Addendum V. By not allowing this addendum to move forward for public comment, we are silencing the voices of many who would like the opportunity to comment on the subject. That is all I have to say, thank you for your time.

CHAIRMAN GILMORE: Robert Brown.

MR. ROBERT T. BROWN: Robert T. Brown; President of the Maryland Waterman's Association. I would like to thank the Technical Committee for their work in preparing this data, and we're looking forward to having a public comment period. We ran into problems when our benchmark was changed, when it was raised up a few years ago.

It just threw us. Less than 1 percent and we ended up with a 25 percent reduction. There is one thing we have to remember; that Mother Nature's going to give us a balance. That may not be what we desire for all fisheries in the Bay. We need a multi-management plan also, because with these predators, these rockfish we have in the Bay, it is spot that they eat on, which has plummeted down.

Also we have the crabs, which have made a rebound, but I don't believe that has to do with the grasses. I just want to thank you all for letting me speak here today. The reason that some of the watermen are not here today, if you haven't noticed the last two weeks the way the weather has been blowing so hard, they haven't been able to work.

I mean today is finally a half-way decent day, and we all have to make a living. Hopefully you will proceed forward with this public comment period. Just remember, we've got to protect more than just the rockfish. If we end up with nothing but rockfish in our Chesapeake Bay, our other fisheries are going to hurt.

CHAIRMAN GILMORE: Patrick.

MR. PATRICK PAQUETTE: Thank you, Mr. Chairman, Patrick Paquette; past President and current Government Affairs Officer for the Massachusetts Striped Bass Association. I also represent a coalition of angling groups from the northeast; regarding this subject. I just wanted to point out a couple of things that I didn't think were adequately covered during your discussion.

One is that there was reference to the conservation measures that have already been taken toward the 2011 class in the Bay. That is only partially true, because according to the science, those reductions were not met. The reductions that were successful in the overall previous addendum were carried by the coastal fisheries and our achieving and over achieving the cutbacks in our fisheries. But down in the Bay they did not meet the reduction that they were required to.

Let's please remember that. That we've already paid for some of that and we don't want to pay for any more of it. We would like it to be equal shared paying it. I think Mr. Grout got along there. But the Bay did not meet the reduction. Effort, the effort projection regarding this 2011 year class should not be blown away in the projections.

It was very clear from the TC that the increased effort that is guaranteed to happen, with more availability along the coast, is not projected. As bad as the projection numbers look, it is going to be worse. But that is clear to those of us that are in the fishery. Along the coast we are going to catch more than what is projected.

Next, the 2011 year class, a fishery cannot be built and maintained on one single year class. Reports from Rhode Island and Massachusetts are a little bit concerning to me; because there is a window of the way the migration reaches New England states. What happens is the really smaller fish tend to show up, and then it's always normally three, four weeks until the first keeper. That is not what we have seen this year.

In both the West Wall and the first keeper, the West Wall in Rhode Island being like sort of the traditional place that people monitor for when the fish are up in Rhode Island. The first keepers were reported at the Salt Water Edge in

Narragansett, exactly three days after the schoolies showed up.

In Massachusetts, on Cape Cod, the first keepers were caught within two days, and worst of all in Martha's Vineyard, which usually sees the smaller sublegal fish for a good six to eight weeks prior to the first keeper showing up. It was the same day that the fish arrived at all that the first keepers were caught.

What that tells me is that there is a big giant hole of years and a lot of small fish prior to the 2011 that aren't there; the year class that is after 2011 are not good and the year classes before we know that story, because they triggered the last reduction. To build a fishery on 2011 and to not be ultra conservative with it is just irresponsible in our opinion.

Also, I would like those of you who love to look at the MRIP data to take a good long look, because what is being reported about the Chesapeake Bay charter fishery is not matching what that fishery is saying on the internet, what they're advertising and fish reports tools are saying, and the MRIP data is clear that catch and number of trips in that fishery are on the rise. Things are getting better there already, without an action. An action is not required. You should consider the next action after the next benchmark.

MR. ARNOLD LEO: I am Arnold Leo; and I am an element of the socioeconomic sector of this fishery. I speak on behalf of the fishing industry of the town of East Hampton. We have very significant commercial and recreational elements in this fishery. It seems to me over the years, and I can't even remember how many decades I've been doing this with striped bass.

We're always getting a reduction, which is very rarely leading to an increase when things begin to look better with the abundance of the stock. It seems to me that there is at least enough evidence to warrant allowing this to go out for public comment and allow yourselves to hear from the socioeconomic element of the fishery. Thanks.

CHAIRMAN GILMORE: Thank you, Arnold.

CAPTAIN ROBERT NEWBERRY: Thank you, Mr. Chairman, my name is Captain Robert Newberry; I am Chairman of DelMarVa Fisheries Association. We represent those on the DelMarVa Peninsula; not only in the commercial entity, but also in the recreational and in the charter industry. One thing I want to say.

I've been in the charter business 35 years of my life, and on the Chesapeake Bay and in Massachusetts. I learned to fish in Massachusetts during the summers. What we're seeing in the Chesapeake, yes last year was probably the worst year that I had ever seen; as far as catching of fish. I don't know where these numbers that granted they may be putting it on the internet. But the old saying is believe none of what you read, half of what you see, and all of what you do.

In respect to my fellow fishermen from Massachusetts, I think that needs to be taken into consideration. The fact is we had people traveling as far as 30 to 40 miles a day coming to the northern reaches of the Bay to catch fish. Because when I moved my business down to the southern reaches of the Bay eight years ago, three years ago it took me 300 fish to catch to put a limit of 12 in my cooler, because the fish were 18, 18.5, 19, 19.5, so by moving to the northern reaches of the Bay I alleviated that problem.

Fortunately I have some property in the northern Bay and I was eligible to do that. But this year specifically, we're in a bad situation too. I've had to cancel the majority of my trips because the availability of the spawning fish. These fish spawned early, as early as the end of February, beginning of March.

I've run 12 trips and I've caught 18 fish. A lot of my guys leave the harbor, fish eight, ten hours, have maybe one pull down, and one fish. It is not the fact that the fish are not there, they've spawned and they've gone. But on the other hand DNR, our department is seeing record numbers of large spawning cows in the reaches of the Susquehanna.

The fish are just not there. They left, we missed them; and that is because of Mother Nature. I think a lot of what we're seeing in these numbers of fish, are where the fish are spawning. They're short spawning. They're going to different areas. I mean it's like they say all the big fish leave the Bay. Well, last summer there were a lot of large fish, just large fish were caught.

We do have a resident school of large fish that maintain in the Chesapeake, but a lot do go up to Massachusetts. Now I've talked to some people this week, for instance on the headwaters of the Hudson River up at Lake Champlain. They're catching huge fish right now. Connecticut River they're catching big fish.

Have these fish missed Maryland? No, most of them are heading up the coast; the surf people in the coast off of Ocean City are catching a lot of fish. You know they're three weeks ahead right now. With Addendum V, I think to bring it to public comment. You know fortunate I was able to come here today. I do have someone running my boat today, because this is a passion to me.

To not have the public comment on this and not to adopt this addendum. I see what the fishery does. I'm out there every day. Fortunately, a lot of the people in the room here are not able to do that. I'm seeing more rockfish than I have ever seen in my entire life in the Bay right now, little ones that are going to grow. I mean I do refute some of the young-of-the-year index and how they do that; but that is for another time another date. But I would implore this Board, and not to offend anybody on here, but I kind of have a saying that I've earmarked. The politicizing of a natural resource is the damnation of that resource.

I mean the technical group has done a very good job of presenting these issues, and to throw personal agendas and politicism, because I don't like this person, I don't like that person. This state doesn't like that state. It is for the betterment of the fish, and that is why I think that we need to go forward with this public comment.

We need to address this; because I just don't want to see us get into a situation in the Bay where we have a bio crash, where we've missed something and all of a sudden bam! All of a sudden more fish show up than we know what to do with. Then bottom line, the only one that suffers is the natural resource. I thank you very much.

CHAIRMAN GILMORE: Okay I'm moving back to the Board, any comments? Go ahead.

MR. DAVID BUSH: Maybe a kind of mixed bag between questions and comments. But if I understand correctly, we have the stock assessment that will be coming up in 2018 and then subsequent management measures might fall. If anybody can help me, what will be the earliest those might hit the ground – or the water I should say?

MR. APPELMAN: The benchmark is scheduled to be completed at the end of 2018, which I believe the Board review of that would be early 2019, which would be the earliest. February would probably be the earliest point you could take action following the assessment.

MR. BUSH: What we're looking at is potentially two and a half, three years before any assessment might change, make an increase or decrease or any availability of harvest. I think at this point, I mean there may be a lot of mixed opinions about what the correct action is to go at this point.

But it seems to be obvious that this has impacted some folks; and all they're asking us to do is consider it. Let us have some time to public comment on it. Let us get some more facts, some more data. Nothing on this, if we made any decision and even approved it in August, would happen before 2018, before that stock assessment or benchmark stock assessment would occur.

In which case I'm sure there are several safeties to say look, we put something in place. Now we know it's a bad idea and we can call it. It is just my opinion at this point, now granted, I'm going to have to discuss this further with my peers. But we're not taking any actions today; we're simply considering them for the future.

CHAIRMAN GILMORE: Okay, Doug.

MR. W. DOUGLAS BRADY: Just a follow up on David's comments. I just want to get clear here. If we followed the process on this addendum and went to the public comment period and took action. That action would be implemented in 2018 at the earliest, and if we waited for the stock assessment and took action, whatever came out of that measures could be implemented in 2019. We're looking at, back to Ritchie's comment. It's a one-year difference that there would be between waiting for a stock assessment and doing action from that or going through this process. Am I clear on that?

CHAIRMAN GILMORE: Yes that's roughly, give or take a few months, yes. John Clark.

MR. CLARK: I just have to question that timeline, Mr. Chairman. If the assessment isn't released to the Board until late 2018, there is no way we're going to have the assessment and a new addendum approved in 2019 for action in 2019. It will be 2020 at the earliest, before there are any actions taken on the benchmark assessment.

CHAIRMAN GILMORE: Yes, John, again that is depending upon how fast the Board can move. But you're probably right; it would probably take us that long. Mike.

MR. LUISI: I'll agree with John. We started this action back at the annual meeting in Florida, which was about 18 months ago. That is how long it's taken us to do an assessment update, and consider the information and draft an addendum. I just want to make sure it's clear that I doubt that 2019 would be the first time that we would be able to take action.

CHAIRMAN GILMORE: All right Marty, you get the last shot; then we're going to caucus.

MR. GARY: Just quick clarification. The Addendum V, if it were to pass, would it be possible for that to be implemented in fall of '17?

MR. APPELMAN: If the Board took final action in August, and states could go through their processes then yes. But if not, I think many states need some time with that as well. It could be as early as January, 2018.

CHAIRMAN GILMORE: Okay, I understand and this is about as difficult as it gets. We're faced with, I think everybody understands the issue with the Chesapeake and the industry, and everyone is concerned about that and the stock being so close to significant changes maybe in the not too distant future.

At that note, I think we're going to take a three-minute caucus. You guys can talk, we'll come back and we'll call the vote. Okay if everybody could grab their seats. We've had several requests for roll call votes, John Clark. Anyway, we'll be doing a roll call vote, so is everybody ready for the question? Okay Max will call the roll.

MR. APPELMAN: North to south starting with Maine.

MR. TERRY STOCKWELL: No.

MR. APPELMAN: New Hampshire.

MR. WHITE: No.

MR. APPELMAN. Massachusetts.

MR. RAYMOND KANE: No.

MR. APPELMAN: Rhode Island.

MR. GIBSON: No.

MR. APPELMAN: Connecticut.

SENATOR CRAIG A. MINER: No.

MR. APPELMAN: New York.

MR. JOHN McMURRAY: No.

MR. APPELMAN: New Jersey.

MR. RUSS ALLEN: Yes.

MR. APPELMAN: Pennsylvania.

MR. ANDY SHIELS: No.

MR. APPELMAN: Delaware.

MR. CLARK: Yes.

MR. APPELMAN: Maryland.

MR. LUISI: Yes.

MR. APPELMAN: District of Columbia, Potomac River Fisheries Commission.

MR. DAVE BLAZER: Yes.

MR. APPELMAN: Virginia.

MR. O'REILLY: Yes.

MR. APPELMAN: North Carolina.

DR. DUVAL: No.

MR. APPELMAN: National Marine Fisheries Service.

MR. DEREK ORNER: No.

MR. APPELMAN: U.S. Fish and Wildlife Service.

MS. SHERRY WHITE: No.

CHAIRMAN GILMORE: The motion fails, 5 in favor, 10 against, no null votes and no abstentions.

REVIEW AND CONSIDER APPROVAL OF 2018 ATLANTIC STRIPED BASS BENCHMARK STOCK ASSESSMENT TERMS OF REFERENCE

CHAIRMAN GILMORE: Okay, we need to move on to the next item of business; which is the Benchmark Stock Assessment Terms of Reference. Katie Drew is going to do a presentation for us.

DR. DREW: Just to refresh the schedule in everybody's mind. I think Max touched on this briefly. Here's our benchmark assessment timeline. We've already had our data workshop planning call webinar. Hopefully today we will have the Board approval of the TORs, which gives us the framework to start moving forward with the assessment. We plan to spend the first year, so basically through 2017, working on developing the model with data up through 2016.

That will give us time to test the model, test any new development or structure, and have an assessment workshop at the end of this year to look at that. Then we plan to have another assessment workshop in the middle of next year; which will give us time to incorporate the new 2017 data into the assessment, so that we can go to peer review with the data through 2017, sometime in early December, so that the results will be available to the Board for review in February.

As I said, today we are going to hopefully approve these TORs. Basically, as you all know, the terms of reference for the stock assessment are a way to give us framework and guidance to help us identify important issues that need to be considered as part of this assessment. But it's also important for us to kind of keep this a little bit flexible and open, so that we are not bound to something that turns out it's going to fail.

The ASFMC external review process, which is what we're going through this time, requires two sets of terms of reference; one for the Stock Assessment Subcommittee to guide our model development process, and one for the reviewers to guide their review process. I'm going to go through these fairly quickly, and try to highlight what the TCs intention is behind some of this language; in the hopes that it allays any concerns that the Board has, in terms of the development of this assessment.

Starting with the Stock Assessment Subcommittee set the terms of reference. TOR1 and 2 are really focused on the data. We used a lot of fairly standard language in this, so I'm going to try to focus on things that are new or special for striped bass. But TOR1 is just focused on investigating all the sources of data, identifying strengths or weaknesses, and discussing how that impacts the assessment.

This includes the fishery independent and dependent datasets, life history, tagging data, indices of abundance and that sort of thing. TOR2 is focused on estimating the commercial and recreational landings and discards; including characterizing the uncertainty of the data and the spatial distribution of the fishery. What is special for this assessment is of course we plan to have the new MRIP estimation of striped bass in this assessment, as well as the calibration effort that's going on.

As you may or may not be aware, MRIP is going to update how they estimate effort; when they're transitioning from the telephone survey to a mail-based survey that has a better response rate, a better estimate of effort. But that is going to change the estimates of total catch for a number of our species. We anticipate striped bass will be one of them. However, we plan to have those new estimates ready to go for the assessment, so that the assessment can incorporate the best available science on that issue. The TOR3 is focused on the statistical-catch-at-age model, and we are going to be trying to develop and estimate an age-based model that can estimate annual fishing mortality recruitment, total abundance and spawning stock biomass for the time series; as well as estimate their uncertainty and perform the standard retrospective analyses.

But we also would like to be able to provide estimates of these quantities by stock component and sex, where possible, as well as for the total stock complex. By stock component, we're really talking about what we consider sort of the major producer stocks within the coastwide meta-population; which includes the Chesapeake Bay stock, the Hudson River stock, and the Delaware Bay stock, as well as looking at any new data that we have for the North Carolina component of this.

We would also like to do this by sex. However, we do include the where possible caveat here, because it is really going to depend on the quality of available data; not just for the most recent years, but for the entire time series. TOR4 is about the tagging model, where we have an extensive set of tagging data to estimate mortality and abundance.

We use that to really complement the work that is done through the statistical catch-at-age model. We've done a tremendous amount of work in the past trying to merge these two data streams together, and that has not really worked out for us; so they continue to be separate models. I think certainly we'll revisit that question, but for now they are separate models and sort of intended to complement each other.

As well as we would like to continue to provide suggestions for the further development of this dataset and this model to make it more complementary, and to help it support our management process better. I'm sure this is the one that everybody is interested in. TOR5 and 6 are focused on the biological reference points, and the TACs.

TOR5 is update or redefine biological reference points, which include point estimates or proxies for BMSY, SSBmsy, FMSY, and MSY itself. We currently use a proxy for these quantities; but this opens up the possibility of using these estimates themselves, using a different definition of a proxy, and we would define stock status based on these BRPs, again by stock component where possible.

We'll touch a little bit more on this on the next topic. But we know there is interest in the Board in redefining these reference points; and that's definitely an important component of this stock assessment process. We will be looking to you guys for further guidance on what reference points to use. But I think for the TORs we want to keep it just vague and open at this point; until we get better guidance from you guys.

TOR6 is to provide annual projections of catch and biomass under alternative harvest scenarios. This is a pretty standard estimate and report annual probabilities of exceeding these threshold biological reference points for F and for SSB, and under different harvest scenarios. TOR7 is just focused on future work.

Review and evaluate the status of our research recommendations, come up with new research recommendations, and recommend the timing and the frequency of future assessment updates and the benchmark assessment process. Those are the TORs for the Stock Assessment Subcommittee. For the peer review process it is essentially the same wording, but instead they will focus on evaluating of the datasets, evaluating the methods used to estimate the commercial and recreational discards, evaluate the uncertainty in the new MRIP estimates of catch.

Evaluate the methods and models. There is really focusing on evaluating the work that we have done. Again, evaluate the tagging model. Evaluate the choice of reference points and the methods that we use to estimate them. Recommend the stock status determination based on what we present; or if appropriate, specify alternative methods or measures.

Again, evaluate the annual projections of catch. The review panel will also provide research recommendations and recommend frequency of timing of the next benchmark assessment; and then write their own report, to be completed within four weeks of the workshop conclusion. I'm going to pause here for questions about the TORs, to make sure that I think this addresses people's concerns about the direction of the stock assessment. See if there are any edits that you guys want to make to those.

CHAIRMAN GILMORE: Questions for Katie? John Clark.

MR. CLARK: Thank you, Katie. Maybe you'll go into this the next part. But just when you were talking about the proxies, you said you were going to use a different definition of a proxy? Would you be explaining that more?

DR. DREW: Sure. At this point with this TOR, and at this point in the process, it is extremely open whatever the future reference point will be. Right now we use the '95 value as the target, or as the threshold, and another value as the threshold that we could move those up or down as a proxy, if we like the empirical based as opposed to a model base. But again that is something we're going to look to the Board for guidance on. But that is what that is referring to.

MR. O'REILLY: Thank you Katie, I have two questions. You said it yourself how difficult it's been over time to juxtapose the tagging data with the model; whether it was VPA or now statistical-catch-at-age. Is it really something else that can be done? In other words, the tagging data might have applicability for TOR2, maybe for some distributional aspects.

But the track record on the tagging data is, I mean some really bright people working on the Tagging Subcommittee over the years, but never could get a corroborative fix between the model and the tagging data. That's one question. The other question is very simple. You mentioned in TOR5 updating the biological reference points and I assume part of that will be looking at natural mortality rate.

DR. DREW: Yes. I guess the first part of your question, getting the tagging data. It has always been supportive of the statistical-catch-at-age model, in terms of total mortality rates. They're actually saying very similar things about the total mortality rate. Some of the disconnect comes between how you're handling natural mortality within that.

Hopefully, we may be able to get some spatial information or migration rates out of these datasets. But it's true that this isn't the first time we've tried to answer this question. I think it's still an important component of data that we need to evaluate for this process. But can we take the next step with it, in terms of enhancing the statistical catch-at-age model? It's unclear at this point, but we certainly want that consideration to be on the table. In terms of natural mortality that would be part of the overall life history information going into both the model, and the reference points coming out would be looking at natural mortality at age, potential changes over time and things like that.

CHAIRMAN GILMORE: Mike Luisi.

MR. LUISI: I appreciate your expansion of TOR3, as it related to the producer areas. Something that we certainly have an interest in is the evaluation of the age-based model on, we use the term resident stock; and resident stock would be those fish that have yet to become part of the migratory stock.

I just want to be clear in that as we proceed. You didn't use the word resident stock, but I'm assuming that it's those areas, Chesapeake Bay, Delaware Bay, Hudson where we have the young fish that have yet to become mature, and you'll be looking at when available the model would be looking at exploitation of those residents, even without using the word residents.

DR. DREW: Right. Obviously the issue that we've struggled with in trying to incorporate some spatial structure is really that immigration and emigration rate. They do as young ones, they're available in their natal bays and estuaries, and they move out at some point during their life to the coastal population; where they become vulnerable to a different fishery.

However, they also do return to those natal bays and estuaries to spawn, where they're again vulnerable. Separating that kind of movement patterns out in the catch and in the biology is always the difficult part; and I think that is what is going to hold us back. But the intent would be to look at the numbers and the fishing mortality rates on that component of the larger coastwide meta-population. Track them while they're in the Bay and they're vulnerable to the Bay fishery.

Track the ones that stay in and the ones that move out and join the coast and then are vulnerable to the coastal fishery. But separating them out as these are fish that came out of the Chesapeake Bay and were subject to Chesapeake Bay mortality versus these are the ones that came out of the Hudson River, and are subject to the Hudson River mortality; I think is what we're trying to go for with understanding kind of these complex stock dynamics within the larger meta-population of striped bass on the coast.

CHAIRMAN GILMORE: Any other questions for Katie? Okay we're going to need a motion on this. Oh, go ahead, Mike.

MR. LUISI: Sorry Mr. Chairman, just one last question. I wonder Katie; you know we talked a lot over the years regarding the triggers that have put us in a position to have to take action. If we're going to be considering new biological reference points, we're obviously going to need some evaluation or consideration of potential new triggers.

How those are related, I wonder can you speak to whether or not that is something that needs to be done as a part of this benchmark, or would we have a follow up action once the benchmark is complete and we have new reference points? I think the Board would be looking for technical advice as to how those triggers relate to the new reference points.

DR. DREW: Yes, the TC did discuss this issue; and we felt it was more appropriate to have that analysis and discussion after the benchmark was complete and the reference points have been selected by the Board. Because there is a certain element of risk tolerance in that; so that we would like it to be more of a dialogue, and a back and forth with the Board, in terms of if you select this reference point here is a potential trigger.

Here is the risk associated with it; and how much risk do you want to tolerate? What happens if you have a more conservative reference point versus a less conservative reference point? I think we would be happy to work with the Board on developing more robust triggers, or triggers that reflect a level of risk that you're willing to take. But it would probably be more efficient use of time to have that after the benchmark process, and after we've decided on the reference points that we would like to use going forward.

CHAIRMAN GILMORE: Any other questions? Mike.

MR. MIKE ARMSTRONG: It's more of a statement. I've watched this Board over the years from when I was technical to my career progression; and the Board has never really decided what it wants this fishery to look like. I bring this up as we talk about reference points, because MSY is a commercial reference point.

It maximizes poundage from a fishery, which is not necessarily what you want from a recreational fishery. I just thought I would raise if as we go along, we may not just want to say MSY is where we want to be, and throw that out to the Technical Committee to consider. Because there are many other places we can go with that rather than perform or go forward with what is recognized in fishery science as a commercial reference point. I thought I would throw that out there.

DR. DREW: I have a whole set of slides on that that we'll get to in the next agenda item, actually.

MR. ARMSTRONG: What a good segue way.

CHAIRMAN GILMORE: Segue way, except for Mark Gibson wants to talk now.

MR. GIBSON: Given that we're going to touch on what Mike just spoke to in the next agenda item, I'll wait until then.

CHAIRMAN GILMORE: Okay, I need a motion if it is the pleasure of the Board, because we have to approve the TORs. Does anybody want to offer one? John Clark.

MR. CLARK: Move to approve the Terms of Reference.

CHAIRMAN GILMORE: Can I get a second? Russ Allen. Any discussion on the motion? Is there any objection to the motion? Okay seeing none; we'll adopt that as unanimous consent.

BOARD GUIDANCE TO SAS REGARDING DEVELOPMENT OF BIOLOGICAL REFERENCE POINTS FOR THE 2018 BENCHMARK STOCK ASSESSMENT

CHAIRMAN GILMORE: Now we can move on to our next item. Katie's going to do a presentation on this, and I think Mike, you did start off the conversation on this. This is kind of food for thought for the future. We can have a little discussion on it, but we really want to get the bigger discussion as we move forward, so Katie, take it away.

DR. DREW: Basically this is, as our Chair was saying, this is not a question that I want an answer to now, today. But it is an answer that the TC is going to look to you guys for over the next couple of months; as we begin work on this assessment, which is basically what types of biological reference points should we be pursuing?

Just as a quick review of the history of the assessment, of reference points that we've used, from 2003 under Amendment 6, we had sort of a mish-mash of FMSY based reference points for the coast and the Chesapeake Bay for F, and then empirical reference points related to the SSB threshold in 1995, as the SSB threshold and the SSB target as a value over that.

In Addendum IV to Amendment 6, we made those reference points line up better. The problem was that the FMSY reference points, if you fished at them, would not get you to your target and threshold. We made them line up, and so that the rate that you're fishing at will get you to your target and your threshold SSB values; given the recruitment history that we've seen in the past.

There were no reference points specifically for the Chesapeake Bay, because the model already incorporated the Chesapeake Bay specific fishery performance within it. But the 2018 benchmark is going to give us an opportunity to really revisit the management and fishery goals for this species; which is what I think is what we've been trying to get at through a lot of this discussion today.

The current biological reference points are based on historical performance that when we put these into management, we were satisfied with the performance in the fishery in 1995. We were satisfied with what the stock looked like, and we wanted to keep it there at or above those levels going forward.

The question now is is this still what the Board wants, or do we have different management goals at this point? Do we want to maximize yield, which as Mr. Armstrong was saying is a historical traditional reference point for a commercial fishery is MSY. Do we want to maximize catch rates, so that you can go out and have a high chance of catching a fish?

Is that what we want? Do we want to maximize trophy-sized fish? Do we want regional reference points or do we want a coastwide reference point? Do we want a less conservative threshold? Do we want that threshold to really represent a threshold that is a danger zone, or do we want it to represent something different?

Do we want ecosystem considerations to be in here? We've talked a lot about what is the effect of striped bass on other species. What is the effect of menhaden on striped bass? Are we ready to start linking some of these things up, and consider the overall ecosystem considerations when we design a reference point?

What we're planning to do, so that is just a taste of some of the questions that we would like you guys to wrestle with over the next couple of months. What we would like to do is have the TC prepare a detailed memo on some of these options, or some of these concepts. I've kind of thrown out a bunch of stuff, but we would like to sit down and prepare some background material and a detailed memo; to give you guys before the summer meeting week, and then put together a Board workshop or subcommittee to start hashing out some of these questions, and decide what you want this fishery to look like, what you want this stock to look like.

When we go forward and develop this assessment, we can develop reference points that reflect the management goals of this Board. I know this is something we've tried in the past, and it's kind of gotten deadlocked in other things. But I think this is a great opportunity, especially given the concerns that have been raised, with the reference points as they are now; to really reevaluate what we want out of this stock and out of this fishery.

As I said, we're not really looking for discussion or input now at this moment. But to give you guys time to start thinking about this, to think about your own states needs and desires, and then to think about this in a larger context and a more structured context at meeting week over the summer. We do have plenty of time before this becomes critical, so hopefully it's not something that we need to do in a hurried fashion, but something that we can do with a lot of thought and consideration to really get at, what do you want this fishery and the stock to look at?

CHAIRMAN GILMORE: Food for thought and I'm not going to open it to questions, so I can gain some time. But I'm sure Katie will be around here. She's not going anywhere.

DR. DREW: No promises.

CHAIRMAN GILMORE: Emerson.

MR. EMERSON C. HASBROUCK: Thank you, Katie. This sounds like a good idea to go forward with. Do you need a consensus of the Board to put that together? Do you need a motion, or are you just going to go forward, pulling this all together?

CHAIRMAN GILMORE: The latter. This is food for thought, at the next Board meeting in August; we'll have a more detailed discussion on it I'm sure. Okay that is the last agenda item we have other than Other Business.

ADJOURNMENT

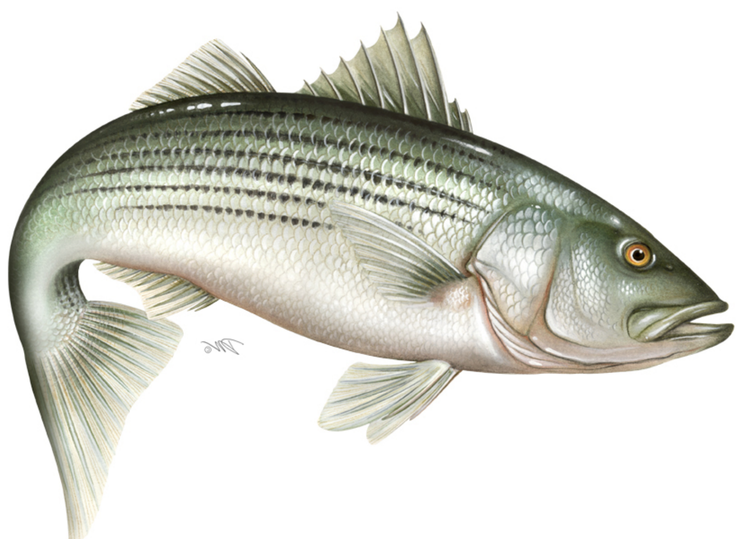
CHAIRMAN GILMORE: Is there any other business to come before the Striped Bass Board? Seeing none; I think we're adjourned.

(Whereupon the meeting adjourned at 3:37 p.m. on May 9, 2017.)

2017 DRAFT REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR

ATLANTIC STRIPED BASS
(Morone saxatilis)

2016 FISHING SEASON



Atlantic Striped Bass Plan Review Team
Max Appelman, Atlantic States Marine Fisheries Commission, Chair
Charlton Godwin, North Carolina Division of Marine Fisheries
Wilson Laney, US Fish and Wildlife Service

Developed September 2017

Executive Summary

Atlantic striped bass from Maine through North Carolina are managed under Amendment 6 and Addenda I-IV to the Interstate Fishery Management Plan.

A benchmark stock assessment was peer reviewed by the 57th Stock Assessment Review Committee and approved by the Board for management use in October 2013. Addendum IV to Amendment 6 was approved by the Board in October 2014, and implemented prior to the start of the 2015 fishing season. The addendum contained new fishing mortality reference points, and required coastal and Chesapeake Bay states/jurisdictions to reduce removals by 25 and 20.5%, respectively, in order to reduce F to a level at or below the new target.

In 2016, total Atlantic striped bass removals (i.e., commercial and recreational harvest plus dead discards, excluding harvest of the Albemarle-Roanoke stock from internal coastal waters of North Carolina) was estimated at 3.58 million fish, which is a 19% increase relative to 2015. Total striped bass harvest in 2016 is estimated at 2.14 million fish or 24.7 million pounds. The recreational fishery harvested 1.52 million fish (19.9 million pounds) in 2016, while the commercial fishery harvested 614,469 fish (4.82 million pounds). Dead discards from the recreational and commercial fisheries are estimated at 1.04 million fish and 404,815 fish, respectively.

In 2016, all states implemented management and monitoring programs consistent with Amendment 6 and Addenda I-IV. Monitoring requirements vary by state, and may include monitoring commercial and recreational catch, effort, and catch composition; monitoring commercial tagging programs; and performing juvenile abundance surveys, spawning stock surveys, and research tagging programs. In 2016, three states exceeded their coastal commercial quota allocation. Massachusetts exceeded its quota by 68,927 pounds, Rhode Island by 32 pounds, and Virginia by 589 pounds. However, the total coastal and Chesapeake Bay commercial quotas were not exceeded.

For the 2017 review of JAIs, the analysis evaluates the 2014, 2015, and 2016 JAI values. No state's JAI met the criteria for recruitment failure, although Maryland's and New York's 2016 JAI values were below the Q1 threshold.

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I. Status of the Fishery Management Plan

Date of FMP Approval:	Original FMP – 1981
Amendments:	Amendment 1 – 1984 Amendment 2 – 1984 Amendment 3 – 1985 Amendment 4 – 1989; Addendum I – 1991, Addendum II – 1992, Addendum III – 1993, Addendum IV – 1994 Amendment 5 – 1995; Addendum I – 1997, Addendum II – 1997, Addendum III – 1998, Addendum IV – 1999, Addendum V – 2000 Amendment 6 – 2003; Addendum I – 2007, Addendum II – 2010, Addendum III – 2012, Addendum IV – 2014
Management Unit:	Migratory stocks of Atlantic striped bass from Maine through North Carolina
States With Declared Interest:	Maine - North Carolina, including Pennsylvania
Additional Jurisdictions:	District of Columbia, Potomac River Fisheries Commission, National Marine Fisheries Service, United States Fish and Wildlife Service
Active Boards/Committees:	Atlantic Striped Bass Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Tagging Subcommittee, Plan Review Team, and Plan Development Team

The Atlantic States Marine Fisheries Commission (Commission) developed a fisheries management plan (FMP) for Atlantic Striped Bass in 1981 in response to declining juvenile recruitment and landings. The FMP recommended increased restrictions on commercial and recreational fisheries, such as minimum size limits and harvest closures on spawning grounds. Two amendments were passed in 1984 recommending additional management measures to reduce fishing mortality. To strengthen the management response and improve compliance and enforcement, the Atlantic Striped Bass Conservation Act (P.L. 98-613) was passed in late 1984, which mandated the implementation of striped bass regulations passed by the Commission, and gave the Commission authority to recommend to the Secretaries of Commerce and Interior that states be found out of compliance when they failed to implement management measures consistent with the FMP.

The first enforceable plan under the Striped Bass Act, Amendment 3, was approved in 1985, and required size regulations to protect the 1982-year class, which was the first modest size cohort in the previous decade. The objective was to increase size limits to allow at least 95% of the females in the 1982 cohort to spawn at least once. Smaller size limits were permitted in producer areas than along the coast. Several states, beginning with Maryland in 1985, opted for a more conservative approach and imposed a total moratorium on striped bass landings for several years. The amendment contained a trigger mechanism to reopen the fisheries when the 3-year moving average of the Maryland juvenile abundance index (JAI) exceeded an arithmetic mean of 8.0 which was attained with the recruitment of the 1989 year class. Also, in 1985, the Commission determined the Albemarle Sound-Roanoke River (A-

R) stock in North Carolina contributed minimally to the coastal migratory population, and was therefore allowed to pursue an alternative management program.

Consequently, Amendment 4, implemented in 1989, aimed to rebuild the resource rather than maximize yield. The amendment allowed state fisheries to reopen under a target fishing morality (F) of 0.25, which was half the estimated F needed to achieve maximum sustainable yield (MSY). The amendment allowed an increase in the target F once spawning stock biomass (SSB) was restored to levels estimated during the late 1960s and early 1970s. The dual size limit concept was maintained, and a recreational trip limit and commercial season was implemented to reduce the harvest to 20% of that in the historic period of 1972-1979. A series of four addenda were implemented from 1990-1994 to maintain protection of the 1982 year class.

In 1990, to provide additional protection to striped bass and ensure the effectiveness of state regulations, NOAA Fisheries passed a final rule (55 Federal Register 40181-02) prohibiting possession, fishing, (i.e., catch and release fishing), harvest and retention of Atlantic striped bass in the Exclusive Economic Zone (EEZ), which the exception of a defined transit zone within Block Island Sound. Atlantic striped bass may be possessed and transported through this defined area, provided that the vessel is not used to fish while in the EEZ and the vessel remains in continuous transit.

In 1995, Chesapeake Bay, Delaware Bay and Hudson River striped bass were declared recovered by the Commission (the A-R stock was declared recovered in 1997), and Amendment 5 was adopted to increase the target F to 0.33, midway between the existing F target (0.25) and $F_{MSY,}$ and increased again to 0.40 after two years of implementation. Regulations were developed to achieve the target F (including measures aimed to restore commercial harvest to 70% of the average landings during the 1972-1979 historical period) and states were allowed to submit proposals for alternative regulations that were conservationally equivalent. From 1997-2000, a series of five addenda were implemented to respond to the latest stock status information and adjust the regulatory regime to achieve each change in target F.

In 2003, Amendment 6 was adopted to address five limitations within the existing management program: 1) potential inability to prevent the Amendment 5 exploitation target from being exceeded; 2) perceived decrease in availability or abundance of large striped bass in the coastal migratory population; 3) a lack of management direction with respect to target and threshold biomass levels; 4) inequitable effects of regulations on the recreational and commercial fisheries, and coastal and producer area sectors; and 5) excessively frequent changes to the management program. Amendment 6 completely replaced all previous Commission plans for Atlantic striped bass.

The goal of Amendment 6 is to perpetuate, through cooperative interstate management, migratory stocks of striped bass; to allow commercial and recreational fisheries consistent with the long-term maintenance of a broad age structure, a self-sustaining spawning stock; and also to provide for the restoration and maintenance of their essential habitat. In support of this goal, the following objectives are included:

- Manage striped bass fisheries under a control rule designed to maintain stock size at or above the target female spawning stock biomass level and a level of fishing mortality at or below the target exploitation rate.

- Manage fishing mortality to maintain an age structure that provides adequate spawning potential to sustain long-term abundance of striped bass populations.
- Provide a management plan that strives, to the extent practical, to maintain coastwide consistency of implemented measures, while allowing the States defined flexibility to implement alternative strategies that accomplish the objectives of the FMP.
- Foster quality and economically viable recreational, for-hire, and commercial fisheries.
- Maximize cost effectiveness of current information gathering and prioritize state obligations in order to minimize costs of monitoring and management.
- Adopt a long-term management regime that minimizes or eliminates the need to make annual changes or modifications to management measures.
- Establish a fishing mortality target that will result in a net increase in the abundance (pounds) of age 15 and older striped bass in the population, relative to the 2000 estimate.

Amendment 6 modified the F target and threshold, and introduced a new set of biological reference points (BRPs) based on female (SSB), as well as a list of management triggers based on the BRPs. The coastal commercial quotas for striped bass were restored to 100% of the states' average landings during the 1972-1979 historical period, except for Delaware's coastal commercial quota which remained at the level allocated in 2002. In the recreational fisheries, all states were required to implement a two-fish bag limit with a minimum size limit of 28 inches, except for the Chesapeake Bay fisheries, fisheries that operate in the A-R (i.e., internal coastal waters of NC), and states with approved alternative regulations. The Chesapeake Bay and A-R regulatory programs were predicated on a more conservative F target than the coastal migratory stock, which allowed these jurisdictions to implement separate seasons, harvest caps, and size and bag limits as long as they remain under that F target. No minimum size limit can be less than 18 inches under Amendment 6. The same minimum size standards regulate the commercial fisheries as the recreational fisheries, except for a minimum 20 inch size limit in the Delaware Bay spring American shad gillnet fishery.

States are permitted the flexibility to deviate from these standards by submitting proposals for review to the Striped Bass Technical Committee (TC), Advisory Panel (AP), and Plan Review Team (PRT) and contingent upon the approval of the Atlantic Striped Bass Management (Board). A state may request a change only if it can demonstrate that the action is "conservationally equivalent" to the management standards or will not contribute to the overfishing of the resource. This practice has resulted in a variety of regulations among states (see Table 8 and Table 9).

In 2007, Addendum I was implemented to establish a bycatch monitoring and research program to increase the accuracy of data on striped bass discards and also recommend development of a web-based angler education program. Also in 2007, President George W. Bush issued an Executive Order (E.O. 13449) prohibiting the sale of striped bass (and red drum) caught within the EEZ. The order also requires the Secretary of Commerce to encourage management for conservation of resources, including State designation as gamefish where the state determines appropriate under applicable law, and to periodically review the status of the populations within US jurisdictional waters.

In 2010, Addendum II was approved. The addendum established a new definition of recruitment failure such that each index would have a fixed threshold indicating failure, rather than a threshold that changes annually with the addition of each year's data. The new definition of recruitment failure is "a value that is below 75% of all values in a fixed time series appropriate to each juvenile abundance index."

In 2012, Addendum III was approved. The addendum requires all states and jurisdictions with a commercial fishery to implement a uniform commercial harvest tagging program. The addendum was initiated in response to significant poaching events in the Chesapeake Bay and aims to limit illegal harvest of striped bass.

In 2014, Addendum IV was approved. The addendum was initiated in response to the 2013 benchmark assessment which indicated a steady decline in SSB since the mid-2000s. The addendum established new F reference points (i.e., target and threshold), and a suite of regulatory measures to reduce F to a level at or below the new target by 2016. Prior to the start of the 2015 fishing season, all jurisdictions were required to implement regulations to achieve a 25% reduction from 2013 removals for the coastal fisheries and a 20.5% reduction from 2012 removals for Chesapeake Bay fisheries. Additionally, since tagging studies conducted on the A-R stock demonstrate that the stock contributes minimally to the total coastwide complex (Callihan et al. 2014), Addendum IV defers management of the A-R stock (i.e., internal coastal waters) to the state of North Carolina using A-R stock-specific BRPs approved by the Board. Striped bass in the ocean waters of North Carolina continue to be managed under Amendment 6 and Addenda I-IV.

While NOAA Fisheries continues to implement a ban on the possession, fishing (i.e., catch and release fishing), harvest and retention of striped bass in the EEZ, Amendment 6 includes a recommendation to the Secretary of Commerce to consider reopening the EEZ to commercial and recreational striped bass fisheries. In July 2003 and continuing for several years, NOAA Fisheries took steps in the rulemaking process to consider the recommendation. In September 2006, NOAA Fisheries concluded that it would be imprudent to open the EEZ to striped bass fishing and chose not to proceed further in its rulemaking. Specifically, NOAA Fisheries concluded that "(1) it could not be certain, especially after taking into account the overwhelming public perception that large trophy sized fish congregate in the EEZ, that opening the EEZ would not increase effort and lead to an increase in mortality that would exceed the threshold, and (2) both the Commission's and NOAA Fisheries ability to immediately respond to an overfishing or overfished situation is a potential issue, particularly given the timeframe within which Amendment 6 was created, and given the lag time in which a given year's data is available to management" (71 FR 54261-54262).

II. Status of the Stocks

Atlantic Striped Bass Stocks

The 2013 benchmark stock assessment for Atlantic striped bass was peer-reviewed at the 57th Stock Assessment Workshop (SAW)/Stock Assessment Review Committee (SARC). Based on recommendations by the 46th SAW/SARC in 2007, the statistical catch-at-age (SCA) model was generalized to allow specification of multiple fleets (an ocean fleet, a Chesapeake Bay fleet, and commercial discard fleet), different stock-recruitment relationships, and year- and age-specific natural mortality rates, among other changes. New F reference points were chosen to link the target and threshold F with the target and threshold female SSB. The 2013 assessment, and the new F reference points, were approved by the Board for management use at its October 2013 meeting.

The 2013 SCA model was updated in 2016 to estimate F, SSB, abundance, and recruitment of striped bass during 1982-2015. Based on results of the 2016 stock assessment update, and in comparison to the biological reference points below, Atlantic striped bass are not overfished and are not experiencing overfishing.

	Female SSB	***Fully-Recruited F***
Threshold	SSB_{1995} = 57,626 metric tons	0.22
Target	$SSB_{threshold}$ x 1.25 = 72,032 metric tons	0.18

In 2015, female SSB was estimated at 58,853 metric tons (mt) (129.7 million pounds) which is above the SSB threshold but below the SSB target (Figure 1). The 2015 estimate is a decrease from the 2014 estimate of 63,918 mt (140.9 million pounds). In 2015, recruitment (age-1 abundance) was estimated at 122.7 million fish which is above average for the most recent 20 years (98.0 million fish) and is the second highest value since 2005; the 2012 estimate (i.e., the 2011 year-class) was 123.9 million fish (Figure 1). In 2015, fully-recruited F was estimated at 0.16 which is below both the F threshold and F target (Figure 2). Overall, the conclusion is that female SSB has declined since the 2003 time series high. Although there appears to be an increasing trend in recreational catch over the last five years, the decline in SSB may be reflected in the coastwide harvest which has been decreasing from about 2007 to present (Figure 5). A new benchmark assessment is currently underway and scheduled for completion at the end of the 2018.

Albemarle Sound-Roanoke River Striped Bass Stocks

The most recent A-R benchmark stock assessment (data through 2012) utilized the ASAP3 statistical catch-at-age model. The model was peer reviewed by an outside panel of experts and approved for management use by the Board in October 2014. The model incorporated all commercial and recreational harvest and discard data for the A-R stock, as well as abundance data from fishery independent surveys conducted by North Carolina Division of Marine Fisheries (NCDMF) and North Carolina Wildlife Resources Commission staff. The benchmark assessment produced new BRPs and annual harvest quota to prevent overfishing. The model was most recently updated in 2016 with catch and index data through 2014. Based on results of the 2016 update, and in comparison to the BRPs below, A-R Atlantic striped bass are not overfished and are not experiencing overfishing.

	F	Female SSB	Total Allowable Landings (TAL)
Threshold	0.41	772,588 lbs.	275,000 lb (split evenly between recreational and commercial sectors)
Target	0.33	965,735 lbs.	

In 2014, female SSB was estimated at 2,024,583 pounds which is above the peak in 2003 and the highest value in the time series (1982-2014; Figure 3). In 2014, F was estimated at 0.06 which is below both the F threshold and target (Figure 4). Caution should be used, however, when evaluating the estimate of SSB and F in the last year of the assessment. The estimated SSB value in 2014 is the largest value in the entire time series and is likely an overestimate, based on past years of retrospective bias exhibited by the model. Subsequent assessments, incorporating additional years of data and possibly a revised stock-recruit relationship, may reduce the magnitude of the 2014 value. (Flowers, J., et al. 2016). A-R striped bass experienced a period of unusually strong recruitment (number of age-1 fish entering the population) from 1994-2001 followed by a period of lower recruitment from 2002-2013 and higher recruitment again in 2014 and 2015 (Figure 1).

Overall, the trends in the A-R stock abundance are quite similar to the Atlantic striped bass stocks described above, with a steady decline in female SSB since about 2003. Total stock abundance reached its peak in the late 1990s, declined gradually through about 2005 and peaking again in 2012 before declining again. A new benchmark A-R stock assessment with data through 2016 is currently underway and is scheduled to be completed at the end of 2018.

III. Status of the Fishery

Chesapeake Bay and Coastal Atlantic Striped Bass Fisheries

In 2016, total Atlantic striped bass removals (i.e., commercial and recreational harvest plus dead discards, excluding harvest from the A-R stock) was estimated at 3.58 million fish, which is a 19% increase relative to 2015. In 2016, total striped bass commercial and recreational harvest (excluding harvest from the A-R) was estimated at 24.7 million pounds or 2.14 million fish, which is a 7% increase by weight and a 9% increase by number relative to 2015 (Table 1 and Figure 5). In 2016, the commercial and recreational fisheries harvested 20 and 80%, respectively by weight, and 29 and 71% by number.

In 2016, the commercial fishery (coastal and Chesapeake Bay combined) harvested 4.82 million pounds or 614,469 fish, which is 8,988 less fish than that harvested in 2015, but only a slight decrease from 2015 by weight (2,794 pounds) indicating an increase in the average weight of fish harvested in 2016 relative to 2015 (Table 2 and Table 3; Figure 6). The Chesapeake Bay jurisdictions accounted for 62% of 2016 commercial landings by weight; Maryland landed 30%, Virginia landed 22%, and PRFC landed 10%. Additional landings came from Massachusetts (19%), New York (12%), Rhode Island (4%), and Delaware (3%). Total commercial dead discards were estimated at 404,815 fish, which is below average for the last 10 years (Table 6). It is important to note, however, that commercial discard estimates are based on the ratio of tags returned from the recreational fishery to those from the commercial fishery and continue to be a source of uncertainty in the stock assessment.

In 2016, the coastal and Chesapeake Bay combined recreational harvest (A + B1) was estimated at 19.9 million pounds or 1.52 million fish which is a 9% increase by weight and a 14% increase by number from 2015 landings (Table 4 and Table 5; Figure 7). The coastal recreational harvest was 14.7 million pounds which is 56,251 pound more than 2015 (<1% increase). The Chesapeake Bay-wide recreational harvest was 5.15 million pounds and represents nearly a 47% increase in Chesapeake Bay harvest from 2015.

In 2016, recreational releases (B2) were estimated at 11.5 million fish which is a 37% increase from 2015 (8.40 million fish) indicating anglers released more of the fish they caught in 2016 relative to 2015 (Table 6 and Figure 7). The 2016 recreational catch estimate (13.0 million fish) is the highest estimate since 2008 (15.0 million fish) but is still 50% less than the peak in 2006. In 2016, the proportion of catch released was estimated at 88%. Using a 9% post-release mortality rate, recreational dead discards are estimated at 1.04 million fish, which is a 37% increase relative to 2015. Total recreational removals (harvest and dead discards combined) in 2016 was 2.56 million fish which is an 18% increase from 2015 (2.09 million fish). Maryland landed the largest percentage of the total recreational harvest in number of fish[1] (39%), followed by New York (19%), New Jersey (18%), Massachusetts (9%) and Virginia (7%). The remaining states each landed 4% or less of the 2016 recreational landings by number of fish (Table 4 and Table 5).

Albemarle Sound and Roanoke River Atlantic Striped Bass Fisheries

In 2016, total commercial and recreational harvest in the Albemarle Sound Management Area (ASMA) and the Roanoke River Management Area (RRMA) was 202,815 pounds (57,126 fish). Commercial harvest in the ASMA was 123,111 pounds (31,072 fish). Recreational harvest in the ASMA was 14,486 pounds (4,794 fish), and recreational harvest in the RRMA was 65,218 pounds (21,260 fish).

IV. Status of Research and Monitoring

Amendment 6 and its Addenda I-IV set the regulatory and monitoring measures for the coastwide striped bass fishery in 2016.

The management plan requires certain jurisdictions to implement fishery-dependent monitoring programs for striped bass. All jurisdictions with commercial fisheries or substantial recreational fisheries are required to define the catch and effort composition of these fisheries. Additionally, all states and jurisdictions with a commercial fishery must implement a commercial tagging program pursuant to Addendum III to Amendment 6.

The management plan also requires certain states to monitor the striped bass population independent of the fisheries. Juvenile abundance indices are required from Maine (Kennebec River), New York (Hudson River), New Jersey (Delaware River), Maryland (Chesapeake Bay tributaries), Virginia (Chesapeake Bay tributaries), and North Carolina (Albemarle Sound). Spawning stock sampling is mandatory for New York (Hudson River), Pennsylvania (Delaware River), Delaware (Delaware River),

[1] In terms of pounds of fish, New Jersey landed the largest proportion of the total recreational harvest (28%) in 2016, followed by New York (26%), Maryland (22%) and Massachusetts (10%).

Maryland (Upper Chesapeake Bay and Potomac River), Virginia (Rappahannock River and James River), and North Carolina (Albemarle Sound-Roanoke River). Amendment 6 requires NOAA Fisheries, USFWS, Massachusetts, New York, New Jersey, Maryland, Virginia, and North Carolina to continue their tagging programs, which provide data used to determine survivorship and migration patterns.

V. Status of Management Measures and Issues

Coastal Commercial Quota

In 2016, one state had a coastal commercial quota lower than their Addendum IV allocation due to quota overages in 2015 (Rhode Island exceeded its quota by 6,903 pounds resulting in an effective quota of 174,669 in 2016). In 2016, the total coastal commercial quota was 2,838,715 pounds and was not exceeded, however three states exceeded their coastal commercial allocation; Massachusetts by 68,927 pounds, Rhode Island by 32 pounds, and Virginia by 589 pounds. The 2016 commercial quotas and harvest and 2017 commercial quotas are listed in Table 7, by state.

Chesapeake Bay Quota

In 2016, per Addendum IV, the Chesapeake Bay-wide quota was 3,120,247 pounds. Shares are allocated to Maryland, the PRFC, and Virginia based on historical harvest. In 2016, the bay-wide quota was not exceeded and all bay-jurisdictions maintained harvest below its respective quota (Table 7).

Chesapeake Bay Spring Trophy Fishery

Recreational fishermen in the Chesapeake Bay are permitted to take adult migrant fish during a limited seasonal fishery, commonly referred to as the Spring Trophy Fishery. From 1993 to 2007 the fishery operated under a quota. Beginning in 2008, the Board approved non-quota management until stock assessment indicates that corrective action is necessary to reduce F on the coastal stock. The Spring Trophy Fishery is managed via bag limits and size restrictions. In 2016, the estimate of migrant fish harvested during the trophy season was 74,349 fish (74,139 fish in Maryland and 210 fish in Virginia) and represents a twofold increase from the 2015 estimate of 30,779 fish (2016 and 2017 state compliance reports).

Wave-1 Recreational Harvest Estimates

Evidence suggests that North Carolina, Virginia, and possibly other states have had sizeable wave-1 (January/February) recreational striped bass fisheries beginning in 1996 (NEFSC 2013b). The Marine Recreational Information Program (MRIP), formerly the Marine Recreational Fisheries Statistics Survey (MRFSS), has sampled for striped bass in North Carolina during wave-1 since 2004. Other states are not currently covered during wave-1.

However, striped bass distributions on their overwintering grounds during December through February has changed significantly since the mid-2000s. The migratory portion of the stocks has been well offshore in the EEZ (>3 miles) effecting both Virginia's and North Carolina's striped bass winter ocean fisheries in recent years. Furthermore, North Carolina has reported zero striped bass landings during wave-1 in the ocean for 2012-2016.

Addendum II: Juvenile Abundance Index Analysis
Amendment 6 requires the following states to conduct striped bass young-of-year juvenile abundance index (JAI) surveys on an annual basis: Maine for the Kennebec River; New York for the Hudson River; New Jersey for the Delaware River; Maryland for the Maryland Chesapeake Bay tributaries; Virginia for the Virginia Chesapeake Bay tributaries; and North Carolina for the A-R stock.

The PRT (including members of the TC) annually reviews trends in all required JAIs. Per Addendum II to Amendment 6, recruitment failure is defined as a value that is below 75% (the first quartile, or Q1) of all values in a fixed time series appropriate to each JAI. If any survey's JAI falls below their respective Q1 for three consecutive years, then appropriate action should be recommended by the TC to the Management Board. The Management Board is the final arbiter in all management decisions.

For the 2017 review of JAIs, the analysis evaluates the 2014, 2015, and 2016 JAI values. No state's JAI met the criteria for recruitment failure (Figure 8). Maine's JAI was below the Q1 threshold in 2015, near the long-term average in 2014, and slightly below average in 2016. New York's 2016 JAI value was below the Q1 threshold, but the JAI was slightly above average in 2014 and 2015. New Jersey's JAI was above average in 2014 and 2016, but was below average in 2015. Maryland's JAI was below the Q1 threshold in 2016, well above average in 2015 (the 2015 value is the 7^{th} highest in the time series), and slightly below average in 2014. Virginia's JAI was below average in 2016 and slightly above average in 2015 and 2014. North Carolina's JAI for the A-R stock was slightly below average in 2016 but well above average in 2015 and 2014.

Addendum III: Commercial Fish Tagging Program
Addendum III to Amendment 6 includes compliance requirements for monitoring commercial fishery tagging programs. In 2016, The PRT determined that all states implemented commercial tagging programs consistent with the requirements of Addendum III. Table 10 describes commercial tagging program requirements by state.

Albemarle-Roanoke Striped Bass FMP
The Interstate FMP for Atlantic Striped Bass requires North Carolina to inform the Commission of changes to striped bass management in the Albemarle Sound/Roanoke River (A-R) System. North Carolina must adhere to the compliance criteria in Amendment 6. After review, the PRT determined that North Carolina's FMP is consistent with the mandatory components of Amendment 6.

Estuarine striped bass in North Carolina are currently managed under Amendment 1 to the North Carolina Estuarine Striped Bass Fishery Management Plan (FMP) and its subsequent revision (NCDMF 2014). It is a joint plan between the North Carolina Marine Fisheries Commission (NCMFC) and the North Carolina Wildlife Resources Commission (NCWRC). Amendment 1, adopted in 2013, lays out separate management strategies for the Albemarle Sound-Roanoke Rive (A-R) stock and the estuarine (non-migratory) Central and Southern striped bass stocks in the Tar/Pamlico, Neuse, and Cape Fear rivers. Management programs in Amendment 1 utilize annual total allowable landings (TAL), daily possession limits, open and closed harvest seasons, gill net mesh size and yardage restrictions, seasonal attendance requirements, barbless hook requirements in some areas, minimum size limits, and slot limits to maintain a sustainable harvest and reduce regulatory discard mortality in all sectors.

Amendment 1 also maintains the stocking regime in the central and southern systems and the harvest moratorium on striped bass in the Cape Fear River and its tributaries (NCDMF 2013). Striped bass fisheries in the Atlantic Ocean of North Carolina are managed under ASMFC's Amendment 6 and subsequent addenda to the Interstate FMP for Atlantic Striped Bass.

Law Enforcement Reporting

States are asked to report and summarize law enforcement cases that occurred the previous season in annual compliance reports. In 2016, reported law enforcement cases (e.g., the number of warnings and citations) were similar to those reported in 2015. The most common violations were recreationally harvested fish under the legal size limit and possessing fish in excess of the bag limit.

VI. Annual State Compliance and Plan Review Team Recommendations

The following regulatory changes occurred in 2016:

- Maryland: effective June 1, 2016, the ocean recreational fishery bag and size limit changed from one fish at 28" minimum size to two fish at 28-38" total length slot size limit, or greater than 44", through conservation equivalency.

In 2016, and based on the annual state compliance reports, the PRT determined that each state and jurisdiction implemented a management program consistent with the requirements of Amendment 6 and addenda I-IV (Table 11). Refer to Table 8 and Table 9 for 2016 striped bass fishing regulations by state.

Amendment 6 includes compliance requirements for monitoring programs (summarized in *Section IV*). Compliance with these requirements is summarized in Table 11. The PRT determined that each state and jurisdictions carried out the required monitoring programs in the 2016 fishing year. No monitoring program changes were documented in the 2017 compliance reports, or provided via personal communication.

Addendum III to Amendment 6 includes compliance requirements for monitoring commercial fishery tagging programs. The PRT determined that all states and jurisdictions with commercial striped bass fisheries implemented a commercial tagging program consistent with the requirements of Addendum III. Table 10 describes each state's program requirements.

VII. Research Recommendations

The following categorized and prioritized research recommendations were developed by the 2013 Benchmark Stock Assessment Subcommittee and the 57th SARC:

Fishery-Dependent Priorities

High

- Continue collection of paired scale and otolith samples, particularly from larger striped bass, to facilitate development of otolith-based age-length keys and scale-otolith conversion matrices.[1]

Moderate

- Develop studies to provide information on gear specific discard morality rates and to determine the magnitude of bycatch mortality.[2]
- Improve estimates of striped bass harvest removals in coastal areas during wave 1 and in inland waters of all jurisdictions year round.
- Evaluate the percentage of fishermen using circle hooks.[3]

<u>Fishery-Independent Priorities</u>

Moderate

- Develop a refined and cost-efficient, fisheries-independent coastal population index for striped bass stocks.
    - The PRT recommends the SBTC be tasked with exploring whether the Cooperative Winter Tagging Cruise, NEAMAP, and/or NMFS Trawl Survey datasets would prove useful in this respect.

<u>Modeling / Quantitative Priorities</u>

High

- Develop a method to integrate catch-at-age and tagging models to produce a single estimate of F and stock status.[4]
- Develop a spatially and temporally explicit catch-at-age model incorporating tag based movement information.[5]
    - The PRT recommends that the SAS be tasked with reviewing recent published literature examining tag-based movement information to see if they would contribute to the development of such a model (e.g., Callihan et al. 2014)
- Review model averaging approach to estimate annual fishing mortality with tag based models. Review validity and sensitivity to year groupings.[6]
- Develop methods for combining tag results from programs releasing fish from different areas on different dates.
- Examine potential biases associated with the number of tagged individuals, such as gear specific mortality (associated with trawls, pound nets, gill nets, and electrofishing), tag induced mortality, and tag loss.[7]
- Develop field or modeling studies to aid in estimation of natural mortality or other factors affecting the tag return rate.

Moderate

- Develop maturity ogives applicable to coastal migratory stocks.
- Examine methods to estimate annual variation in natural mortality.[8]
- Develop reliable estimates of poaching loss from striped bass fisheries.
- Improve methods for determining population sex ratio for use in estimates of SSB and biological reference points.
- Evaluate truncated matrices and covariate based tagging models.

Low

- Examine issues with time saturated tagging models for the 18 inch length group.
- Develop tag based reference points.

Life History, Biological, and Habitat Priorities
High

- Continue in-depth analysis of migrations, stock compositions, etc. using mark-recapture data.[9]
- Continue evaluation of striped bass dietary needs and relation to health condition.[10]
- Continue analysis to determine linkages between the mycobacteriosis outbreak in Chesapeake Bay and sex ratio of Chesapeake spawning stock, Chesapeake juvenile production, and recruitment success into coastal fisheries.

Moderate

- Examine causes of different tag based survival estimates among programs estimating similar segments of the population.
- Continue to conduct research to determine limiting factors affecting recruitment and possible density implications.
- Conduct study to calculate the emigration rates from producer areas now that population levels are high and conduct multi-year study to determine inter-annual variation in emigration rates.

Low

- Determine inherent viability of eggs and larvae.
- Conduct additional research to determine the pathogenicity of the IPN virus isolated from striped bass to other warm water marine species, such as flounder, menhaden, shad, and largemouth bass.

Management, Law Enforcement, and Socioeconomic Priorities
Moderate

- Examine the potential public health trade-offs between the continued reliance on the use of high minimum size limits (28 inches) on coastal recreational anglers and its long-term effects on enhanced PCB contamination among recreational stakeholders.[11, 13]
- Evaluate striped bass angler preferences for size of harvested fish and trade-offs with bag limits.

Habitat Recommendations

- Passage facilities should be designed specifically for passing striped bass for optimum efficiency at passing this species.
- Conduct studies to determine whether passing migrating adults upstream earlier in the year in some rivers would increase striped bass production and larval survival, and opening downstream bypass facilities sooner would reduce mortality of early emigrants (both adult and early-hatched juveniles).
- All state and federal agencies responsible for reviewing impact statements and permit applications for projects or facilities proposed for striped bass spawning and nursery areas shall ensure that those projects will have no or only minimal impact on local stocks, especially natal rivers of stocks considered depressed or undergoing restoration.[11]
- Federal and state fishery management agencies should take steps to limit the introduction of compounds which are known to be accumulated in striped bass tissues and which pose a threat to human health or striped bass health.

- Every effort should be made to eliminate existing contaminants from striped bass habitats where a documented adverse impact occurs.
- Water quality criteria for striped bass spawning and nursery areas should be established, or existing criteria should be upgraded to levels that are sufficient to ensure successful striped bass reproduction.
- Each state should implement protection for the striped bass habitat within its jurisdiction to ensure the sustainability of that portion of the migratory stock. Such a program should include: inventory of historical habitats, identification of habitats presently used, specification of areas targeted for restoration, and imposition or encouragement of measures to retain or increase the quantity and quality of striped bass essential habitats.
- States in which striped bass spawning occurs should make every effort to declare striped bass spawning and nursery areas to be in need of special protection; such declaration should be accompanied by requirements of 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 area. For those agencies without water quality regulatory authority, protocols and schedules for providing input on water quality regulations to the responsible agency should be identified or created, to ensure that water quality needs of striped bass stocks are met.[12]
- ASMFC should designate important habitats for striped bass spawning and nursery areas as HAPC.
- Each state should survey existing literature and data to determine the historical extent of striped bass occurrence and use within its jurisdiction. An assessment should be conducted of those areas not presently used for which restoration is feasible.

Footnotes

- [1] The Fish and Wildlife Service has archived otolith samples from known-age (CWT-tagged), stocked fish, for which scale ages were derived as well. These fish were collected during past Cooperative Winter Tagging Cruises and the otoliths, once aged, will increase our sample size, and since these are known-age fish, will also allow an examination of extent that which reader error affects both otolith age, and scale age.
- [2] Literature search and some modeling work completed.
- [3] Work ongoing in New York through the Hudson River Angler Diary, Striped Bass Cooperative Angler Program, and ACCSP e-logbook.
- [4] Model developed, but the tagging data overwhelms the model. Issues remain with proper weighting.
- [5] Model developed with Chesapeake Bay and the rest of the coast as two fleets. However, no tagging data has been used in the model.
- [6] Work ongoing by Striped Bass Tagging Subcommittee to evaluate the best years to use for the IRCR and the periods to use for the MARK models.
- [7] Gear specific survival being examined in Hudson River.
- [8] Ongoing work by the Striped Bass Tagging Subcommittee
- [9] Ongoing through Cooperative Winter Tagging Cruise and striped bass charter boat tagging trips. See Cooperative Winter Tagging Cruise 25 Year Report, in preparation.
- [10] Plans for a stomach content collection program in the Chesapeake Bay by the Chesapeake Bay Ecological Foundation.
- [11] Ongoing in New York.
- [12] Significant habitat designations completed in the Hudson River and New York Marine Districts.
- [13] Samples collected from two size groups ($\geq$ 28 inches and 20-26 inches) in Pennsylvania and processed by the Department of Environmental Protection to compare contamination of the two size groups.

VIII. References

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IX. Tables

Tables 1 – 6 report harvest and discard estimates from 1990-2016 due to space constraints.

Table 1. Total harvest of Atlantic striped bass by sector, 1990-2016. Source: MRIP and ACCSP, 2016 estimates queried August 2 and July 28, 2017, respectively. Previous year's estimates may differ from MRIP due to routine updates. Estimates exclude inshore harvest from the A-R.

Year	Commercial Landings		Recreational (A+B1)		Total	
	Pounds	Numbers	Pounds	Numbers	Pounds	Numbers
1990	689,895	115,636	2,226,545	163,242	2,916,440	278,878
1991	1,471,703	153,798	3,643,994	262,469	5,115,697	416,267
1992	1,434,495	230,714	4,026,657	300,180	5,461,152	530,894
1993	1,749,628	312,860	5,651,079	428,719	7,400,707	741,579
1994	1,776,176	307,443	6,777,886	565,167	8,554,062	872,610
1995	3,390,937	534,914	12,425,549	1,089,182	15,816,486	1,624,096
1996	3,367,185	766,518	13,123,332	1,175,112	16,490,517	1,941,630
1997	5,882,643	1,108,612	15,714,071	1,648,127	21,596,715	2,756,739
1998	6,443,874	1,233,089	12,457,222	1,457,062	18,901,096	2,690,151
1999	6,545,102	1,103,812	13,478,473	1,446,388	20,023,575	2,550,200
2000	6,698,988	1,057,712	17,498,212	2,025,113	24,197,199	3,082,825
2001	6,235,788	952,820	19,144,159	2,085,127	25,379,947	3,037,947
2002	5,999,275	658,091	18,219,143	1,973,171	24,218,418	2,631,262
2003	7,072,686	874,817	24,771,639	2,545,052	31,844,325	3,419,869
2004	7,320,357	913,160	29,184,709	2,550,747	36,505,066	3,463,907
2005	7,134,538	973,572	30,222,991	2,441,938	37,357,529	3,415,510
2006	6,783,628	1,054,664	31,044,414	2,788,125	37,828,042	3,842,789
2007	7,050,692	1,023,358	26,994,977	2,523,500	34,045,669	3,546,859
2008	7,188,715	1,010,955	30,595,742	2,466,018	37,784,457	3,476,973
2009	7,215,818	1,043,512	22,937,526	2,040,680	30,153,344	3,084,191
2010	6,979,612	1,030,938	22,994,782	1,986,415	29,974,394	3,017,353
2011	6,783,239	931,570	27,235,091	2,230,256	34,018,330	3,161,826
2012	6,514,238	839,540	19,269,083	1,545,614	25,783,321	2,385,154
2013	5,816,204	765,797	26,411,290	2,120,768	32,227,494	2,886,565
2014	5,937,662	766,610	24,062,167	1,782,868	29,999,829	2,549,478
2015	4,820,489	620,034	18,184,192	1,338,080	23,004,681	1,958,114
2016	4,818,212	614,469	19,879,730	1,524,474	24,697,425	2,138,943
3 yr avg	**5,192,121**	**668,119**	**20,708,696**	**1,550,559**	**25,900,645**	**2,218,678**
10 yr avg	**6,312,488**	**864,962**	**23,856,458**	**1,959,688**	**30,168,894**	**2,824,650**

Table 2. Commercial harvest (pounds) of Atlantic striped bass by state, 1990-2015. Source: ACCSP, 2016 estimates queried July 28, 2017. Previous year's estimates may differ from ACCSP due to routine updates. Commercial harvest and sale prohibited in ME, NH, CT, and NJ. * includes fish taken for personal consumption. ^ North Carolina estimates are from the Atlantic Ocean only.

Year	ME	NH	MA*	RI	CT	NY	NJ	DE	MD	PRFC	VA	NC^	Total
1990			148,000	4,000		81,870		6,509	2,887	169,060	267,735	9,797	689,858
1991			235,000	28,000		105,163		21,079	191,066	216,755	668,454	6,186	1,471,703
1992			239,200	39,000		226,611		17,795	552,451	127,398	204,338	27,702	1,434,495
1993			262,600	40,000		109,362		28,032	916,764	142,742	213,665	36,463	1,749,628
1994			199,600	39,810		171,279		33,897	884,970	149,891	204,124	92,605	1,776,176
1995			782,000	113,461		500,784		38,198	856,568	198,478	557,741	343,707	3,390,937
1996			696,815	122,562		504,350		117,560	1,523,293	346,834		55,771	3,367,185
1997			785,942	96,519		460,762		165,978	2,030,061	731,114	1,153,743	458,524	5,882,643
1998			822,000	94,663		484,900		163,169	2,368,393	726,179	1,476,502	308,068	6,443,874
1999			788,171	119,679		491,790		187,096	2,377,393	653,266	1,538,220	389,454	6,545,069
2000			779,736	111,812		542,659		140,634	2,411,554	666,001	1,883,856	162,736	6,698,988
2001			815,054	129,654		633,095		198,802	1,774,758	658,676	1,675,469	350,280	6,235,788
2002			924,870	129,172		518,573		160,560	1,852,634	521,048	1,592,910	299,508	5,999,275
2003			1,055,439	246,312		753,261		188,419	1,813,727	676,574	1,856,831	482,123	7,072,686
2004			1,206,305	245,204		741,668		181,974	1,899,539	772,333	1,668,307	604,824	7,320,154
2005			1,104,737	242,303		689,821		173,815	2,055,558	533,456	1,746,247	588,601	7,134,538
2006			1,312,168	238,797		688,446		185,987	2,207,350	673,508	1,413,914	63,458	6,783,628
2007			1,040,328	240,627		729,743		188,668	2,336,886	599,261	1,534,799	380,380	7,050,692
2008			1,160,122	245,988		653,100		188,719	2,326,023	611,789	1,714,564	288,410	7,188,715
2009			1,138,291	234,368		789,891		192,311	2,394,620	727,197	1,549,145	189,995	7,215,818
2010			1,224,356	249,520		782,402		185,410	2,150,577	680,496	1,434,219	272,632	6,979,612
2011			1,163,865	228,163		854,731		188,620	1,976,473	694,151	1,434,636	242,600	6,783,239
2012			1,219,665	239,913		681,399		194,324	1,928,982	733,789	1,509,940	6,226	6,514,238
2013			1,004,459	231,280		823,801		191,424	1,755,712	623,792	1,185,736	0	5,816,204
2014			1,138,507	217,037		531,456		167,902	1,926,612	603,068	1,353,080	0	5,937,622
2015			865,753	188,475		509,135		144,068	1,471,493	536,357	1,105,208	0	4,820,489
2016			938,740	174,701		560,803		136,536	1,465,317	500,602	1,041,513	0	4,817,695

Table 3. Commercial harvest (numbers) of Atlantic striped bass by state and annual dead discard estimates, 1990-2016. Source: ACCSP, 2016 estimates queried July 28, 2017. Previous year's estimates may differ from ACCSP due to routine updates. Commercial harvest and sale prohibited in ME, NH, CT, and NJ. * includes fish taken for personal consumption. ^ North Carolina estimates are from the Atlantic Ocean only.

Year	ME	NH	MA*	RI	CT	NY	NJ	DE	MD	PRFC	VA	NC^	Total	Commercial Discards
1990			5,927	784		11,784		698	534	38,884	56,222	803	115,636	510,011
1991			9,901	3,596		15,426		3,091	31,880	44,521	44,970	413	153,798	327,167
1992			11,532	9,095		20,150		2,703	119,286	23,291	42,912	1,745	230,714	186,601
1993			13,099	6,294		11,181		4,273	211,089	24,451	39,059	3,414	312,860	347,839
1994			11,066	4,512		15,212		4,886	208,914	25,196	32,382	5,275	307,443	359,518
1995			44,965	19,722		43,704		5,565	280,051	29,308	88,274	23,325	534,914	515,454
1996			38,354	18,570		39,707		20,660	415,272	46,309	184,495	3,151	766,518	394,824
1997			44,841	7,061		37,852		33,223	706,847	87,643	165,583	25,562	1,108,612	216,745
1998			43,315	8,835		45,149		31,386	790,154	93,299	204,911	16,040	1,233,089	326,032
1999			40,838	11,559		49,795		34,841	650,022	90,575	205,143	21,040	1,103,812	236,619
2000			40,256	9,418		54,894		25,188	627,777	91,471	202,227	6,480	1,057,712	666,997
2001			40,248	10,917		58,296		34,373	549,896	87,809	148,346	22,936	952,820	310,900
2002			48,926	11,653		47,142		30,440	296,635	80,300	127,211	15,784	658,091	168,201
2003			61,262	15,497		68,354		31,531	439,482	83,091	161,777	13,823	874,817	261,974
2004			66,556	15,867		70,367		28,406	461,064	91,888	147,998	31,014	913,160	465,642
2005			65,332	14,949		70,560		26,336	569,964	80,615	119,244	26,573	973,572	798,544
2006			75,062	15,429		73,528		30,212	655,951	92,288	109,396	2,799	1,054,664	194,524
2007			57,634	13,934		78,287		31,090	598,495	86,695	140,602	16,621	1,023,358	606,599
2008			65,330	16,616		73,263		31,866	594,655	81,720	134,603	12,903	1,010,955	308,715
2009			63,875	20,725		82,574		21,590	618,076	89,693	138,303	8,675	1,043,512	611,944
2010			65,277	17,256		81,896		19,830	584,554	90,258	159,197	12,670	1,030,938	254,841
2011			63,309	14,344		87,349		20,517	490,969	96,126	148,063	10,814	931,490	617,457
2012			66,394	14,953		66,897		15,738	472,517	90,616	111,891	323	839,329	792,861
2013			62,570	13,825		76,206		17,679	399,118	78,006	117,697	0	765,101	525,581
2014			60,619	10,468		52,903		14,894	370,661	81,429	175,324	0	766,298	931,391
2015			42,250	11,325		44,809		10,990	300,929	69,981	139,750	0	620,034	299,566
2016			48,044	11,693		50,780		17,584	286,092	70,737	129,539	0	614,469	404,815

Table 4. Recreational harvest (numbers) of Atlantic striped bass by state, 1990- 2016. Source: MRIP, 2016 estimates queried August 2, 2017. Previous year's estimates may differ from MRIP due to routine updates. ^ North Carolina estimates are from the Atlantic Ocean only.

Year	ME	NH	MA	RI	CT	NY	NJ^	DE	MD	VA	NC^	Total
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	70,522	262,181	284,257	3,101	406,371	94,473	0	1,338,080
2016	10,557	4,325	131,793	58,247	48,830	290,423	271,451	2,442	595,902	110,504	0	1,524,474

Table 5. Recreational harvest (pounds) of Atlantic striped bass by state, 1990-2016. Source: MRIP, 2016 estimates queried August 2, 2017. Previous year's estimates may differ from MRIP due to routine updates. ^ North Carolina estimates are from the Atlantic Ocean only.

Year	ME	NH	MA	RI	CT^	NY	NJ^	DE	MD	VA	NC	Total
1990	60,483	11,363	319,092	73,349	193,011	505,440	588,974	18,115	12,967	443,751	0	2,226,545
1991	58,177	6,731	440,605	496,723	125,309	1,053,589	643,571	25,501	456,954	333,743	3,091	3,643,994
1992	107,693	44,612	972,116	203,109	196,278	921,201	746,343	25,677	613,174	187,852	8,602	4,026,657
1993	11,953	28,115	1,113,446	292,428	400,067	1,575,938	874,296	52,540	794,853	505,742	1,701	5,651,079
1994	66,451	66,017	1,686,049	109,817	355,829	1,974,759	438,080	63,832	1,096,409	870,140	50,503	6,777,886
1995	45,933	67,992	1,504,390	436,058	671,647	3,296,025	3,141,222	175,347	2,057,450	955,822	73,663	12,425,549
1996	44,802	102,271	1,291,706	950,973	915,418	4,809,381	1,736,508	281,481	1,560,389	1,340,414	89,989	13,123,332
1997	185,178	206,904	2,891,970	927,919	920,465	4,449,564	821,784	232,186	1,962,947	2,813,471	301,683	15,714,071
1998	178,584	114,342	2,973,456	671,841	989,923	2,318,291	1,333,329	236,926	1,908,344	1,581,560	150,626	12,457,222
1999	98,623	84,255	1,822,818	886,666	824,031	3,171,344	3,342,372	100,541	1,137,940	1,741,857	268,026	13,478,473
2000	269,325	71,370	2,618,216	1,160,304	515,962	4,050,569	4,286,040	346,905	2,100,854	2,005,721	72,946	17,498,212
2001	290,233	223,072	3,644,561	1,138,974	628,044	2,996,805	5,341,867	382,498	2,072,943	2,140,713	284,449	19,144,159
2002	383,270	152,342	4,304,883	1,192,295	600,482	2,813,596	4,133,678	299,561	1,423,515	2,648,115	267,406	18,219,143
2003	253,910	281,549	5,120,554	1,502,455	1,537,899	4,687,685	4,545,515	303,909	2,975,437	2,789,745	772,981	24,771,639
2004	226,200	98,995	6,112,746	1,386,138	1,617,561	3,727,105	5,548,167	330,623	2,347,752	2,956,310	4,833,112	29,184,709
2005	381,058	281,114	5,097,821	1,732,581	2,173,638	5,537,432	5,958,454	286,777	4,612,417	1,996,840	2,164,859	30,222,991
2006	323,355	179,181	4,832,355	999,300	2,030,878	6,028,409	7,067,533	260,134	3,868,944	3,694,529	1,759,796	31,044,414
2007	232,328	68,142	5,136,580	1,584,354	1,468,499	7,913,817	3,718,451	99,800	3,504,041	2,392,258	876,707	26,994,977
2008	271,768	73,807	5,763,763	751,507	1,868,335	10,925,408	4,696,090	333,149	2,728,048	2,657,976	525,891	30,595,742
2009	329,064	113,705	4,786,895	1,123,434	835,970	5,004,604	4,238,319	275,410	4,278,145	1,791,058	160,922	22,937,526
2010	104,117	67,409	4,270,401	1,096,369	1,259,008	6,997,089	5,382,743	251,853	2,630,802	481,147	453,844	22,994,782
2011	91,705	370,798	3,504,522	1,257,302	758,623	8,969,762	6,197,026	241,149	2,640,309	1,160,914	2,042,981	27,235,091
2012	57,509	163,804	5,489,928	851,460	815,545	6,540,024	2,376,866	360,106	1,260,490	1,353,351	0	19,269,083
2013	102,437	233,039	4,193,416	3,043,251	2,286,969	8,624,422	4,945,069	253,062	2,203,319	526,306	0	26,411,290
2014	100,213	78,310	4,397,183	2,161,265	1,783,224	7,552,788	4,133,460	107,421	3,251,151	497,152	0	24,062,167
2015	63,878	30,614	2,701,724	798,394	1,262,377	4,620,923	5,145,204	34,808	3,095,910	430,360	0	18,184,192
2016	128,324	45,719	2,048,238	1,001,147	799,458	5,188,892	5,476,495	40,602	4,312,637	838,218	0	19,879,730

Table 6. Commercial Discards, Recreational Releases and Recreational Dead Discards (numbers) of Atlantic striped bass by state, 1990-2016. Source: MRIP, 2016 estimates queried August 2, 2017. Previous year's estimates may differ from MRIP due to routine updates. Estimates exclude inshore harvest from the A-R.

Year	Commercial Dead Discards	Recreational Releases (B2)	Recreational ^ Dead Discards	Total Dead Discards	%Com	%Rec
1990	510,011	1,653,594	148,823	658,834	77%	23%
1991	327,167	3,061,047	275,494	602,661	54%	46%
1992	186,601	3,367,397	303,066	489,667	38%	62%
1993	347,839	4,344,569	391,011	738,850	47%	53%
1994	359,518	7,930,839	713,776	1,073,293	33%	67%
1995	515,454	9,743,862	876,948	1,392,401	37%	63%
1996	394,824	12,288,668	1,105,980	1,500,804	26%	74%
1997	216,745	15,718,341	1,414,651	1,631,396	13%	87%
1998	326,032	14,928,367	1,343,553	1,669,585	20%	80%
1999	236,619	12,514,721	1,126,325	1,362,944	17%	83%
2000	666,997	16,808,809	1,512,793	2,179,790	31%	69%
2001	310,900	13,444,497	1,210,005	1,520,905	20%	80%
2002	168,201	13,693,056	1,232,375	1,400,577	12%	88%
2003	261,974	14,611,333	1,315,020	1,576,994	17%	83%
2004	465,642	17,053,333	1,534,800	2,000,442	23%	77%
2005	798,544	18,078,899	1,627,101	2,425,645	33%	67%
2006	194,524	23,343,299	2,100,897	2,295,421	8%	92%
2007	606,599	16,110,023	1,449,902	2,056,501	29%	71%
2008	308,715	12,510,987	1,125,989	1,434,704	22%	78%
2009	611,944	7,970,813	717,373	1,329,317	46%	54%
2010	254,841	6,258,081	563,227	818,068	31%	69%
2011	617,457	5,932,480	533,923	1,151,380	54%	46%
2012	792,861	5,191,891	467,270	1,260,131	63%	37%
2013	525,581	8,539,986	768,599	1,294,180	41%	59%
2014	931,391	7,282,547	655,429	1,586,820	59%	41%
2015	299,566	8,397,456	755,771	1,055,337	28%	72%
2016	404,815	11,503,542	1,035,319	1,440,134	28%	72%
3 yr avg	**545,257**	**9,061,182**	**815,506**	**1,360,764**	**38%**	**62%**
10 yr avg	**535,377**	**8,969,781**	**807,280**	**1,342,657**	**40%**	**60%**

^ Dead discards are estimated by multiplying the number of released fish by a mortality rate of 9%.

Table 7. Commercial Quotas, Harvests, Overages, and Adjusted Quotas (in pounds)
Source: ACCSP, queried July 28, 2017.

Atlantic Coast					
State	**Add IV Quota†**	**2016 Quota**	**2016 harvest**	**overage**	**2017 Quota**
Maine *	188	188	-		188
New Hampshire *	4,313	4,313	-		4,313
Massachusetts	869,813	869,813	938,740	68,927	800,886
Rhode Island	182,719	174,669	174,701	32	181,540
Connecticut **	17,813	17,813	-		17,813
New York	795,795	795,795	560,803		795,795
New Jersey **	241,313	241,313	-		241,313
Delaware	145,085	145,085	136,536		145,085
Maryland	98,670	90,727	32,636		90,727
Virginia	138,640	138,640	139,229	589	138,051
North Carolina ^	360,360	360,360	0		360,360
Coastal Total	**2,854,706**	**2,838,715**	**1,982,645**	**69,548**	**2,776,070**
Chesapeake Bay					
Jurisdiction	**Add IV Quota**	**2016 Quota**	**2016 harvest**	**overage**	**2017 Quota**
Maryland	1,471,888	1,471,888	1,432,681		1,471,888
Virginia	1,064,997	1,064,997	902,284		1,064,997
PRFC	583,362	583,362	500,602		583,362
Chesapeake Bay Total	**3,120,247**	**3,120,247**	**2,835,567**		**3,120,247**
Total Commercial	**5,974,953**	**5,965,864**	**4,818,212**		**5,896,317**

* Commercial harvest/sale prohibited, with no re-allocation of quota.
** Commercial harvest/sale prohibited, with re-allocation of quota to the recreational fishery.
^ North Carolina estimates are from the Atlantic Ocean only.
† 25% reduction from Amendment 6 quota allocations. Quota reduced through conservation equivalency for MD (90,727 lbs) and RI (181,572 lbs)

Table 8. Summary of Atlantic Striped bass <u>commercial</u> regulations in 2016. Source: Annual State Compliance Reports. Minimum sizes and slot size limits are in total length (TL). *commercial quota reallocated to recreational bonus fish program

STATE	SIZE LIMITS	SEASONAL QUOTA	OPEN SEASON
ME	Commercial fishing prohibited		
NH	Commercial fishing prohibited		
MA	34” minimum size	869,813 lbs. Hook & line only	6.23 until quota reached, Monday and Thursdays only; 15 fish/day with commercial boat permit; 2 fish/day with rod and reel permit (striped bass endorsement required for both permits)
RI	Floating fish trap: 26” minimum size General category (mostly rod & reel): 34” min.	Total: 181,572 lbs., split 39:61 between the trap and general category. Gill netting prohibited.	Trap: 4.1 – 12.31, or until quota reached; unlimited possession limit until quota reached General Category: 5.29-8.31, 9.8-12.31, or until quota reached. Closed Fridays and Saturdays during both seasons. 5 fish/vessel/day possession limit.
CT*	Commercial fishing prohibited; bonus program: 22 – <28” slot size limit, 5.1 – 12.31 (voucher required)		
NY	28-38” minimum size (Hudson River closed to commercial harvest)	795,795 lb. Pound nets, gill nets (6-8”stretched mesh), hook & line.	6.1 – 12.15, or until quota reached. Limited entry permit only.
NJ*	Commercial fishing prohibited; bonus program: 1 fish at 24 – <28” slot size limit, 5.1 – 12.31 (permit required)		
PA	Commercial fishing prohibited		
DE	Gillnet: 20” min in DE Bay/River during spring season. 28” in all other waters/seasons. Hook and Line: 28” min	Gillnet: 137,831 lbs. Hook and line: 14,509 lbs.	Gillnet: 2.15-5.31 (2.15-3.30 for Nanticoke River) & 11.15-12.31; drift nets only 2.15-28 & 5.1-31; no fixed nets in DE River. No trip limit. Hook and Line: 4.1–12.31, 200 lbs/day trip limit

(Table 8 continued – Summary of commercial regulations in 2016)

STATE	SIZE LIMITS	SEASONAL QUOTA	OPEN SEASON
MD	Bay and Rivers: 18–36" Ocean: 24" minimum	Bay and River: 1,471,888 lbs. (part of Bay-wide quota). Gear specific quotas and landing limits. Ocean: 90,727 lbs.	Bay Pound Net: 6.1-12.31, Mon-Sat Bay Haul Seine: 6.1-12.30, Mon-Fri Bay Hook & Line: 6.1-12.29, Mon-Thu Bay Drift Gill Net: 1.1-2.29, 12.1-12.31, Mon-Thu Ocean: 1.1-5.31, 10.1-12.31, Mon- Fri
PRFC	18" min all year; 36" max 2.15–3.25 (1.1-3.1 for H&L fisheries)	583,362 lbs (part of Bay-wide quota). Allocated by gear and season.	Hook & line: 1.1-3.1, 6.1-12.31 Pound Net & Other: 2.15-3.25, 6.1-12.15 Gill Net: 1.1-3.25, 11.9-12.31 Misc. Gear: 2.15-3.25, 6.1-12.15
DC	Commercial fishing prohibited		
VA	Bay and Rivers: 18" min, and 28" max size limit 3.26–6.15 Ocean: 28" min	Bay and Rivers: 1,064,997 lbs Ocean: 138,640 lbs. (ITQ- system for both areas)	Bay and Rivers: 1.16-12.31 Ocean: 1.16-12.31
NC	Ocean: 28"	360,360 lbs. (split between gear types). Number of fish allocated to each permit holder. Allocation varies by permit.	Seine fishery was open for 120 days, 150 fish/permit Gill net fisher was open for 45 days, 50 fish/permit Trawl fishery was open for 70 days, 100 fish/permit

Table 9. Summary of Atlantic Striped bass recreational regulations in 2016. Source: Annual State Compliance Reports. Minimum sizes and slot size limits are in total length (TL).

STATE	SIZE LIMITS	BAG LIMIT	GEAR RESTRICTIONS	OPEN SEASONS
ME	≥ 28” minimum size	1 fish/day	Hook & line only; circle hooks only when using live bait	All year, except spawning areas are closed 12.1 – 4.30 and catch and release only 5.1 – 6.30
NH	≥ 28” minimum size	1 fish/day	Gaffing and culling prohibited	All year
MA	≥ 28” minimum size	1 fish/day	Hook & line only; no high-grading	All year
RI	≥ 28” minimum size	1 fish/day	None	All year
CT	≥ 28” minimum size	1 fish/day	Spearing and gaffing prohibited	All year
NY	Ocean and Delaware River: 28” minimum size Hudson River: 18-28” slot limit, or ≥40”	1 fish/day	Angling only. Spearing permitted in ocean waters. Catch and release only during closed season.	Ocean: 4.15 – 12.15 Hudson River: 4.1 – 11.30 Delaware River: All year
NJ	1 fish at 28 to < 43”, and 1 fish ≥ 43”			Closed 1.1 – 2.28 in all waters except in the Atlantic Ocean, and 4.1 – 5.31 in the lower Delaware River and tributaries (spawning ground closure)
PA	Upstream from Calhoun St Bridge: 1 fish at ≥ 28” minimum size Downstream from Calhoun St Bridge: 1 fish at ≥ 28” minimum size, from 4.1 – 5.31, a 2 fish at 21-25” slot size limit			
DE	28” min, no harvest 38-43” (inclusive). In Del. River, Bay & tributaries, may only harvest 20-25”slot from 7.1-8.31	2 fish/day	Hook & line, spear (for divers) only. Circle hooks required in spawning season.	All year except 4.1-5.31 in spawning grounds (catch & release allowed).

(Table 9 continued – Summary of recreational regulations in 2016)

STATE	SIZE LIMITS	BAG LIMIT	OTHER	OPEN SEASON
MD	Ocean: 28” min^ Bay Trophy: 28 to ≤36” slot, OR ≥40” Bay Summer/Fall: (2) 20-28” slot OR (1) 20-28” slot, (1) > 28” minimum size	Ocean: 1 fish/day Bay Trophy: 1 fish/day Bay Summer/Fall: 2 fish/day	See compliance report for specifics.	Ocean: All year Bay SF: 1.1-5.3 Bay Spring (C&R): 3.1-4.15 Bay Trophy: 4.16-5.15 Bay Summer/Fall: 5.16-12.20
PRFC	Spring Trophy: 35” minimum size limit Summer/Fall: 20” min with 1 fish >28”	Trophy: 1 fish Summer/Fall: 2 fish	No more than two hooks or sets of hooks for each rod or line	Spring Trophy: 4.16 -5.15 Summer/Fall: 5.16-12.31
DC	2 fish at ≥ 20” minimum, only one fish >28”		Hook & line only	5.16-12.31
VA	Ocean: 28” Bay/Coastal Trophy: 36” min (28” max in tribs) CB Spring: 20-28”; only 1 fish can be >36” CB Spring: 20-28”; only 1 fish can be >28”	Ocean: 1 fish/day Bay/Coast Trophy: 1 fish/day Bay Spring/Fall: 2 fish/day	Hook & line, rod & reel, hand line only. Gaffing is illegal in Virginia marine waters.	Ocean: 1.1-3.31, 5.16-12.31 Bay/Tribs Trophy: 5.1-6.15 Coastal Trophy: 5.1-5.15 Bay Spring: 5.16-6.15 Bay Fall: 10.4-12.31
NC	Ocean: 28” min size	Ocean: 1 fish/day	No gaffing allowed.	Ocean: All year

^ 2 fish at 28-38” slot size limit, or >44”, effective June 1

Table 10. Status of Commercial Tagging Programs by state for 2016.

State	Number of Participants	Number of Tags Issued	Number of Tags Used	Point of Tag (sale/harvest)	[1]Biological Metric (Y/N)	Year, State and Unique ID on Tag (Y/N)	Size Limit on Tag (Y/N)	Number of Tag Colors and Tag Color by Gear, season, or area	Annual Tag Color Change (Y/N)
MA	110	65,120	48,044	Sale	Y	Y	Y	one tag color	Y
RI	30	14,290	11,617	Sale	Y	Y	N	two tag colors by gear	Y
NY	437	70,400	49,326	Harvest	Y	Y	N	One tag color	Y
DE*	111 (gill net) 117 (H&L)	41,615	17,584	Both	Y	Y	N	Harvest: two tag colors by gear Sale: one tag color	Y
MD	1052	460,610	328,495	Harvest	Y	Y	N	Three tag colors by gear and permit	Y
PRFC	350	77,585	70,737	Harvest	Y	Y	N	Five tag colors by gear	N
VA	405	153,500	139,750	Harvest	Y	Y	Y	two tag colors by area	Y
NC	92	40,486	29,706	Sale	Y	Y	Y	Three tag colors by area	N

[1] States are required to allocate commercial tags to permit holders based on a biological metric. Most states used the average weight per fish from the previous year, or some variation thereof. Actual biological metric used is to be included in State Annual Commercial Tag Reports.
* the number of tags issued represent the combined total from tags used by harvesters and weigh stations, such that each fish has two tags

Table 11. Status of compliance with monitoring and reporting requirements in 2016. JAI = juvenile abundance index survey, SSB = spawning stock biomass survey, tag = participation in coastwide tagging program, Y = compliance standards met, N = compliance standards not met, NA = not applicable, R = recreational, C = commercial

Jurisdiction	Fishery-independent monitoring		Fishery-dependent monitoring		Annual reporting
	Requirement(s)	Status	Requirement(s)	Status	Status
ME	JAI	Y	composition, catch and effort (R)	NA	Y
NH	NA	NA	composition, catch and effort (R)	NA	Y
MA	tag	Y	composition, catch & effort (C&R), tag program	Y	Y
RI	NA	NA	composition (C&R), catch & effort (R), tag program	Y	Y
CT	NA	NA	composition, catch & effort (R)	Y	Y
NY	JAI, SSB, tag	Y	composition, catch & effort (C&R), tag program	Y	Y
NJ	JAI, tag	Y	composition, catch & effort (R)	Y	Y
PA	SSB	Y	composition, catch and effort (R)	NA	Y
DE	SSB, tag	Y	composition, catch & effort (C), tag program	Y	Y
MD	JAI, SSB, tag	Y	composition, catch & effort (C&R), tag program	Y	Y
PRFC	NA	NA	composition, catch & effort (C&R), tag program	Y	Y
DC	NA	NA	composition, catch and effort (R)	NA	Y
VA	JAI, SSB, tag	Y	composition, catch & effort (C&R), tag program	Y	Y
NC	JAI, SSB, tag	Y	composition, catch & effort (C&R), tag program	Y	Y

X. Figures

Figure 1. Atlantic striped bass spawning stock biomass (SSB) and recruitment estimates (age-1 fish), and biological reference points, 1982-2015. Source: 2016 Stock Assessment Update

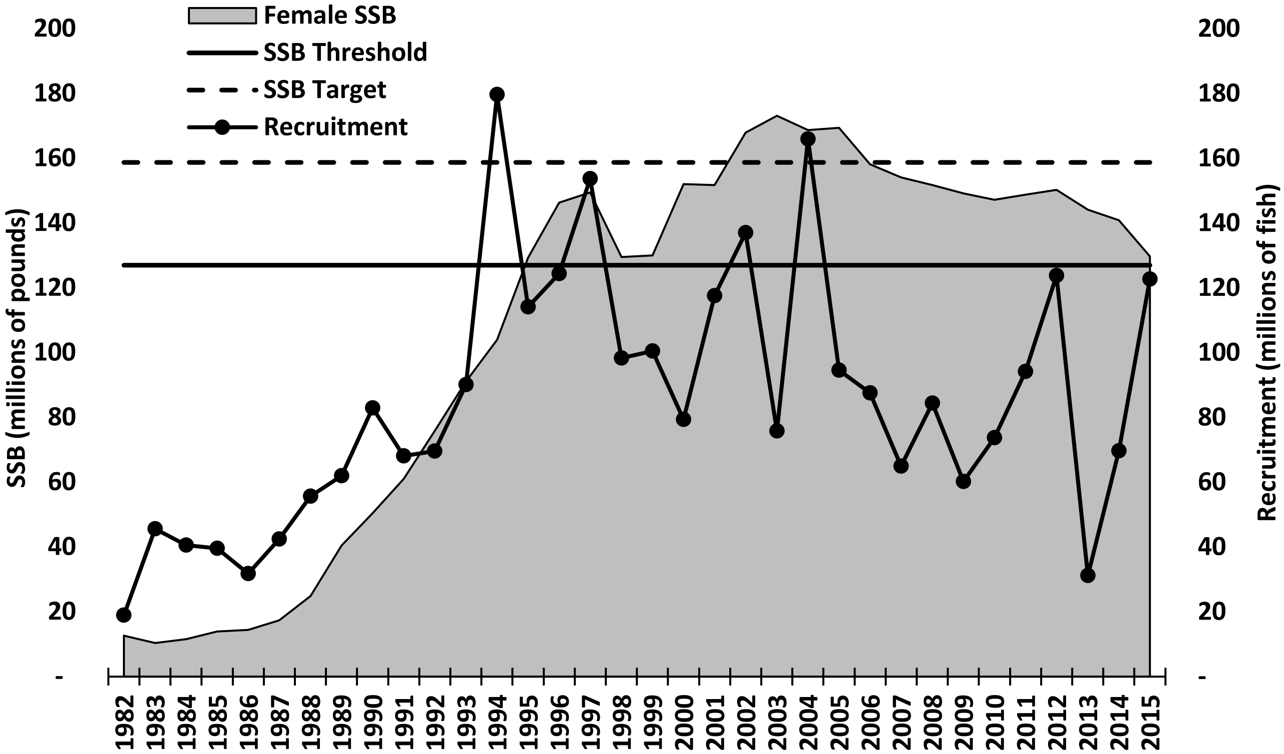


Figure 2. Atlantic striped bass fishing mortality rate (F) estimates, and biological reference points, 1983-2015. Source: 2016 Stock Assessment Update

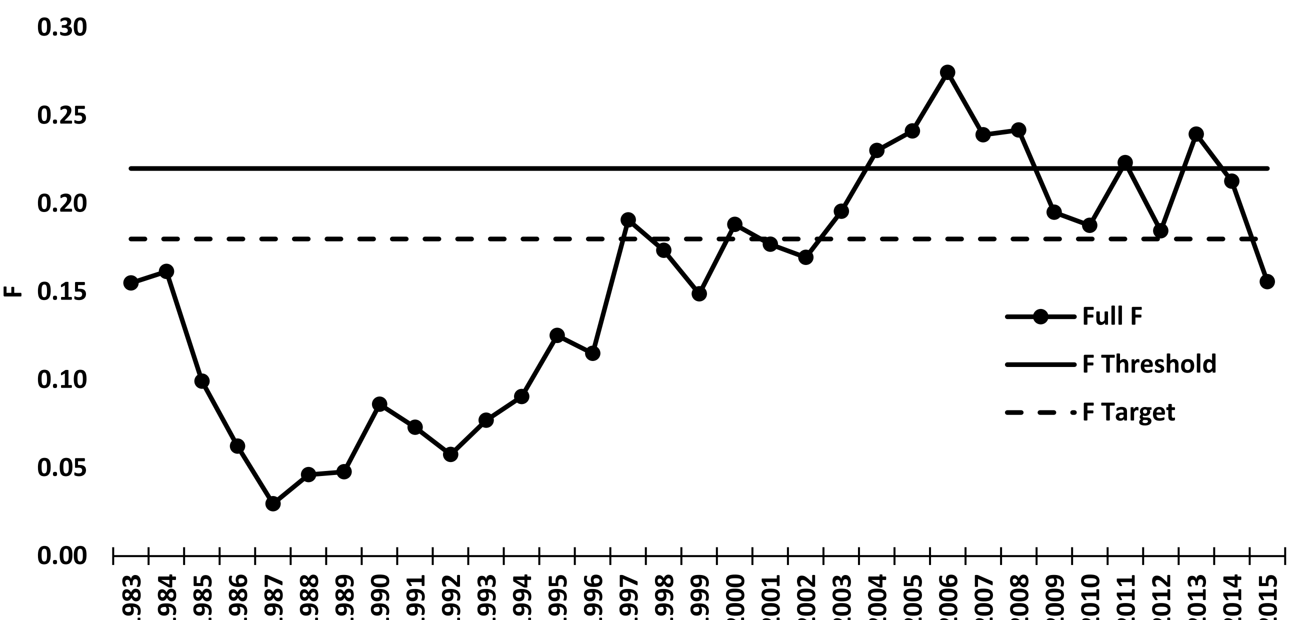


Figure 3. Albemarle/Roanoke striped bass female spawning stock biomass and recruitment (abundance of age-1), and biological reference points, 1982-2014. Source: Stock Status of Albemarle Sound-Roanoke River Striped bass, 2016

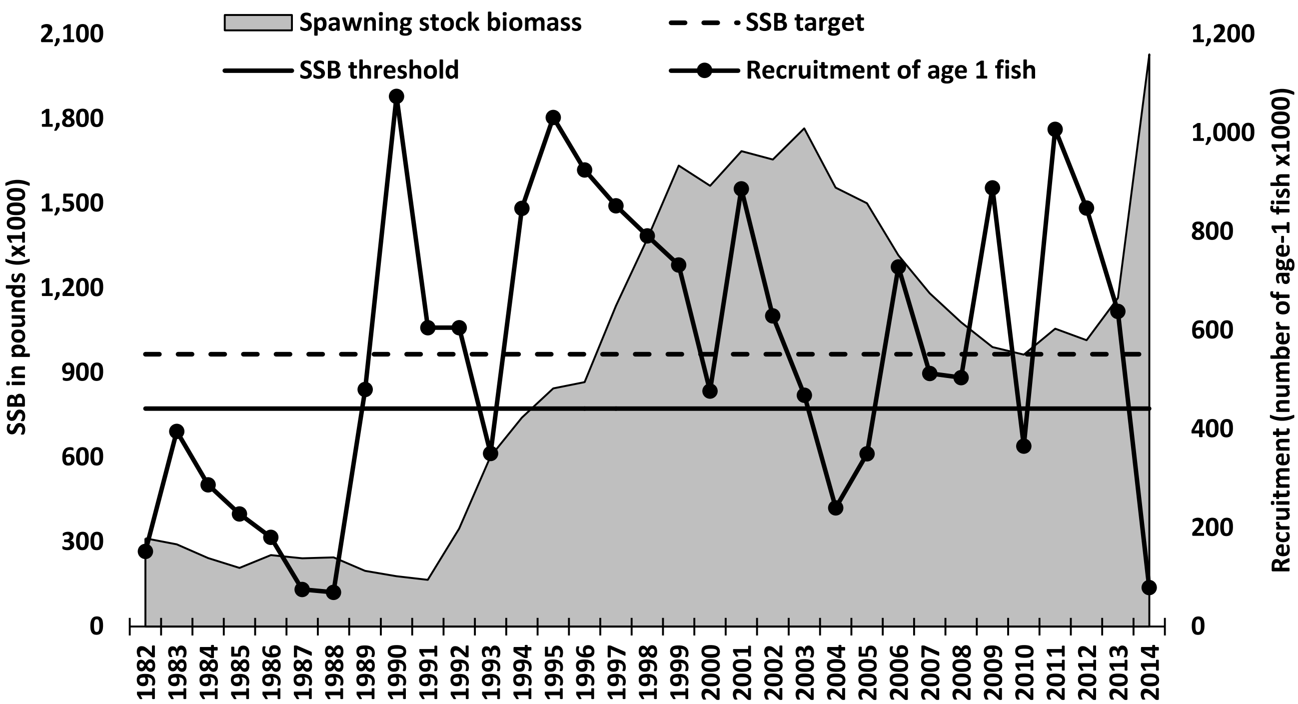


Figure 4. Albemarle-Roanoke striped bass fishing mortality (F) estimates, and biological reference points, 1982-2014. Source: Stock Status of Albemarle Sound-Roanoke River Striped bass, 2016.

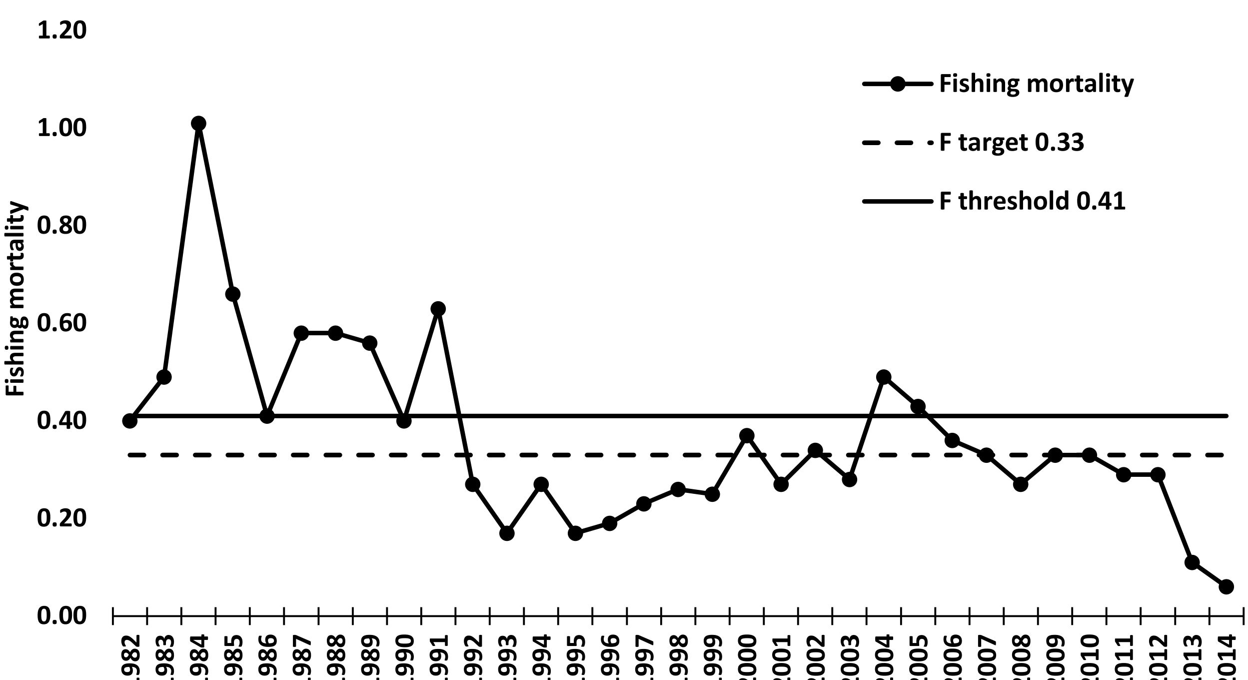


Figure 5. Total removals in millions of fish by sector, 1982-2016. Source: MRIP and ACCSP, 2016 estimates queried August 2 and July 28, 2017, respectively. Previous year's estimates may differ from MRIP due to routine updates. Estimates exclude inshore harvest from the A-R.

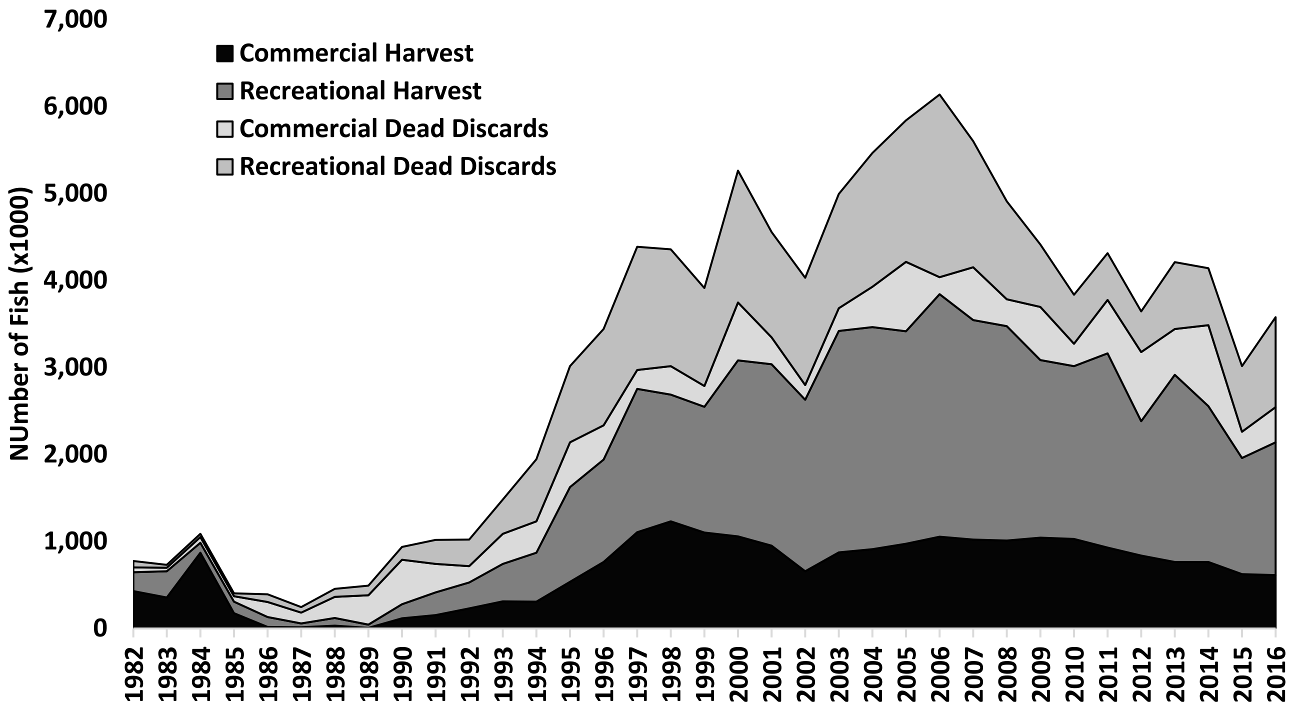


Figure 6. Commercial landings, in pounds, of migratory Striped bass, by state, 1990-2015. Source: ACCSP, 2016 estimates queried July 28, 2017. Previous year's estimates may differ from ACCSP due to routine updates. Commercial harvest and sale prohibited in ME, NH, CT, and NJ. * includes fish taken for personal consumption. NC is ocean only.

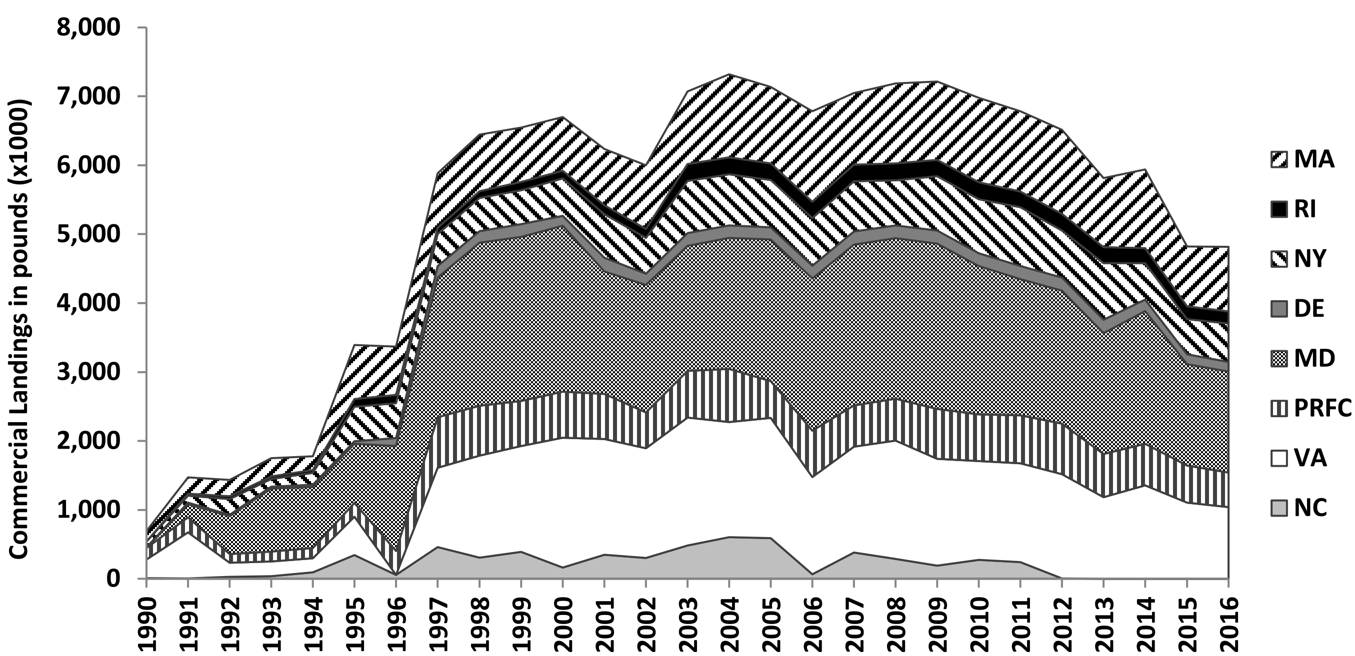


Figure 7. Recreational catch (A + B1 + B2), harvest (A + B1) and the proportion of fish released, 1982- 2015. Source: Marine Recreational Information Program (MRIP) queried June 26, 2016. Estimates may differ from MRIP depending on date queried.

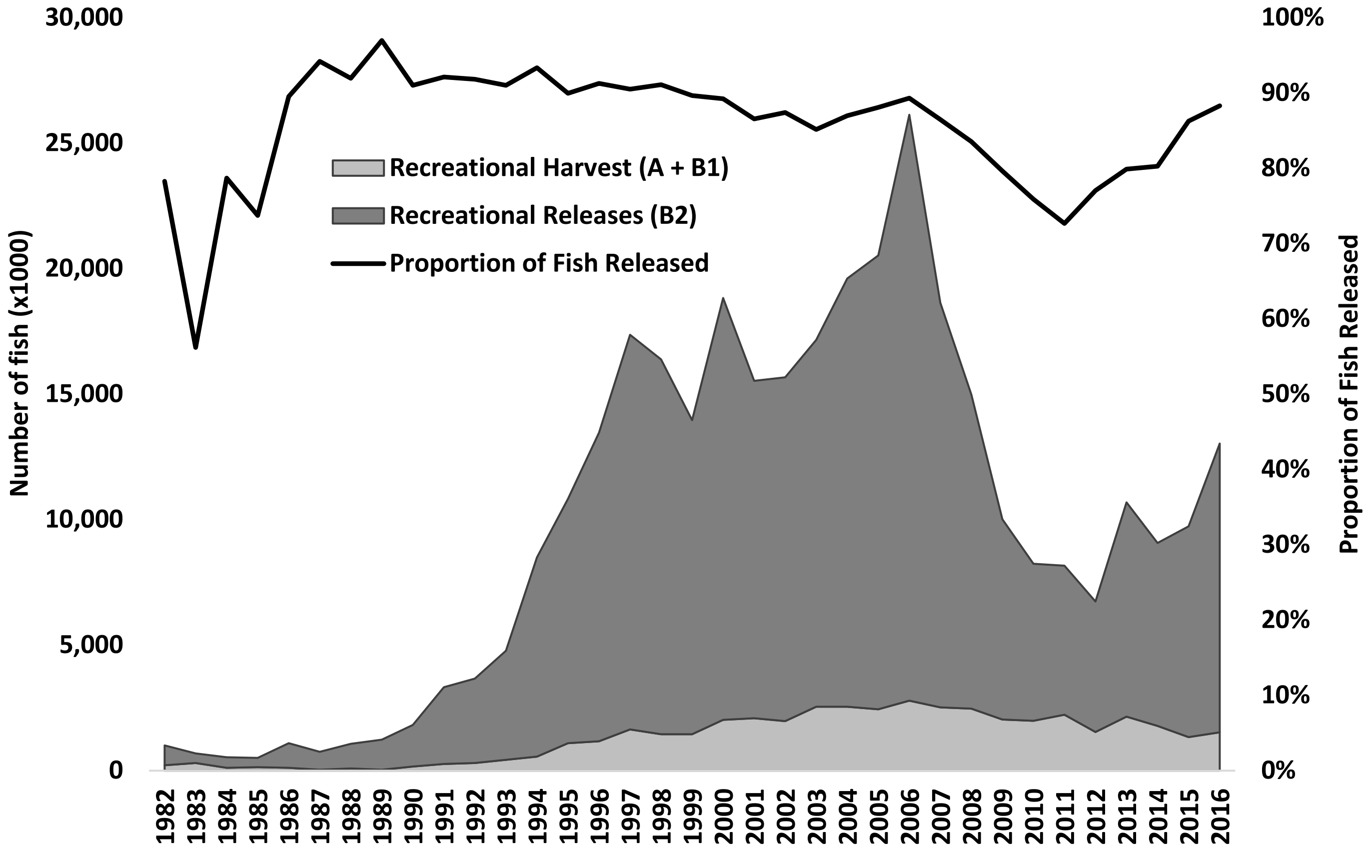
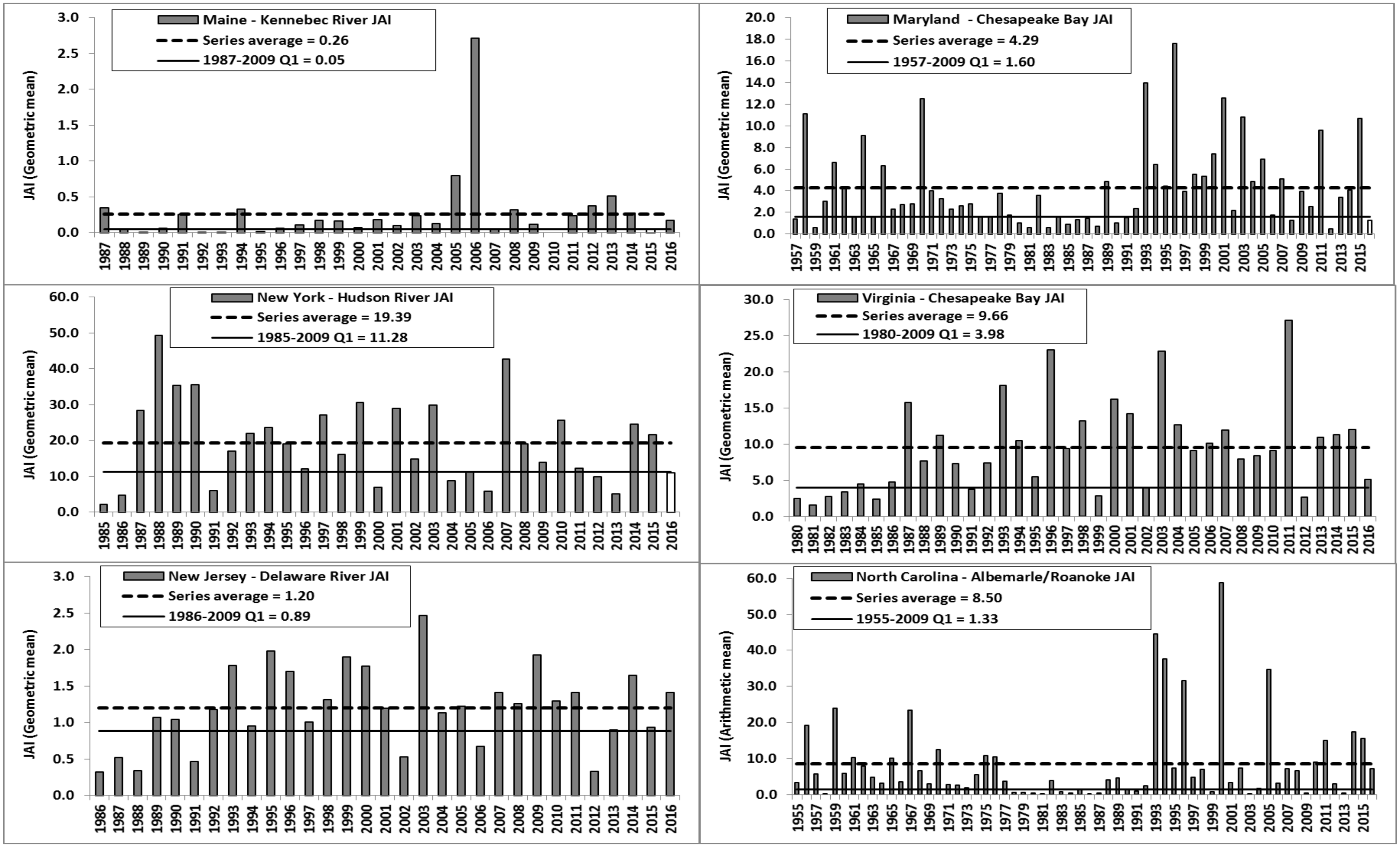


Figure 8. Juvenile abundance index analysis for Maine, New York, Jew Jersey, Maryland, Virginia, and North Carolina. Source: Annual State Compliance Reports. Q1 = first quartile, which is the value that is below 75% of all values in a specified time series. An open bar in the last three years indicates a value below the Q1 threshold.



Atlantic States Marine Fisheries Commission

ISFMP Policy Board

October 19, 2017
9:30-11:30 a.m.
Norfolk, Virginia

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)*	9:30 a.m.
2. Board Consent *(D. Grout)* • Approval of Agenda • Approval of Proceedings from August 2017	9:30 a.m.
3. Public Comment	9:35 a.m.
4. Update from the Executive Committee (*D. Grout*)	9:40 a.m.
5. Update on Non-compliance Decision and Meeting with the Secretary Of Commerce *(D. Grout)*	9:45 a.m.
6. Review Risk and Uncertainty Workgroup Progress (*J. McNamee)*	10:05 a.m.
7. Discuss Recommendation from the Atlantic Herring Section on New England Fishery Management Council Participation in Atlantic Herring Management *(T. Kerns)* **Possible Action**	10:20 a.m.
8. Discuss Non-Compliance in the Charter and Party Boat Sector (*T. Kerns*)	10:30 a.m.
9. Review White Paper from the Climate Change Working Group (*T. Kerns*)	10:40 a.m.
10. Standing Committee Reports • Habitat (*L. Havel*) • Atlantic Coastal Fish Habitat Partnership (*L. Havel*) • Law Enforcement (*M. Robson)*	10:55 a.m.
11. Discuss the Utility of Reporting Species Technical Committees Assignments (*S. Madsen)*	11:05 a.m.
12. Review and Consider Committee on Economics and Social Sciences' (CESS)	11:10 a.m.

Recommendation on the ISFMP Charter Guidance for CESS Membership (*S. Madsen)* **Final Action**

13. Review and Consider Approval of the Assessment Schedule (*T. Kerns*) **Action** 11:15 a.m.
    - Changes to the Shad and Weakfish Assessment Timeline

14. Review Non-compliance Findings, If Necessary 11:20 a.m.

15. Other Business/Adjourn 11:25/11:30 a.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk VA; 757.627.4200

MEETING OVERVIEW

ISFMP Policy Board Meeting
Thursday October 19, 2017
9:30-11:30 a.m.
Norfolk, Virginia

Chair: Doug Grout (NH) Assumed Chairmanship: 10/15	Vice Chair: Jim Gilmore (NY)	Previous Board Meeting: August 3, 2017
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, 2017

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 (9:40-9:45 a.m.)
Background • The Executive Committee will meet on October 19, 2017
Presentations • D. Grout will provide an update of the two meetings
Board action for consideration at this meeting • none

5. Update on Non-compliance Decision and Meeting with the Secretary of Commerce (9:45-10:05 a.m.)
Background • The Commission sent a letter to the Secretary of Commerce requesting additional information on the decision to not find New Jersey out of compliance with Addendum XXVIII to the Summer Flounder, Scup, and Back Sea FMP. The Commission also requested a meeting with the Secretary to discuss the Non-Compliance process. • The Commission received two memos and one letter from NOAA and the Secretary (**Briefing Materials**)
Presentations • None

Board discussion for consideration at this meeting
• Discuss next steps

6. Review Risk and Uncertainty Workgroup Progress (10:05-10:20 a.m.)
Background • Previously, the Risk and Uncertainty Policy Workgroup presented a draft Commission Risk and Uncertainty Policy and were advised by the Board to continue development. • The Risk and Uncertainty Policy Workgroup was tasked last Annual Meeting with creating a Workshop to walkthrough the Policy using striped bass as an example. (**Supplemental Materials)**
Presentations • J. McNamee will present the progress to-date the workgroup has made.
Board actions for consideration at this meeting • None

7. Discuss Recommendation from the Atlantic Herring Section on New England Fishery Management Council Participation in the Atlantic Herring Management (10:20-10:30 a.m.) Possible Action
Background • The NEFMC has requested to participate on the Atlantic Herring Section. The Herring FMP is a complimentary FMP with the NEFMC. • The Charter, as it is written, does not allow for Council participation by invitation on Sections. This is only a provision for Boards. • The Policy Board tasked the Herring Section to discuss the issue and bring a recommendation back to the Board.
Presentations • R. White will provide the recommendation from the Herring Section.
Board actions for consideration at this meeting • Determine how the NEFMC should be included in the Commission's management of Atlantic Herring.

8. Discuss Non-compliance in the Charter and Party Boat Sector (9:10-9:20 a.m.)
Background • Recently there have been violations in the for-hire sector. In some states the Captain of the vessel is not held accountable when anglers on the vessel do not follow fishery regulations. • Some states have set regulations to incentivize Captains to follow regulations; for example • *Liability for Violations Onboard For-hire Recreational Vessels. With respect to recreational for-hire fishing operations permitted: Permit Requirements Applicable to For-hire Vessels, an individual patron, as well as the named for-hire permit holder or for-hire vessel operator, may each be held liable for any violations of recreational size, possession or daily bag limits established that are attributable to the patron fishing onboard the for-hire recreational fishing vessel. In enforcing this provision,*

law enforcement officers may exercise their discretion on whether to cite the named for-hire permit holder or for-hire vessel operator for such violations in instances where the best industry practices required: Permit Requirements Applicable to For-hire Vessels have been used on the for-hire vessel.

Presentations

- None

Board action for consideration at this meeting

- Discuss ways to improve compliance within the for-hire fleet

9. Review White Paper from the Climate Change Working Group (10:40-10:55 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.
- In fall of 2016 the Work group met via conference call to brainstorm how to address the Policy Board task. In January 2017 the working group met to make recommendations to include in the white papers to address the Policy Boar task. In May the working group met to continue to develop drafts of science and policy white papers.

Presentations

- T. Kerns will present the Working Group White Paper.

Board action for consideration at this meeting

- None

10. Standing Committee Reports (9:40-9:55 a.m.)

Background

- The Habitat Committee will meet on October 18.
- The Atlantic Coastal Fish Habitat Partnership will meet on October 16 and 17.
- The Law Enforcement Committee will meet on October 17 and 18.

Presentations

- An overview of Habitat Committee and ACFHP meetings will be presented by L. Havel and the LEC meeting will be presented by M. Robson.

Board action for consideration at this meeting

- None

11. Discuss the Utility of Reporting Species Technical Committee Assignments (11:05-11:10 a.m.)

Background

- The Assessment Science Committee(ASC) recommended the creation of an annual task list for each species, complied annually by Commission staff and the Technical Committee (TC) and/or Stock Assessment Subcommittee (SAS) chairs.

- The list will include all current tasks with timelines, assign an activity level for the committee, a committee overlap score based on membership overlap with other TC/SASs, as well as list TC and SAS members and their affiliations.
- At the time of tasking a Committee, the Task List can be projected to help prioritize the task and assign a deadline.

Presentations

- S. Madsen will review an example task list and discuss the Utility of the list.

Board action for consideration at this meeting

- None

12. Review and Consider Approval of the Assessment Schedule (9:20-9:30 a.m.) Action

Background

- The Committee on Economics and Social Sciences has been working to assign members to Commission-managed species in order to have more socioeconomic background and analyses integrated into management-change documents (e.g. amendments and addenda).
- The CESS currently has many vacancies and would like to fill them to assist with gaps in species' coverage.
- The CESS would like to request a relaxation of the membership requirements outlined in the ISFMP Charter to reach broader pool of volunteers. (**Briefing Materials)**

Presentations

- S. Madsen will review the language in the ISFMP Charter that outlines the CESS membership requirements and present suggested changes. **(Briefing Materials)**

Board action for consideration at this meeting

- Approve the stock assessment schedule

13. Review and Consider Approval of the Assessment Schedule (11:10-11: 15 a.m.) Action

Background

- The Shad and River Herring Board will consider changes to the 2018 Shad stock assessment update at the Board meeting on October 17.
- It is recommended the Weakfish benchmark be delayed until 2019 until after the new data from MRIP (calibrated data from the FES and APIS changes) is available.

Presentations

- T. Kerns will present the changes to the assessments

Board action for consideration at this meeting

- Approve changes to the assessment schedule

14. Review Non-Compliance Findings, if Necessary Action

15. Other Business

16. Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ISFMP POLICY BOARD

The Westin Alexandria
Alexandria, Virginia
August 3, 2017

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 2017** by Consent (Page 1).

3. **Postponed Motion from Spring Meeting: Move to postpone the New Jersey Appeal of the Summer Flounder, Scup, and Black Sea Bass Addendum XXVIII until the Summer/August ISFMP Policy Board Meeting.** Motion made by Adam Nowalsky; seconded by Pat Keliher.

4. **Move to postpone the New Jersey appeal of the Summer flounder, Scup, and Black Sea Bass Addendum XXVIII indefinitely or until hell freezes over** (Page 11). Motion by Russ Allen; second by Dennis Abbott. Motion carried (Page 12).

5. **Motion to Adjourn** by consent (Page 26).

ATTENDANCE

Board Members

Pat Keliher, ME (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Doug Grout, NH (AA)
Ritchie White, NH (GA)
Raymond Kane, 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)
Mark Alexander, CT (AA)
Lance Stewart, CT (GA)
Sen. Craig Miner, CT (LA)
James Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
Russ Allen, NJ, proxy for L. Herrighty (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Andy Shiels, PA, proxy for J. Arway (AA)
Roy Miller, DE (GA)
John Clark, DE, proxy for D. Saveikis (AA)
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)
Chris Batsavage, NC, proxy for B. Davis (AA)
David Bush, NC, proxy for Rep. Steinburg (LA)
Sen. Ronnie Cromer, SC (LA)
Spud Woodward, GA (AA)
Pat Geer, GA, proxy for Rep. Nimmer (LA)
Rep. Thad Altman, FL (LA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Sherry White, USFWS
Kelly Denit, NMFS

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

Ex-Officio Members

Staff

Bob Beal
Toni Kerns
Mike Schmidtke
Lisa Havel
Shanna Madsen
Katie Drew

Guests

John Bullard, NMFS
Kelly Cates, NOAA
Kiley Dancy, MAFMC
Jeff Deem, VMRC
Donna Delem, State of NJ, DC
Matt Gates, CT DEEP
Zach Greenberg, PEW
Arnold Leo, E. Hampton, NY
Molly Masterton, NRDC
Nichola Meserve, MA DMF
Matthew Moran, Ofc. of Rep. LoBiendo, DC
Brandon Muffley, MAFMC
Mike Rogers, Ofc. of Rep. Pollard, DC
Ariana Spawn, Ofc. of Sen. Booker, DC
Jack Travelstead, CCA

The ISFMP Policy Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 3, 2017, and was called to order at 8:06 o'clock a.m. by Chairman Douglas E. Grout.

CALL TO ORDER

CHAIRMAN DOUGLAS E. GROUT: Good morning everybody. If the Policy Board members could take their seats, welcome and we have an agenda before us.

APPROVAL OF AGENDA

CHAIRMAN GROUT: Are there any changes to this agenda or additions to the agenda that any member of the Policy Board would like to make? Seeing none; is there any objection to approving the agenda? The agenda is approved by unanimous consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN GROUT: We also in our packets have proceedings from our May, 2017 meeting. Are there any edits or changes to that? Seeing none; is there any opposition to approving those proceedings? Seeing none; the proceedings are approved by unanimous consent. This is our opportunity on the agenda for public comment. Is there anybody in the public that has something that they would like to bring before the Policy Board that isn't already on the agenda?

UPDATE FROM THE STATE DIRECTOR'S MEETING

CHAIRMAN GROUT: Seeing none; we will move on to our next agenda item, which is me providing you an update on the State Director's Meeting and the Executive Committee. As you might expect, one of our largest and most involved discussion items at the State Director's meeting was the fluke out-of-compliance decision by the Secretary of Commerce. We had Sam Rauch and John Oliver there, as well as the Regional Administrator John Bullard there; although Sam provided most of the feedback and input on our discussion.

One of Sam's major points about the decision as we questioned him was that the Commission needed a stronger justification for Criteria 2. That is one of the reasons, as you see in the letter, that they did not agree with our out of compliance finding. That is just for those of you who are not aware that a state's failure to implement and enforce the measures in the management plan, are necessary for the conservation of the fishery in question.

We had considerable debate about that. The other thing that was brought forward by Sam was despite the uncertainty about how effective New Jersey's measures would be; the Secretary felt that they were likely to be equivalent in total conservation. As you know, New Jersey used the criteria of total mortality, while in our plan we are using harvest mortality as a measure.

He also made it quite clear that each future noncompliance finding will be evaluated on its own merits. There is nothing new or some precedent that has been set here. Obviously since this is the first time that a Secretary of Commerce has not agreed with a Commission's out of compliance finding recommendation, the Commission was very concerned that this was precedent setting. But he made it very clear that any future noncompliance findings will be evaluated on its own merits. That's essentially the discussion we had on fluke; and I'll tell you in my Executive Committee report. I'm going to provide you with an update of what the Executive Committee is making as a recommendation for further action on this. For now I'm going to go into some of the other things on the State Directors reports.

We had a discussion about ASMFC and NOAA Fisheries budget priorities. Typically our high priorities for budgets, and this is one of the main reasons we have this annual meeting with

NOAA Fisheries is to provide them with our priorities; are the Commission and Council line item budget, SEAMAP/NEMAP funding, ACCSP funding, Saltonstall-Kennedy funds, as well as IJ and Rec data collection funds.

For those of you who are unaware, last year there was an increase in the Council and Commission line item budget; and the Commission received roughly $171,000.00 increase. We allocated it to state ACA programs. This is the first increase we've had in nearly ten years; and so we were very appreciative of that and we have been working over the past year to try and get some kind of an increase.

For your information, in the Presidents FY18 budget, he has put that line back to 2016 levels. The House has put forward a proposal to level fund at FY17 funding levels; which was what we just discussed. The Senate has a 1.6 million dollar increase to that line item for 2018 over the 2017 levels.

There is also some direction in that all of that increase should be directed to the international and interstate fisheries commissions. Obviously we're still at the beginning stages of the budget; but that's where we're at right now with our Council and Commission line item. NEMAP funding, we had a discussion about increasing shortfalls for both the NEMAP survey in the Mid-Atlantic and the Maine/New Hampshire trawl survey.

The ultimate, we finished discussion on this with the intent that there is going to be a NEMAP Summit this fall to develop plans for filling the funding gap or if we can't find funds to fill the gaps, to adjust the surveys to account for current funding levels. When we discussed SEAMAP funding, an issue was brought up about that there is a potential that NOAA Fisheries is currently evaluating whether they can eliminate the M and A fees, these are the administration fees that are assessed at the Regional level and at Headquarters level.

They are looking at the possibility of not having to have some of those taxes assessed – excuse me for using the word tax, Kelly – to help provide more funds to some of our grants; and this may help out SEAMAP. Also we had a discussion about ACCSP and Fisheries Information Network funding. One thing in the Senates current appropriations bill, it specifically allocates 22.5 million dollars in Fisheries Information Network funding.

We're going to be looking as what is that compared to previous years. Nobody at the meeting was quite clear on how that compared to previous years; but it was something that was specific wording in the Senate's language. For Saltonstall-Kennedy funds, the Commission was asked; we had a discussion with Sam about that and how we can better provide input into this.

It was decided the Commission would continue to provide a working list of priorities for the National Program portion of the funds. That is what we had discussion on for funding. Then we went on to have sort of a discussion about how implementation of APAIS is going with the states. Generally there has been a positive response. The states in general feel that things have been going well, and there have been some positive benefits to that. There have been some minor hiccups, as you would expect when a new entity takes over conducting a survey. Another thing that was brought forward by a number of states is there seems to be increased resistence on the part of the charterboat sector to participate in the surveys in some states.

We also received an update from the National Marine Fisheries Service on the Fishing Effort Survey and APAIS calibration and transition. As I think many of you know, we're transitioning to a new effort survey based on the license frame, which I think many of us believe will be an improvement over the coastal household telephone survey.

Some of the preliminary results from this are indicating that fishing effort in the private boat and the shore fishery are somewhere between two and six times higher than what the coastal household telephone survey is. As a result there is going to be a need to calibrate historical data to the new effort system.

They are going through a peer review, they just had a peer review in, I think it was May or June, of it. There is going to be a peer review of the final calibration and the re-estimation should be up and running sometime in 2018. Next there was a discussion on benchmark assessments versus operational assessments, primarily on how to incorporate new scientific information into benchmark assessments.

In addition we had a discussion on observer coverage requirements for small vessels with state permits; with or without federal permits. There is a concern that was expressed by one of our state directors that there is excess coverage burden going on; because these day boat trips are easier for the contractors to actually get their required samples on it.

They seem to be spending more time interviewing these or going out on sea sampling trips or observer trips on these smaller boats. Finally, the Regional Administrator, John Bullard, brought forward a request for ASMFC to potentially start considering tribal representation on ASMFC, or at the Council level.

Obviously both of those could be a heavy lift, because they will require an act of Congress to change the makeup or either ASMFC or the Council's to include tribal representation. That is my report from our meeting with NOAA Fisheries. Are there any questions on any of those items? Eric.

MR. ERIC REID: When you were speaking about the NEMAP funding, you said something about a summit this fall. What is that going to look like, Mr. Chairman?

CHAIRMAN GROUT: Toni, can you provide or Bob, can you provide a description of what that summit is going to be?

EXECUTIVE DIRECTOR ROBERT E. BEAL: Sure. Yes Eric, we haven't planned it yet. But the idea is it's going to be bringing together the NEMAP Board and a number of the NEMAP technical groups that look at the structure of the survey and all the details of how it's conducted. In addition to just reviewing how it's going, they are going to try to answer two questions.

One is what additional sources of money can we find to round out the needs of the survey? The second question would be if we can't find additional funds, what do we do? How do we make up for that shortfall in the way the survey is conducted? Do we shrink the range of the survey? Do we keep the same range but reduce stations?

Whatever it might be, do we adjust the sort of post processing and things that are done at VIMS? All those things are probably fair game to talk about. The idea is getting everybody involved with NEMAP in the same room, and sort of talking about how it's going. You know NEMAP is at about a ten year maturity level.

That's where a lot of the assessments and stock assessment folks feel that the time series is long enough to incorporate that data into assessments. We had planned this summit prior to the budget shortfalls. We were going to focus on the technical aspects; but given that we had these budget issues, we're going to roll that into the same meeting now.

CHAIRMAN GROUT: Follow up?

MR. REID: It's more of a point than anything else. I'm sure you're aware that NEMAP goes in areas where the Bigelow can't go. They tend to catch more of the young of the year and very young fish; which are critical to the data. Anything that can be done to maintain the survey range is critical; not only to the NEMAP itself but to the industry going forward. I strongly suggest we figure out a way to get them fully funded, and not just for one year for some amount of time.

EXECUTIVE DIRECTOR BEAL: Just as a quick follow up. You know Eric, you're exactly right. We had a lot of conversation about that on Monday. There are the state surveys that are kind of right up against the beach, there is the Bigelow that's way offshore, and NEMAP is that sort of no-man zone in the middle.

How do we make sure that's still covered? Then the other thing we talked about on NEMAP, which is unique to NEMAP, is the fact that it's on an industry boat by a trusted industry captain. A lot of the commercial side especially trusts that data and feels that is good data that needs to go in these assessments, so keeping all those aspects in consideration, we need to find a way to keep it going.

CHAIRMAN GROUT: Anything else on this report; any questions? Bob.

EXECUTIVE DIRECTOR BEAL: Sorry, don't mean to be talking the whole time. Back on the New Jersey fluke issue. A couple commissioners have asked me if we've gotten a response from the letter that we sent to the Secretary. As I think everyone knows, ASMFC sent a letter to the Secretary asking or expressing the concerns that ASMFC had over the decision on summer flounder.

The letter ultimately asked for additional information on what went into the decision by the Secretary to agree with New Jersey's position that their conservation equivalency was essentially close enough to what the Commission had done. I just want to let everyone know, we have not received a response to that letter. Sam Rauch indicated on Monday that if and when they put together a response, we may actually already have a lot of the information. He said since NOAA Fisheries has shared the documentation that New Jersey provided. That was a big part of their decision. Sam also said they've asked the Secretary if there is any other documentation that the Secretary would like to provide to ASMFC, and they're still waiting for a response from the Secretary. We haven't received a response yet, and if we do we'll share it as soon as we do.

UPDATE FROM EXECUTIVE COMMITTEE MEETING

CHAIRMAN GROUT: Is there anything else? Okay the next thing is the Executive Committee met on Tuesday morning. Our three main agenda items was the Council/Commission line item and NOAA budget; again, the Secretary's decision regarding fluke and Bob Beal's contract. Under the Commission line item and NOAA budget, our continued goal is to get back to the original 28/72 split; where Commissions will get 28 percent of that line.

It got 28 percent of that line when we were first combined. It's been eroding over the past ten years, because of increases to the Council; any of the increases to that line have gone to the Councils over those ten years. The Executive Committee as I said, his goal is to get back to that 28 percent by whatever allocation direction we can provide.

I had mentioned in my previous report that the Senate bill has a specific language to only allocate any increase to the international and the three interstate fisheries commissions. The Executive Committee had previously supported having a 50/50 split of any increase; until we got back up to 28 percent, and after that any increase would be a proportional allocation of any change in the amount.

We're going to continue to go forward with that as our plan for trying to allocate any increase in this particular line. Also we had again a long and thorough discussion, as particularly the South Atlantic Board was well aware of, since we were over an hour late, about the

Secretary's decision on New Jersey's fluke compliance.

We had a discussion about lessons learned, and then we went into a closed session to decide what our next actions would be; what should we do at this point? The Executive Committee is recommending that the Commission leadership request a face-to-face meeting with the Secretary; with the goal of protecting the process.

In addition, the question needs to be put forward both by the Commission here and to the Secretary. Are the states via the Commission still the best entity to manage interstate fisheries? We would like to come forward with a specific ask to develop an MOA to better define the process that goes on between the initial out-of-compliance finding submittal by ASMFC, and when the Secretary's decision is made.

Specifically we're going to seek to insert the opportunity for ASMFC to also meet, either during the meeting that the states are afforded that a state that's been found out of compliance, either during that meeting or after that meeting. We felt there was a concern by the Executive Committee that after the state had had their opportunity to make their case before the Secretary of Commerce that we were not given the opportunity to more fully explain the reason for our decision.

We feel that that would be an important point in the future to have that opportunity. Also at this meeting, and in the conference call that the Executive Committee had on July 20, the Commission should be aware that we also discussed the possibility of taking legal action. But in both those meetings we chose other actions, first of all the letter and then this meeting. We chose other actions at this time. Finally, our Executive Director's contract will be up at the end of this year.

I made a recommendation to the Executive Committee that Bob's contract be extended for another five years. We all think he's done a fantastic job. He has consistently had positive performance reviews, and we're looking forward to having him on for at least another five years; and the Executive Committee agreed with that. Are there any questions about the Executive Committee report? Yes, Jim.

MR. JAMES J. GILMORE, JR.: I just wanted to make one comment, and this goes back to the noncompliance thing. In the meeting, both the Executive Committee and with the meeting on Monday was relative to that justification that the Commission did. I think it really hasn't been stated, but I personally and I hope all of us, disagree with that completely.

What I really wanted to state was that I think of all the justifications I've seen in my career that was one of the strongest ones in any part of species management I've ever seen. I think the staff for the Commission and the states, even the federal government that were involved did an exemplary job on that.

You shouldn't feel that there was any deficiency in what was done through that whole process. I just wanted to make sure that I don't think that is really what's going on here. Again, I think the justification was well done; and we'll get into hopefully that meeting and find out a little bit more about what really happened with that decision.

CHAIRMAN GROUT: Yes I agree with that and in fact the point was made to Sam that we do strongly disagree with his feedback that we could have done a better job of making an argument on the compliance determination Criteria Number 2. If you've all looked at the Technical Committee's report, it is a very strong justification; and we made that point to him, Ritchie.

MR. G. RITCHIE WHITE: I agree with your comments and Jim's. In thinking about this, because we're now in a time when a decision like this can be made politically and not based on science, the people sitting around this table have to make a decision going forward whether this method of fisheries management is the best method; and whether we want to preserve it or not.

I think we have to take the Secretary of Commerce out of our process, and what I mean by that is that we have to not have out of compliance findings. The states have to think long and hard before entering into this, and thinking about what I believe will be a short-term gain for a state that may not be a long-term gain. I think it's up to us to make sure that this system is solid and goes forward, and that we don't use this change in political decisions to advance what we might perceive as a short-term gain for our individual state.

CHAIRMAN GROUT: Tom Fote.

MR. THOMAS P. FOTE: Once Ritchie opened up the box about political decisions. You know there have been a lot of political decisions made on summer flounder; and New Jersey has been the losing end of those political decisions over the last couple of years. That had a lot to do with it. I also think that our appeal process is not working. As a matter of fact two or three states wanted to appeal and they realized that it's an appeal process they can't win, so they didn't even bother doing it.

We truthfully had never put the formal request – appeal – had a hearing on it at the Policy Committee, because some of it was by the time you went through the document we sent in, the points that we thought were important, the same one you thought was important when you said to the Secretary of Commerce, we're completely ignored and we weren't even allowed to discuss those points.

If you're going to have an appeal process and people are going to buy into that; because that is the way it should have happened, it needs to be more thorough and it needs to look more at the states; and it shouldn't be a small decision by a couple of individuals, whether the whole appeal goes through or not.

But yes, the summer flounder decision, when we were forced in a region that we did not want to go, never supported that region, and when two other states opted out just by saying on the telephone call; we don't want to be in a region together, and they were allowed to do that when we were not. It's political.

I mean New Jersey has the good fortune of being in the middle, because we're on the Mason/Dixon line, it runs through New Jersey. We get thrown back and forth as a ball sometimes, for the benefit of the people above us and people below us. Also, because of our historical fishery, and we get shots at these fish as they go back and forth in their migratory pattern.

We've had some of the biggest catches in that; that's historical catches; you know the same way Virginia uses that on menhaden. It's the same way we should be able to do that; and people want to go after those historical decisions. They find more ways of getting around it or those historical landings.

If we have felt, I think New Jersey had gotten more of an appeal process, gone through the proper channels and actually listened. I mean you can justify that we were out of compliance, but when you look to the conservation that was very iffy, whether we were doing more conservation or not. You should have given us a chance and that would have happened.

We tried at the Technical Committee, we tried at the Board. We tried at the appeal process, and we weren't getting a fair shake as we saw it, all three. I agree with Ritchie, we need to get the politics out of here. We need to be fair. When the states feel they're getting a fair share, and that's historically what we've done. We've listened to, whether it was Virginia, whether it was New York. How do we basically enhance that? Sometimes it's just the figures.

We look at 2013 and I can pick out a number of examples when the Marine Recreational Survey we call MRIP now, has basically failed us. We get numbers like that from New York, numbers that New Jersey one year caught two-thirds of the recreational catch on weakfish; and we say those numbers are lousy, and they should be thrown out. If we were in business, if we were in any other field, they would look at the PSE on those numbers they would have thrown them out and said they are not verifiable. I know it's kind of long winded, but you know I felt strongly in what we did. I supported what we did, and I think it was the right thing. But the Commission needs to adjust how it does the appeal process, how it handles states; because we have gotten political in the last couple years. When states feel like they're not getting a fair and honest hearing, and they feel they are being politically picked on, then they are going to basically have to react.

CHAIRMAN GROUT: I have Dennis Abbott and Robert Boyles. Dennis.

MR. DENNIS ABBOTT: Monday when the Executive Committee met, during that conversation I noticed that Jason McNamee really was troubled by this decision. As we know, Jason is a great scientist; and I think he was responsible for putting together the technical justification for the noncompliance.

I know that he felt very bad about this. I could see it in his face. But, as far as getting a fair shake. I think that the administrative record would show that New Jersey did get a fair shake. It went through the complete Commission process. Ritchie White and I, Ritchie is a good guy and he takes me fishing now and then so that we can talk about these matters.

With each of us holding on to our striper rods, we talked about this and it became very clear that the process, the Compact that we're dealing with was really being put in a bad place with this decision. Anyone that thinks this wasn't politics. If you can add up Christie, Trump and Ross and not come out with the fact that this wasn't a political decision, you've got blinders on.

In the end I think that the states really have to consider placing the Compact above their individual state issues. It may be difficult, as it was in this case difficult for Massachusetts and New York to go along with essentially what the federal government agency told us when we had to cut back on summer flounder catch.

It wasn't ASMFC really that came up with a 30 percent cut. It was the Feds that told us that. But we have to manage these species, because their health relies on the decisions that we make. But also, we can't allow for one sided decision making. Doug Grout alluded to that that they may have a conversation, and as I said during our Executive Committee meeting that we need more than a conversation, because the Secretary of Commerce sits there temporarily.

He may be there who knows, a week, a month, a year, four years or whatever. This could happen under another administration. But what did happen, really in my mind; and Ritchie and I spoke about it, really weakens the process that we're all engaged in and committed to. Also, I think that the process of conservation equivalency, I don't know if it needs another look, but we've generally when we've had conservation equivalency proposals offered.

They're generally, I don't know the percentages, but usually approved and rarely disapproved. Maybe in the future we have to ask the Technical Committee to be more detailed and provide clearer justification of noncompliance; when science is the issue as opposed to administrative issues.

But in this case, as Jim Gilmore stated a few minutes ago, he thought this was very thorough. I'm sure Jason McNamee would tell you that they provided clear reasons for disallowing the noncompliance finding. I think on one side we have to do more, we have to do better. But the states really have to look at the big picture and look at the damage that was done. We can say that this is a one-issue or one-time thing. But it doesn't work that way. There are always precedents. Mark my words, I may not be around, but this will come up again, and now you have precedents. I'm concerned, and I think that at the end of the day it's very important that we place the Compact above all else.

CHAIRMAN GROUT: Robert Boyles.

MR. ROBERT H. BOYLES, JR.: Representative Abbott, thank you for what I would like to consider a great segue way to my remarks. Mr. Chairman, I think it's important that we recognize that the very constitution of this great nation holds matters of interstate commerce to be the purview of the Federal Government.

In the early 1940s when the country was engaged in some distractions around the globe, the Congress in its wisdom decided that there is a lot to be gained by states sitting in a body like this to cooperate, to commit to one another to work together on problems, challenges, and opportunities.

In 1993, the Congress established the Atlantic Coastal Act; that really put that idea, that concept, that ideal of interstate cooperation into what I would argue a more mature, modern, cooperative venue with both the carrot to encourage cooperation, as well as a stick to ensure cooperation once a decision had been made.

Clearly, South Carolina doesn't sit on the Summer Flounder Board, and so our interest in that particular management board may not be as great as other states. But I too share Representative Abbott's concerns about the efficacy of this institution as a place where we can come together and work through problems, work through disagreements, and really provide a stable and a vigorous forum for discussions; to how to manage these great resources that we are blessed to have the privilege of being stewards of.

With that Mr. Chairman, I just would like to quote Dr. Franklin, who just before signing the Declaration of Independence remarked, as he concluded his comments, "We must indeed all hang together, or most assuredly we shall all hang separately." I think I speak for my colleagues in South Carolina that we're disappointed with what has brought us here.

But from our perspective, we remain committed to this Compact. We remain committed to each other, in terms of the belief that the states are the best place for these decisions to be made; and we will do our best to ensure that folks around here feel like they get a fair hearing. We are committed to continued cooperation.

CHAIRMAN GROUT: I have Roy Miller.

MR. ROY W. MILLER: Robert, I don't know if I can add to that eloquent presentation by you; but I have a practical suggestion for us to possibly consider. Having listened to Tom Fote's comments regarding the appeal process, and looking over the letter seeing who handled the appeal on behalf of the Commission. I'm wondering if we want to give consideration to adding a player or two or three to the appeal process, who are outside of the Commission process. In other words, not Commission members, not part of the Policy Board who originally voted on the compliance finding; and thereby giving a little bit of independent peer review, if you will, to future appeals process. I'm not saying go totally outside. Clearly we need Commission members; we need staff on that appeal process. But I'm just wondering if some fresh perspective from outside the Commission might give that appeals process a little more objectivity in the eyes of those who maybe are on the negative side of that appeal.

CHAIRMAN GROUT: I'll just point out. I think that's a good discussion item, particularly in light of the fact that Commissioner Fote has suggested that we may need to relook at the appeals process that we have. I'll remind the Commission that we just recently revised our appeals process in the past two or three years; of which everybody on this Board at that time supported those revisions.

But I think if we find that something or if we feel that something still isn't perfect that it's an opportunity to move forward; and possibly look at this again in the future with your suggestion and any other suggestions that the Commissioners might have for revising our appeals process. Tom Fote.

MR. FOTE: I don't take going out of compliance lightly. As a matter of fact, I don't know who was sitting on the Board but Bob might have been here. Years ago because of my role as a legislative appointee on one of the Boards as a proxy, I voted New Jersey out of compliance. I took it seriously; and felt that they should put the regulation.

I caught a lot of heat from that back in my state; but that's what we did. Over the years we've basically gone out of compliance a few times, and automatically came right back into compliance as soon as we could. Part of the problem was we used to do striped bass by legislation; so it was always a long process.

One time we were supposed to get it done the state house flooded, and they had to postpone the whole vote on the thing; so it passed the date. I take it very seriously. But I also look at the way the law was written. The law was written for a particular purpose to basically help the Compact work, and it gave us a lot of power, an extreme lot of power to basically shut a state down by automatically going to the Secretary of Commerce.

But it also laid on the Secretary of Commerce to be the arbitrator sometimes, to look at what he thinks is the right move to make. I don't think the process failed us. They've supported us all the time. They've sent the letter to New Jersey every time they thought it. But this time they thought there was something valid with the arguments we made.

We should look at that as part of the system "working," not "not working." Because of all the noncompliance, as a matter of fact I've watched states say, well I can't say this out in public, but vote me out of compliance; because it forces me to do the right thing when I got back, and that's happened numerous times and we've done it, so it has worked.

To say the whole system is broken because of one instance where the Secretary of Commerce looks at an issue, felt that maybe it wasn't, with taking all the facts that were put out. You put a beautiful justification out, so did New Jersey. I think the system worked. The system before that needs to work a little better, and I thanked everybody. I support what Robert said and I support what Roy said. I mean I looked at it, I take it very seriously. We vote states out of compliance for specific reasons; but again we've got to look also when we vote them out. Just because they are not doing it, but it's not going to hurt the resource or it's not going to really affect anything; we need to take a chance once in a while, and thank you for your patience. I understand it's very hard.

It was hard for us. I mean I served this Commission off and on for 27 years. I don't take going out of compliance lightly, as I said, we've always got back into compliance as soon as we could; and I voted my state out of compliance when I had the opportunity. I'll leave it at that.

CHAIRMAN GROUT: Ray Kane.

MR. RAYMOND W. KANE: As you all know I'm a junior Commissioner here, but I sat in the peanut gallery for years. I would like to start by commending Bob Beal and his staff and the Technical Committee. We've got nothing but good things from them over the years. I'm at a point sitting at the table; we can beat this up the rest of the day.

Decisions have been made. A lot of people aren't happy with it or we can live for today and tomorrow. I certainly hope because of this outcome, this previous outcome that we don't become hypercritical and paranoid in future FMPs.

CHAIRMAN GROUT: Adam.

MR. ADAM NOWALSKY: One of the biggest criticisms I've heard of the Secretary's decision is that somehow there is a sense that an individual state won here. We all lost; everyone around this table! I would make the argument NOAA Fisheries and even the Secretary of Commerce for being forced to get involved in this, and New Jersey lost.

For the first year in 18 years, I'm not running my own vessel this year. It didn't matter if it was three fish at 19 inches or three fish at 18 inches, with almost a month less season. Neither of those regulations served the public; and worse than that when we put forth a proposal that acknowledges that it kills more fish through discards than harvest. We are certainly not serving the resource we claim so ardently to protect.

The concerns about wanting to protect the process that's all well and good, when the process is working. But when it comes to recreational fisheries management, the process is not working. It's not, and it's unfortunate that it's had to come to this, and I certainly understand a lot of the criticisms are coming from those states that have not been as impacted by the recreational problems with data collection.

Using FMP processes that were put in place not to manage resources at very high levels of abundance, but that were put in place at a time solely for rebuilding purposes; and that purpose only. For those that say you're concerned about the process. You should be concerned about the process.

But sometimes it's okay to go ahead, have those concerns, have a third party step in; which is essentially what happened in this case, say take another look at what we're doing. I hope; I truly hope that we can use this as a stepping stone to something better. I sincerely hope that we can look at the information that was provided by the Secretary, and use that as a building block in making our appeals process stronger. Most importantly, recognizing that second element of the noncompliance findings, are the measures that we seek to enforce truly about conservation of the resource?

CHAIRMAN GROUT: Jay McNamee.

MR. JASON McNAMEE: I'm going to work off one of the comments that Adam just made, and it was a reference to reviewing information from the Secretary. What became very apparent to me during this past couple of days is there is nothing to review. We had a really rigorous process. New Jersey put forward a fair effort.

I appreciate Mr. Abbott's comments earlier, and I was on that technical review; but so were a lot of other people. Your state scientists, NOAA Fisheries scientists, Mid-Atlantic staff, it was not a single person it was a full technical review. We reviewed their work. We offered our advice on that work; and what happened subsequent to that is there was a process that occurred with the Secretary that second guessed what that technical body did, without any evidence, any information. There is nothing to review. I was told that bluntly.

That is the biggest issue with all of this, and my view is that process that occurred, it wasn't much of a process after it left our table. I don't understand. I don't feel we can let that stand. I appreciate the idea by the Executive Committee to meet with the Secretary; because I think we really need to emphasize this point that we put forward a technical review, and were offered nothing in return as to why that technical review was deemed insufficient.

CHAIRMAN GROUT: Any other comments on this issue? Okay it was a good discussion. I do appreciate all the comments that our Commissioners have put forward here. This is obviously a very difficult issue. I look forward to working with all of you to continue to cooperatively manage our interstate fisheries for the benefit of the resource and our constituents here. That is what I have for Agenda Item Number 4. Oh Dan, go ahead one more?

MR. DAN McKIERNAN: Quick question, Doug. You had mentioned earlier that there was going to be a redraft of an MOU about noncompliance. Is that a task coming out of this discussion?

CHAIRMAN GROUT: We are going to request a meeting with the Secretary, a face-to-face meeting with Commission leadership and the Secretary; and one of our asks of him is to develop an MOA with the Secretary and NOAA Fishery and the Commission, to try and better define the process between when the Commission sends a letter of noncompliance to him, and when he makes his final decision.

One of the things that we would like to get in that is an opportunity, either in conjunction with or following when the state, who is by the ACA Act provided the opportunity to make their case before the Secretary that the Commission also be afforded that same opportunity.

MR. McKIERNAN: Who would be the signatories to that MOA?

CHAIRMAN GROUT: ASMFC; and hopefully the Secretary of Commerce.

MR. McKIERNAN: The head of NOAA or NMFS rather?

PUBLIC COMMENT

CHAIRMAN GROUT: Maybe even higher. I'll take one very brief comment**.** Can you go down to the public microphone?

MR. ARNOLD LEO: I'll just do it here. Arnold Leo; I represent the fishing industry of the town of East Hampton, Long Island. I just think it's worth hearing a word from the gathering mob that in New York already at one of our fisheries meetings, a very large group of fishermen are saying to the DEC on the tautog fishery, where there is a proposed 50 percent reduction in landings in Long Island Sound.

Well, why don't you just do what New Jersey did, go out of compliance and see what happens. My point is that this action by the Secretary of Commerce is definitely going to make it hard for the credibility of the environmental agencies in the states; you know to follow a kind of rational process of fishery management.

REVIEW AND CONSIDER NEW JERSEY APPEAL OF ADDENDUM XXVIII POSTPONED MOTION

CHAIRMAN GROUT: Okay anything else from the Board? All right our next agenda item was to take up a postponed motion that was moved concerning the appeal process that New Jersey put forward. Again, this had been that New Jersey's made a motion that was seconded by Pat Keliher to postpone consideration of New Jersey's appeal of Summer Flounder, Scup, and Black Sea Bass Addendum XXVIII until this particular Policy Board meeting. We need to somehow dispense with this. Russ.

MR. RUSS ALLEN: You have no idea how much I would like to dispense of this. **I would like to move to postpone the New Jersey appeal of**

the Summer Flounder, Scup and Black Sea Bass Addendum XXVIII indefinitely or until hell freezes over.

CHAIRMAN GROUT: Is there a second to that motion? Dennis Abbott. Don't forget hell freezes over in there. Is there any discussion on this motion? Seeing none; is there any objection to approving this motion? **Seeing none; the motion is approved by unanimous consent.** The next agenda item is Discuss the Secretary of Commerce Decision Regarding New Jersey's Summer Flounder Recreational Measures.

We just had a fairly lengthy and I think very fruitful discussion on this. Is there anybody that would like to add something to that discussion that we had? Seeing none; we'll move on to Agenda Item Number 7, Review Annual Performance of the Stocks.

REVIEW ANNUAL PERFORMANCE OF THE STOCKS

MS. TONI KERNS: As a part of our strategic planning process through 2018, we reviewed the performance of the stocks each year; also within our action plan, and we have been doing this since 2009. Really the goal of this here is to validate the status of each of the stocks, and look at the rate of progress that they're making, and if the Policy Board is not pleased with the process then to identify corrective actions and to give advice back to the Boards.

Each of the species is reviewed and has for the species that are of concern, depleted, or unknown, the document talks about how the Boards have been following the technical advice. That is where the advice back to the management boards from the Policy Board would come into play. In addition to feedback, we also can use this information to help guide staff as we create the 2018 action plan. We have five categories; rebuild/sustainable, recovering/rebuilding, concerned, depleted, and unknown. For this year black sea bass was added to the rebuilt/sustainable category after the release of the stock assessment last year; and red drum and tautog for the Mass/Rhode Island proportion region of tautog were pulled into the recovering/rebuilding.

In the document there are tables that give the status of these rebuild/sustainable and the recovering/rebuilding stocks, and talks about different little caveats of the assessment, as well as when the next assessment will be. I'm going to go into some of the information on species of concern. For horseshoe crab, we are still looking for dedicated funding for the coastwide survey, or surveys of a broader regional geographical region.

Thanks to a lot of efforts by LoBiondo and Pallone's office, for 2017 we have secured funding for the survey. That funding was done through the SK funds, and NOAA dedicated the Commission's SK funds for the horseshoe crab survey. The 2018, both House and Senate also have the same direction for NOAA to find funds for the horseshoe crab survey as well, this was again thanks to LoBiondo and Pallone's office for that work on that.

Horseshoe crab is still looking to develop biological reference points; as well as a mechanism to include biomedical data and mortality estimates into regional assessments, without compromising data confidentiality. As the Board knows, the 2018 assessment that we will do is a regional assessment; but because of the confidentiality of the biomedical data, we're going to have to do that assessment pretty much behind closed doors in its entirety.

Then when we report out to the Management Board, it will have to be in trends and in code for a lot of it; because we won't be able to give the results, due to that confidentiality as well. For summer flounder, the retrospective patterns are evident in the assessment; and have substantial implications in the reliability of the model projections.

The stock is not overfished, but overfishing is occurring; and we have been seeing declines in the SSB for the past couple of years. We have not had a good recruitment class since 2010. In 2017 the probability of overfishing is higher than what is in the Mid-Atlantic Council's risk management policy.

It was also higher in 2016, and the results of the 2016 recreational harvest were about 114 percent of their recreational harvest limit. There is concern with the summer flounder stock; and the fact that we've been setting recreational measures that likely will exceed the RHL. Additional species of concerns are coastal sharks, as well as winter flounder.

For winter flounder, there will be a GARM assessment that will include winter flounder. The groundfish stocks will all be looked at through the Northeast Fisheries Science Center in the next coming year, I believe, and Gulf of Maine will be looked at. Previously the assessment is based on a swept area, estimated biomass, and this assessment was last completed in 2014.

The Commission's Board has been maintaining the same management measures since 2015 for the Gulf of Maine winter flounder stock. For depleted species, southern New England lobster. It's depleted, but overfishing is not occurring. The abundance is at 42 percent of the threshold, and the exploitation rate is below the threshold. Estimates of recruitment are near zero, or the lowest on record. The TC has advised the Board to use output controls, yet the Board continues to use input measures to manage the stock. The TC has advised 50 to 75 percent reductions in each of the LCMAs within southern New England, and previously the Board had approved a 10 percent reduction. Then at this past meeting the Board did not take any action to increase egg production; where at the previous meeting the Board had agreed to do a 5 percent increase. For northern shrimp, due to failed recruitment the stock is not expected to recover until at least this year; although indications from the survey is that it will be further out from this year.

The Section has been implementing a moratorium since 2014; and is in the process of doing an amendment that looks at state quota. The last year we have seen a small uptick in information for a shrimp-survey abundance. We're hoping that that will be continued positive increase trends; but it is a very small uptick in response to these many years of moratorium.

For tautog, the 2016 assessment update indicates that the Long Island Sound and New Jersey/New York Bight regions are overfishing. The Long Island Sound, New York/New Jersey Bight and DelMarVa regions are overfished. The assessment proposed new reference points for each of these regions; and recommended that the Board manage the stock on a regional basis.

The Board initiated Draft Amendment 1, which is currently ongoing, which does consider regional management, regional reference points, and additional measures including a tagging program for tautog. For winter flounder, southern New England, the stock is at 23 percent of the SSB target. There have been some modest increases over the last decade; but the stock has remained at approximately a quarter of the target since the early 2000s.

Since 1981, recruitment has been declining, 2013 had been the lowest in the time series; where it was approximately 4 percent of the estimated recruitment in 1981, which was the highest in the time series. The 2014 recruitment estimate increased slightly, and the overall stock productivity yet still continues to decline.

In 2014 NOAA Fisheries extended the rebuilding timeframe to 2023; to allow for increased fishing opportunities while the stock rebuilt. Following the TCs advice, the Board maintained a 50 pound trip limit for non-federally-permitted-commercial vessels for the 2017 fishery. NOAA Fisheries has reduced the state water subcomponent of the stock, so the state-water catch and the total stock-wide catch limit; but the allowable harvest levels are still very high, yet the actual harvest remains quite low.

The Board also had extended the recreational season from March 1st through December 31st, to increase fishing opportunities based on the species availability. Additional species that are depleted are American eel. We haven't had a recent stock assessment for eel in a while; so I wasn't going to repeat what I've been telling you for the past couple of years for all of these species.

For eel the assessment will be coming in 2018. The 2016 harvest was just over the coastwide cap. The Eel Board is going to have a working group get together to discuss how to manage the yellow eel landings; as well as looking at the quota for Maine for glass eel, and report back to the Board at the annual meeting.

For American shad, as we heard yesterday the TC does have some concerns about how to do a shad update; based on the issues that we had during the river herring assessment update. Because the significant portion of these assessments that are qualitative and the amount of time that has lapsed between the two assessments, and the turnover that we've had of folks on the Assessment Committee; it's hard to have the continuity of judgments from one assessment to the next.

In addition for shad, there have been some changes in studies on whether or not scales are appropriate for aging; which impacts some of the information coming out of the assessment. For shad, we're going to have the TC as well as the Assessment Science Committee look at that and figure out what's the best way forward for an assessment for shad; to provide some sound, stable management advice to the Management Board, and get back to you at the annual meeting.

We just heard about the river herring assessment update; so I'm not going to repeat that from what you heard yesterday. Then for weakfish, we have a weakfish assessment coming up in 2018. Landings have remained similar over the past couple years; so hopefully we'll get some new information out of this assessment update.

Then unknown species, for Jonah crab, the Jonah crab landings have increased six-fold since the early 2000s, with about 13.5 million pounds of Jonah crab landed in 2015. The status of the Jonah crab resource is unknown; and there is currently no data on juvenile recruitment. There are currently ongoing studies to look at age at maturity for U.S. waters in Jonah crab.

A lot of those efforts are being done by the state of Massachusetts. We are also at the same time investigating the annual migration patterns of Jonah crab. All of this information will be necessary in order to conduct a stock assessment. Once we have enough information then we will do our first stock assessment of Jonah crab. Additional species of unknown are Atlantic croaker, sturgeon, spot, and spotted sea trout. For both Atlantic croaker and spot, we had recent assessments that did not pass peer review.

But the Peer Review Panel felt that the status of the stock is doing all right, based on the trends and the indices. Although we did get information on Tuesday that we should look at the traffic light approach, which we use indexes to see how the stock is doing outside of the assessment time periods. We are looking to enhance those traffic light approaches, and will be bringing information back to the Board once that's been completed, and that is my full report.

CHAIRMAN GROUT: Any questions for Toni on this report? John Clark.

MR. JOHN CLARK: Thank you, Toni. This is kind of tangential to that; but you mentioned that for the horseshoe crab that was SK funded this year, but that's coming out of money that ASMFC would have gotten in SK that could go to other projects? I mean I'm glad the project is getting funded, but we've also up and down the coast have benefited from SK funding through ASMFC for other projects, like the striped bass tagging. I was just curious as to how the whole funding mechanism works there.

MS. KERNS: For this year NOAA determined and told us we would use our SK money for horseshoe crab. Often in the years past they've said you have $500,000.00; decide how you want to use it. But this year we were told to use it for horseshoe crab. It was $200,000.00.

CHAIRMAN GROUT: Chris Batsavage.

MR. CHRIS BATSAVAGE: Toni, for species that had a stock status from a previous accepted assessment, but then the next assessment doesn't pass peer review, does the status of that species switch to unknown at that point?

MS. KERNS: That is what we have done for most of the species, yes.

CHAIRMAN GROUT: Are there any other questions? I think this is important review that we do every year. The good news is that over the years we've been able to put into the rebuilt and rebuilding category. We've gone from 6 to 9 species, and if you include the recovered/rebuilding category, which we didn't have back when we started this process, we're up to 12.

We've also been able to knock down the number of unknowns from 8 to 5; and that's despite taking on additional species. Our concern here clearly has to be our concerned and depleted, which has actually increased from 10 to 12. All of these are species which we've been managing for a long time; except for coastal sharks.

I hope the Commission will take a good close look at this, and work together to try and move more into the rebuild and sustainable stocks.

DISCUSS NEW ENGLAND FISHERY MANAGEMENT COUNCIL PARTICIPATION ON THE ATLANTIC HERRING SECTION

CHAIRMAN GROUT: Okay the next is to discuss New England Fishery Management Council participation on the Atlantic Herring Section. Toni has a presentation. This was something that was brought up in the Coordinating Council.

MS. KERNS: Correct. The New England Fishery Management Council has expressed joining the Atlantic Herring Section, and this was done through discussions at the NRCC; as Doug just said. I think the purpose this was really done because of the last amendment that the Herring Section adopted; and the Council just really wants to have input on some of the measures that are being put forward through the Council.

I think things such as the carrier rules and transfers at sea were things of concern that they had expressed in the public comment. If there is interest in allowing this to occur, our guiding documents have provisions in them currently that don't allow for this to happen; so we would have to make some changes.

The ISFMP Charter only allows for council participation on management boards, it does not include Sections in that portion of the Charter. In addition, Amendment 1 in the Compact specifies that states may come together to form Sections; but there is no other jurisdictions that are allowed to do that. It's much more flexible to change the Charter than it is to change the Compact.

In order to make a change to the Compact, all the states would have to resign the Compact as well as Congress. If there is an interest in having the Council to have a voting seat on the Atlantic Herring Section, the least path of resistence would be to change the Herring Section into a management board. The Policy Board would be the one that would make this decision.

I will note that the Atlantic Herring Section has not discussed whether or not they would want to give a voting seat to the New England Fishery Management Council. But in order for them to even allow that to happen, we would have to make these changes at this Board first.
CHAIRMAN GROUT: Ritchie White.

MR. WHITE: Did the Council give any rationale why they thought they needed a voting member; because we now allow a member to attend, and to speak, but does not vote?

MS. KERNS: I think I'll start and then Bob or Doug can fill in. They noted at the NRCC that the Commission has states that sit around the table on the New England Council, which have a voting seat; and that they were interested in a voting seat, because of the impact that the Sections decisions can have on federal vessels as well. Bob, do you have other?

CHAIRMAN GROUT: Just to point out that yes we did invite them to have a seat on the Section during the development of that management plan; but it was not a voting seat. I think because of the outcome of what we decided on that they were hoping that in future management measures that they would actually be able to participate and vote. Follow up Ritchie, and then Dennis.

MR. WHITE: I would think the first step in this is to have the Herring Section discuss this, and then make a recommendation back to the Policy Board.

MR. ABBOTT: I think it would be helpful if we really understood what they would gain by becoming a voting member. If we were to switch from being a Section to a Board, would we not also have to invite U.S. Fish and Wildlife and the Feds to become members of the Board? Does that go along with it?

CHAIRMAN GROUT: Yes it would. We invite them under the process to be part of it. They don't always participate in it. But they have the opportunity under boards to participate; both services. Follow up.

MR. ABBOTT: Yes. Are there any boards that the Feds do not participate in; none that I know of?

MS. KERNS: I don't believe there are any boards that National Marine Fisheries Service does not sit on. But there are boards that Fish and Wildlife do not sit on.

CHAIRMAN GROUT: Pat Keliher.

MR. PATRICK C. KELIHER: I have mixed emotions on this. I mean there is obviously overlap between the Council and the Commission membership on both the Herring Section and the Council committee for herring. This is an obvious move, because of the disagreement on what they perceive as unfair impact to federal permit holders within the herring fishery.

We as states have the ability to impact federal permit holders with our rules and regulations and laws within the states. We do this with almost every one of our fisheries. I would tend to agree with Ritchie in this instance. I think this conversation should go back to the Herring Section, be fully vetted, and then a recommendation from the Section back to the Policy Board should be made.

CHAIRMAN GROUT: Bob.

EXECUTIVE DIRECTOR BEAL: I was going to make a number of the same comments that Pat made. You know this dialogue started at the NRCC, really over this number of different jurisdictional questions. Who has the authority to do certain things? ASMFC has spawning closures that obviously extend out in the federal waters.

Those are solely in the ASMFC plan and not in the federal plan. There are things that the federal plan has that our plan doesn't have. As Pat referenced, there has been some disagreement on jurisdictions that the states have recently. The Council was hoping that if they had a greater integration into our process that some of these jurisdictional issues would be better addressed.

I'm not sure if they would or wouldn't, but that is where this was coming from. Referring it back to the Section probably makes a lot of sense. Any of these committees and boards and sections and everything else, there is a lot of overlap just by the state directors; regardless of the memberships.

All the states directors from Maine through Connecticut are on the New England Council and they're on our Section. Our Section goes a little farther south. There is a pretty considerable overlap already. But incorporating NOAA Fisheries and the Council is probably something worth discussing at the Section level.

CHAIRMAN GROUT: Okay, I think we have a direction forward. Is there any objection to having this be remanded to the Northern Shrimp Section for consideration? Excuse me, Atlantic Herring Section, not the Shrimp Section; I know where you stand on that but the Herring Section. Seeing none; we'll put that on the agenda for the next Herring Section meeting. Next we're going to Review and Consider Approval of Standard Meeting Practices. Toni.

REVIEW AND CONSIDER APPROVAL OF STANDARD MEETING PRACTICES

MS. KERNS: We've had to push this document off a couple of meetings. I'm pleased that we can get through this today. This document, which was on your meeting materials, was established in order to help Chairs have something in front of them that would potentially make meetings more effective and efficient.

On the front side of the document it has required elements, and it provides information on quorums and voting procedures as defined in the Commission's guiding documents; things like what is a quorum, who is present at the meeting, who has authority to vote, what constitutes a final action.

On the backside of the document are the discretionary elements that were developed; which can be used by the Chair in order to make things go a little smoother. It includes things for process, for things such as allowing everyone to speak once before giving a second opportunity to individuals to speak; only allowing folks to speak two times per motion at meetings.

Using the no objection clause, so when taking up motions, asking if there is no objection instead of taking individual votes; especially on final actions, where we would have to go around and do the entire roll call. If the meetings are getting quite lengthy, and we're really running short on time, the Chair could have the ability to limit the amount of time each speaker takes; then as well as potentially using the one in favor, one against method when running short on time as well. If the Board does approve this document for use, then what we'll do is we'll make a laminated copy and we'll sit it up here for Chairs to have a helpful reminder as we go through each of our management boards.

CHAIRMAN GROUT: Are there any questions about this? As she said, this came out as a suggestion by Collette when we had our last meeting management training. The Executive Committee went through this and the staff put this together. I think it's a good summary. Are there any questions about it? We need to approve this, Dennis Abbott.

MR. ABBOTT: Well, I would like to approve it, but I would also like to comment on it if I could.

CHAIRMAN GROUT: Go right ahead.

MR. ABBOTT: I think over the years we've seen a marked improvement on board Chairs. I mean just this week watching John Clark operate, and particularly watching Bob Ballou operate yesterday on menhaden; was a good example of how good meetings should be run. I think this becomes a good primer for board Chairs to have in front of them. But again, I complement the board Chairs that we've had, as we continue to do better after having our training with Collette and whatever and whatever.

CHAIRMAN GROUT: Further comments or questions on this? Is there any objection to accepting this by unanimous consent? Okay we have approved the new standard operating procedures for meetings. Thank you very much, and thank you Toni and staff for putting this together. It is now time for a Progress Update on our Sturgeon Benchmark Stock Assessment. Katie.

UPDATE ON THE 2017 ATLANTIC STURGEON BENCHMARK STOCK ASSESSMENT

DR. KATIE DREW: I'll keep this brief. The Sturgeon Stock Assessment report went to the Peer Review Panel this Monday, so they will have two weeks to review it and we will be having the Review Workshop August 14 through the 17th, for them to actually get together with the lead analysts and have a discussion.

They will have then two weeks or so to write their final report, and the materials will be available for the board meeting in October; to get the final sturgeon stock assessment report. It's going to look a lot like what you saw for river herring and eel; in that this is a very data poor species, and we're kind of working with a strange set of datasets to figure out some status for this species. It's on track for your review in October. I'll take any questions you might have.

CHAIRMAN GROUT: John.

MR. CLARK: Thank you, Katie. I recall when this benchmark process got started. One of the goals, I think of the management board was hopefully it would help in the getting sturgeon delisted. From the rumors I've heard, there won't be that type of information that could really help in such a process.

DR. DREW: I think the real hang up is that NOAA has not set its recovery targets yet; so there is no way for us to show that we've met any kind of recovery target without that. Having said that there are not really good estimates of abundance or spawning stock biomass for this species, either at the DPS or at the coastwide level, which again, not knowing what NOAA is going to set their targets at, I think that is kind of what's going to hinder any question of delisting.

MR. CLARK: Do you know when NOAA will be setting those recovery targets?

DR. DREW: No, we have not received any information on that. To be honest, I think they were sort of hoping that we would come out with some really great recovery targets. I think their plan is to, not to put words in their mouth, but my understanding is their plan is to review this assessment report and see what they can do with that information; in terms of setting recovery targets.

MR. CLARK: If you put into this assessment that we've now hit the recovery targets that could do it, right?

DR. DREW: For sure, we put some benchmarks in there and they could decide those are great and we will go forward with that. But let's not get too optimistic here.

CHAIRMAN GROUT: Chris Batsavage.

MR. BATSAVAGE: Actually Katie, I think you pretty much answered my questions; and yes you're right, without a recovery plan there can't be any delisting or down-listing processes to begin for Atlantic sturgeon. Yes hopefully the assessment passes peer review and provides some information that maybe can inform future recovery plans for the DPSs.

CHAIRMAN GROUT: Dave.

MR. DAVID BUSH: I understand that there are certain requirements that need to take place for this, and obviously I appreciate that. I would like to express that this is an issue, especially in some of our areas where we're trying to make efforts to remove an invasive species; but yet this is the choke species that's right there with that. It is an urgent issue for us. In some of our areas we have blue cats that have made their way into areas where they never use to be.

Trying to bring their populations under control or bring them down, or even create a market for them to keep them from destroying our estuaries that are now being hampered by our efforts to protect the sturgeon. I guess until we find a big blue cat with a belly full of baby sturgeon, I'm not sure what we're going to do next. Anything we can do to put a little heat on this would be greatly appreciated.

CHAIRMAN GROUT: Adam.

MR. NOWALSKY: I appreciate the update from staff. As Chair of the Sturgeon Board, I also want to thank them for having reached out to me; Max in particular, in trying to keep me up to date. I just want to extend this note to Commissioners that as of right now for the annual meeting for the Sturgeon Board, we don't have a whole lot for the agenda beyond the review of this assessment. If there are any potential action items, or something that staff would like looked at leading up to that. I would ask that they get in touch with myself or staff in advance; so we can have that prepared for you.

CHAIRMAN GROUT: Are there any other questions or comments? Seeing none; thank you, Katie, I appreciate it. Next we're going to Review and Consider Approval of the Assessment Schedule; Shanna.

REVIEW AND CONSIDER APPROVAL OF THE ASSESSMENT SCHEDULE

MS. SHANNA L. MADSEN: Diving right into the assessment schedule. I'm going to just run over some of the changes that have been made since the last time I spoke to you guys; I think May 2016. First of all, following the request of the Horseshoe Crab Management Board, we added a horseshoe crab benchmark assessment to the schedule in 2018.

SAW/SARC reviews were added to the schedule for Atlantic herring in 2018, and the 2019 summer flounder assessment was changed from an update to a benchmark at the Fall, 2016 NRCC meeting; with the potential to move it forward to 2018. The benchmark assessment for northern shrimp was moved back to spring, 2018, to accommodate a calibration study for the Summer Survey.

There is a necessary equipment change on the Summer Survey, so it requires some side-by-side-calibration tows. We also added a cobia SEDAR review to the schedule for 2019. During the call that the ASC had in the spring, we also got an update from the MRIP Transition Team. We discussed what that might mean for some of ASMFCs species.

Following their calibration model peer review, the re-estimation of the historical catch in effort could lead to some changes in stock statuses or quotas that would require management action. On the call, the ASC divided our ASMFC managed species into anticipated levels of impact; sort of based on the amount of recreational harvest that we typically see with these species. We looked at that and then compared it to the stock assessment schedule.

For now, mostly all of our potential high impact species, things like striped bass, are already on the stock assessment schedule in the very near future. The ASC decided to leave the assessment schedule as is. Once we actually get those calibrated numbers released, the ASC and the TCs can reevaluate the stock assessment schedule; and the timing, just based on the difference between those calibrated numbers and the previous numbers.

Jointly or cooperatively managed species, we said, you know that's kind of updated on the federal schedule. We just looked at the ASMFC species. Secondly, and I apologize for how awful this looks. This is the assessment schedule workload score sheet. You guys always get this when you receive the Excel file that contains the stock assessment schedule.

Essentially this workload score sheet is a way to calculate the workloads of the TC and the Stock Assessment Subcommittee members along our coast. Historically we update this on an annual basis; and it only includes benchmark stock assessments, and more recently we decided to add assessment updates to the score sheet.

The ASC has looked at this schedule and sort of realized that we're overlooking a lot of participation on other assignments that these folks are working on, on the other science committees, as well as tasks that are coming to us; either outside of a regular stock assessment. The ASC is going to kind of review this workload score sheet. We have a meeting in September planned. We're going to try to identify a more representative way of capturing scientist workload across the coast; which can kind of help with future task prioritization and will hopefully be able to bring some sort of improved score sheet to you guys at the annual meeting, is what we're hoping for. With that I will be happy to take any questions.

CHAIRMAN GROUT: Bob.

EXECUTIVE DIRECTOR BEAL: Can you switch back to the schedule? I think there is one update that probably needs to take place on this schedule; based on the last NRCC meeting in June. The summer flounder assessment will go through the SARC process in 2018, and that's to capture all the new recreational data, as well as some of the new methodologies being put forward by Pat Sullivan. I think that's the one update there.

Then while I'm speaking, the striped bass, SARC is in italics for next fall. That one is sort of tentatively put on the SARC schedule. We've been having trouble with getting species on the SARC schedule, to be kind of blunt. We're hoping to get that on the SARC schedule. We'll see how that goes, and we may need to find a different peer review venue toward the end of next year for the striped bass assessment.

CHAIRMAN GROUT: Are there any other questions, discussion? We need to approve this schedule as modified just now. I'm going to try and do it without a motion. **Is there any objection to approving this schedule as modified? Seeing none; it's approved by unanimous consent.** Finally we have a couple of reports from the Habitat and Artificial Reefs, as well as ACFHP from Lisa.

HABITAT COMMITTEE REPORT

DR. LISA HAVEL: I'll start out with our Habitat Committee report, which I haven't been able to give, I think over the past six months. This is what we've been doing for six months. The Habitat Committee met May 2nd and 3rd at the ASMFC offices in Arlington, Virginia. They received a presentation from Dr. Bob Orth from VIMS on Submerged Aquatic Vegetation in Chesapeake Bay.

They also checked in on Goal 4 progress from the Action Plan. This includes the SAV policy update, which I'll get into in a little bit; the progress on the Aquaculture Habitat Management Series document that they've been working on, our 2017 Habitat Hotline, which will focus on submerged aquatic vegetation, as well as updating the species habitat fact sheets.

For the SAV policy update, this year marks the 20th anniversary of ASMFCs SAV policy. The Habitat Committee created a subcommittee, which then created a questionnaire to identify how ASMFC SAV policy has been implemented over the past 20 years; based on recommendations in the original policy.

We received results from nine states that have marine SAV within their borders. From these results, seven of the nine states have implemented a resource assessment and monitoring strategy. Three out of the nine states have evaluated the effectiveness of these measures they've put into place, to limit SAV damage. Five out of nine states have set restoration goals.

Eight out of nine states have identified the key reasons for SAV loss in their state. Six out of nine states have identified suitable areas for protection and restoration. Seven out of nine states have included SAV information in aquatic education programs, and eight out of nine states have supported SAV research. These graphs are all in your briefing material. The Subcommittee found that the goals in the original SAV policy are still relevant; and arguably the policy is more important now than ever. They would like to update the policy with new science and management issues; which includes adding new references, as well as adding some emerging issues such as aquaculture.

If you have any feedback on what you would like to see included in this SAV policy update, I would be happy to hear it. The Habitat Committee has also been working on a couple of letters to the Department of Interior. Last week we sent a letter to Secretary Zinke reiterating ASMFCs position on seismic testing.

Currently there is a comment period open for the 2019 to 2024 Outer Continental Shelf leasing. This closes on August 17, and the Habitat Committee wrote a draft letter; which was included in supplemental materials for Policy Board comments and edits, and possible approval. The draft letter includes a list of potential negative impacts to fish habitat; including noise, toxins, spills, blowouts and shoreline development.

The letter asks that BOEM does not lease on current and proposed HAPCs coming from the North Atlantic, Mid-Atlantic and South Atlantic Councils; as well as not leasing on any National Marine sanctuaries, parks and monuments; and these can be found in Massachusetts, Maryland, North Carolina, Georgia and Florida.

These suggestions are broad. For example, they do not include recommendations for seasonal closures in particular areas, boundaries, buffer zones for any of these areas. It's pretty general as it is now, and we're open to any comments or suggestions for anything to change or add to the letter.

CHAIRMAN GROUT: Are there any questions, first of all for Lisa about this and the SAV policy review? Seeing none; as Lisa pointed out, we have a letter in the packet in our briefing book, a draft letter that we're proposing to send to the Secretary. Are there any questions about the letter, any comments about the letter?

MS. KERNS: The letter is in the supplemental materials; if you're not familiar.

CHAIRMAN GROUT: I would like to see, is there any objection by the Policy Board to sending that letter as drafted right now? Yes, go ahead, Eric.

MR. REID: I have no problem with the letter. I am not sure if Hudson Canyon should be included as a proposed National Marine Sanctuary, because it's not here. I don't know what the status of that is; but there is some activity on Hudson Canyon in the National Sanctuary.

MS. KERNS: We pulled it directly from the website.

CHAIRMAN GROUT: Any other comments or concern? Is there any objection to sending the letter? Seeing none; I see that approved by unanimous consent. Thank you. Now you have ACFHP.

DR. HAVEL: I still have a little more for Habitat.

CHAIRMAN GROUT: Okay, keep going.

DR. HAVEL: At the spring meeting, the Habitat Committee debated once again the merits of completing a document summarizing the Commission's HAPCs, Habitat Areas of Particular Concern for the 2018 Action Plan, and designating HAPCs where we haven't yet done so. There was a debate on whether the Commission should use the term HAPC, since it does not carry the same regulatory weight as the Federal HAPC designation.

The pros for using Habitat Areas of Particular Concern in a Commission context include consistency. It has been discussed twice in the past and approved by the Policy Board, and it would be beneficial possibly to try and initiate the use of HAPC in a broader term, similar to MSY, how MSY carries both a regulatory context, depending on when you use it, and also MSY is just a definition. There was argument in just saying HAPC could be a definition. Another pro is that we are currently using it in documents.

The cons are that using HAPC in a Commission context creates confusion for possibly staff, Commissioners, those reading these documents; and it could provide more work for the Commission in order to having to explain the difference in regulations, and how HAPC is designated between the Federal definition and the Commission definition. There was group consensus from the Habitat Committee to continue using Habitat Areas of Particular Concern, but the consensus was not unanimous among the group.

I am open to feedback from you all, on whether a summary HAPC document, so it would be pulling all of the HAPC information from all the fishery management plans into one location, would be useful; whether we need to fill in the gaps for certain species, and whether we should continue using the term HAPC. If you all are interested in a document like this it would be added to the 2018 Action Plan.

CHAIRMAN GROUT: Okay, any feedback on this from the Policy Board here; one on whether we're using the definition, two, whether we want to bring all the HAPCs into a single document, and whether this document would be useful for us. Toni.

MS. KERNS: In addition, we are trying to get feedback of whether or not we should use the term HAPC or not, or if we should come up with some other term to use; because of the non-consent of the Habitat Committee, as well as in discussions with some Commissioners that I have had. The confusion of what it means to be an HAPC in the federal version versus the Commission; because we don't have any regulatory teeth associated with HAPCs for Commission documents. We really would like some feedback from you on this.

CHAIRMAN GROUT: Hands have gone up. I have John Clark, Roy and Chris.

MR. CLARK: I don't know if I have any way to clarify that; but I was just curious also. I know the regional planning bodies have come up with yet another term, I think they're using for, what is it Ecologically Rich Areas or something to that regard. Have you been working in conjunction with them also, Lisa, these regional planning bodies like the Mid-Atlantic and the New England?

DR. HAVEL: Not on that definition, no; but they do serve on the Habitat Committee.

CHAIRMAN GROUT: Roy Miller.

MR. MILLER: As I look over the list of Habitat Areas of Particular Concern that is in the appendix from the meeting materials for this discussion topic. I see specific banks and canyons and coral habitat, and identifiable marine landmarks and that kind of thing. Then I see summer flounder habitat. Summer flounder habitat sounds kind of vague to me. Isn't the entire Mid-Atlantic basically summer flounder habitat? Why would we pick out that particular species to be so general?

DR. HAVEL: Those in the letter to the Department of Interior, those are all of the Council HAPCs, so those are not necessarily the Commission HAPCs, which is a good example of how this is confusing. That list was pulled directly from the North Atlantic, Mid-Atlantic, and South Atlantic Fisheries Management Council websites.

There are certain areas, for example a particular canyon that are listed, but then there are also areas that are just summer flounder habitat; which does create some issues sometimes with artificial reefing, because South Atlantic Council designates artificial reefs as essential fish habitat, but if you put an artificial reef on, for example sand, you might be taking away other essential fish habitat; but all of that is the Council's definition of HAPC.

MR. MILLER: Just a follow up comment. If I were being asked to review offshore wind development proposals, for instance. Every single one of them is going to affect summer flounder habitat, because that is such a vast area; so therefore something as general as that lacks specificity, and therefore is not terribly useful from that standpoint, just a comment, thank you.

MR. BATSAVAGE: I think the confusion over HAPC and the Commission's habitat guidance versus the federal has been clearly stated here; and our agency is concerned about that confusion; with just our stakeholders, let alone the other folks that use this kind of information.

CHAIRMAN GROUT: Is there any other feedback on this, or questions, or comments? Ritchie.

MR. WHITE: If you're looking for a vote, I'm in favor of changing HAPC.

CHAIRMAN GROUT: Anybody else? I guess from my standpoint, as someone who sits on both the Council and the Commission, and formerly on the Regional Planning Body, I would concur with some of the comments here that we do need to come up with a separate term; because of the regulatory context.

Primarily from a way of making it clear to the public the difference, because we'll get asked questions on this; and it's a potential for misunderstanding from the public and some of our constituents on this. Has anybody given the two comments, and now three comments, does anybody disagree with that; that we should task the Habitat Committee with coming up with a different term from the prospect of the Commission's habitat areas that we are putting forward? Yes, John.

MR. CLARK: I'm just curious, Lisa. Did the Committee come up with any suggestions for different terms to use for this?

DR. HAVEL: The discussion always led to terms that are already there like, well the habitat just has to be essential. Well, we already have essential fish habitat. We spent some time on it, but did not come up with any recommendations; but we can do that for the annual meeting.

CHAIRMAN GROUT: Are there any further comments? Are we all comfortable with tasking the Habitat Committee with coming up with a different term for the Commission purposes? Yes, go ahead Mark.

MR. MARK ALEXANDER: I was just going to suggest as the Council's present person on the Regional Planning Body that you avoid the term Important Ecological Areas; that is fraught with all kinds of problems, and you don't want to use that one.

CHAIRMAN GROUT: Good point, okay I think you have your charge on this; any thoughts on having this all taking some of the, I'm trying to avoid using Habitat Areas of Particular Concern, Important Habitat Areas from a Commission perspective, and putting them all into a single document. Would that be useful to the Commission; or is just okay to have it in each plan; any feedback on that? Go ahead, Russ.

MR. ALLEN: Yes, I think it would be a great idea, because as we go through waterfront development permits and things of that nature; our folks in permitting always ask us, well where can we find some information that would help out? Instead of sending them to different plans, I think just one summary would be a real good idea.

CHAIRMAN GROUT: Any other feedback? Anybody object to tasking them with doing this? Okay you have your answer to those two questions.

DR. HAVEL: Great, thank you all. Finally for the Habitat Committee, we have a new Chair; January Murray from the state of Georgia, and a new Vice-Chair Marek Topolski from the state of Maryland. With that I'll take any further questions on the Habitat Committee.

CHAIRMAN GROUT: Pat.

MR. KELIHER: Could you give me just a 30 second or less overview of what you're doing with aquaculture related to habitat? I saw a reference earlier in your presentation.

DR. HAVEL: When I started as the coordinator for the Habitat Committee there was an ongoing document regarding aquaculture. We're trying to complete it this year. We're pulling a lot of information from the South Atlantic Council's document on aquaculture; but moving it throughout the entire coast.

It's just a summary of the different aquaculture practices. There is a list of them by state, the benefits, and the impacts to fish habitat for the species that we manage. It's just a summary document on aquaculture practices. I don't know the background on to how that got started; but I think it was charged by the Policy Board a few years ago.

MR. KELIHER: Follow up. I haven't seen the draft document, so I want to make sure that Maine has an opportunity to take a look at this. Obviously we've got a very robust aquaculture industry in the state. Our laws and regulations focus on ensuring flora and fauna associated with aquaculture is not impacted; and want to make sure that there are no negatives from what may come out of this document, based on how we promulgate our leases.

CHAIRMAN GROUT: Toni.

MS. KERNS: Pat, since you currently don't have a Habitat Committee member, is there a person that you could forward to myself or Lisa that we could touch base with to give us some input?

MR. KELIHER: Yes. The coastal program within the state of Maine has just been absorbed into the department, and my plan is to task somebody from that group and put them on the Habitat; so I'll definitely do that.

CHAIRMAN GROUT: Any other feedback, comments for Lisa on the Habitat Committee? Seeing none; Lisa, move forward.

ARTIFICIAL REEF COMMITTEE REPORT

DR. HAVEL: The other two updates will be more brief. First the Artificial Reef Committee report. The ASMFC and Gulf States Marine Fisheries Commission Artificial Reef Committees met February 7th and 8th in Jacksonville, Florida. They held discussions on HAPCs, the federal definition, permitting and reef deployment complications, and history resource survey requirements; solicited feedback from the 2016 National Artificial Reef Workshop that we co-hosted with NOA Fisheries.

There were guest presentations about fish aggregating devices in Japan, as well as a presentation on northeast Florida's Offshore Reef Fisheries Independent Monitoring Program. Everyone provided state updates, and the next meeting will be hosted by the Gulf States Marine Fisheries Commission in early 2018.

I am currently serving as the Commission representative on a symposium that the Florida Fish and Wildlife Conservation Commission is hosting at the American Fisheries Society meeting in Tampa in about two weeks; so I've been on that Steering Committee to bring together presentations.

I am also leading the development of the South Atlantic Council's Artificial Reef Essential Fish Habitat Policy Document. We formed a subcommittee from North Carolina, South Carolina, Georgia, Florida and BOEM created a draft policy, which is no longer currently in our view. That actually was sent out. Well, the draft is finalized and it will be reviewed by the Council's Policy Board for approval and adoption in September. That is all I have for the Artificial Reef Committee. Does anyone have any questions?

CHAIRMAN GROUT: John.

MR. CLARK: It's not a question, I just wanted to announce that on the artificial reefs, we just acquired one of the Cape May Louis ferries; and it will be sunk next year on the Del/Jersey/Land Reef, which is the reef that is jointly managed by Delaware, New Jersey and Maryland. I believe this is a fairly unique vessel to be sunk on the east coast. It's over 300 feet long, and with the big ferry structure, it's going to be considered a very good diving type of reef; because you'll have that big area to swim under there.

CHAIRMAN GROUT: Other questions, comments? Okay, Lisa.

ATLANTIC COASTAL FISH HABITAT PARTNERSHIP REPORT

DR. HAVEL: Finally, the Atlantic Coastal Fish Habitat Partnership update. The ACFHP Steering Committee met May 4th and 5th at the ASMFC offices in Arlington, Virginia. A full day of this meeting was dedicated to action planning. The group also received updates on science and data initiatives; the Melissa Laser Award recipient and collaboration with the National Fish Habitat partnership and other fish habitat partnerships.

For the past year and a half, we've been working on our five-year-conservation-strategic plan, as well as our two-year-action plan; and this was finalized and released on July 21, 2017, so it's a very new document for us. It includes goals, objectives, strategies and actions to accelerate the conservation of ACFHPs priority fish habitats; and it is available on the ACFHP website, as well as on the table right outside there.

We are also currently working on a business plan. We're on our fourth internal draft, and on track to be finalized for the end of this year. For our Science and Data Initiatives, we're moving forward on a southeast fish habitat mapping project. This is funded by NOAA; and it covers North Carolina to Florida.

We're working to spatially prioritize fish habitat areas for protection and restoration. We're working on GIS mapping and analysis, looking at habitat threats, first fish presence/absence, and habitat maps. We held a webinar with the Science and Data Committee on June 12, and we are planning a two-day meeting at the end of September.

We have been approved for U.S. Fish and Wildlife National Fish Habitat Action Plan funding for FY17. This funding will go towards ACFHP operations, website development, including putting the species habitat matrix, which was published back in 2016 online into a searchable database. It's also going to fund two conservation projects; one in Maine and one in North Carolina.

The Maine project is a Sheepscott River barrier removal. It includes both the Cooper Mill Dam and a Head Tide partial removal; and will open 71 river miles for Atlantic salmon, river herring, shad and other diadromous species. It includes extensive outreach to the community. This river is the southernmost Atlantic salmon river designated as critical habitat; and it is being led by the Atlantic salmon federation.

Our North Carolina project that we're working to support is in Bogue Sound. It is being led by the North Carolina Coastal Federation, and they are using recycled oyster shells placed on 300 feet of shoreline; to promote salt marsh growth. This is a nursery habitat for black sea bass and red drum, and a feeding ground for summer flounder. With that ACFHP would like to thank the Commission's continual support, and I'll take any questions.

CHAIRMAN GROUT: Are there any questions for Lisa? Okay, seeing none; thank you very much, Lisa. I appreciate your report.

ADJOURNMENT

CHAIRMAN GROUT: That brings us, since we have no noncompliance finding to other business. Does anybody have any other business to bring before the Policy Board? Seeing none; this meeting is adjourned.

(Whereupon, the meeting was adjourned at 10:13 o'clock a.m., August 3, 2017.)

July 10, 2017

To: Secretary Ross
Fr: Earl Comstock
Re: <u>Decision on New Jersey Fishery Management Issue</u>

Recreational fishing for summer flounder off the Atlantic coast is one of a number of fisheries managed by the Atlantic States Marine Fisheries Commission ("Commission"). The Commission is composed of all 11 states that border the Atlantic, and each state has one vote. The Commission was established by an Act of Congress and adopts fishery management measures for stocks that migrate among the various states. The fishery management measures are implemented by the States, or, if the States disagree or don't comply, by regulations adopted by the Department of Commerce.

For summer flounder, the Commission adopted regulations that differ among the States to try and ensure the combined catch by all States stays within limits and allows for rebuilding of the stock. New Jersey and New York account for the lion's share of the summer flounder catch. New Jersey disagreed with the methodology used to establish the fishing restrictions that the other 10 states voted to adopt for New Jersey. New Jersey argued, unsuccessfully, that the size limits adopted were not reflective of the size of fish found off New Jersey, and would result in a large number of fish having to be discarded, many of which would die as a result of handling by fishermen to remove the hook. New Jersey argued the Commission size limits would cause anglers to switch to other states, to the serious detriment of the New Jersey businesses and beach communities that depend on recreational fishing.

Given the multi-billion dollar recreational fishing industry that helps support New Jersey coastal communities, New Jersey did not adopt the Commission size limits, and instead adopted a lower size limit with a reduced number of fishing days, and cited analysis by their fishery management department that showed that the lower size limit would result in lower discard mortality. In addition, New Jersey started an aggressive angler education campaign and is distributing 20,000 J hooks for free to further reduce discard mortality.

The Commission has sent you a letter asking you to find New Jersey out of compliance with the Commission's regulations. A finding of non-compliance would result in a moratorium on fishing for summer flounder off New Jersey, beginning on a date you would determine. However, you can also find New Jersey in compliance. NMFS has reviewed the New Jersey methodology, and agrees that the New Jersey regulations should result in lower discard mortality and therefore have the same net conservation effect on the summer flounder stock as the Commission rules.

<u>I recommend you find New Jersey in compliance</u>. The New Jersey approach has the same conservation impact but is significantly better from the economic perspective because it preserves jobs and revenue that are critical to New Jersey beach communities.

Agree <u>WLR</u> Disagree, I find New Jersey out of compliance ________

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

JUL 11 2017

MEMORANDUM FOR: Chris Oliver
Assistant Administrator for Fisheries

FROM: Alan Risenhoover
Director, Office of Sustainable Fisheries

SUBJECT: Atlantic States Marine Fisheries Commission State of New Jersey Compliance Finding for Summer Flounder--INFORMATION MEMORANDUM

The Secretary of Commerce has determined, based on the information communicated to him, that the alternative measures implemented by the State of New Jersey for the 2017 recreational summer flounder fishery are compliant with the intent of the Atlantic States Marine Fisheries Commission's (Commission) Summer Flounder, Scup, and Black Sea Bass Interstate Fishery Management Plan (ISFMP).

The information below supports the Secretary's determination that while New Jersey failed to carry out its responsibility to implement the Commission's measures under the ISFMP, the measures New Jersey did implement are likely to provide equivalent total conservation as those required by Addendum XXVIII to the ISFMP.

This information is based upon the findings made during the noncompliance process of the Atlantic Coastal Fisheries Cooperative Management Act (Atlantic Coastal Act). These provisions were triggered when the Commission found New Jersey out of compliance with the ISFMP and forwarded that finding to the Secretary for formal review in a letter dated June 8, 2017. As required by the Atlantic Coastal Act, a decision must be made by July 11, 2017.

BACKGROUND

Statutory Requirements

The Atlantic Coastal Act, 16 U.S.C. 5101 *et seq.,* contains a noncompliance review and determination process that is triggered when the Commission finds that a State has not implemented measures specified in an ISFMP and refers that determination to the Secretary for review and potential concurrence.

The Atlantic Coastal Act's noncompliance process involves two criteria. The Secretary must determine: 1) whether the State in question has failed to carry out its responsibility under the Commission's ISFMP; and 2) if so, whether the measures that the State failed to implement and enforce are necessary for the conservation of the fishery in question.

to implement and enforce are necessary for the conservation of the fishery in question. These initial findings must be made within 30 days after receipt of the Commission's noncompliance referral.

If the Secretary determines a State is noncompliant with both of these criteria, the Atlantic Coastal Act mandates that the Secretary impose a moratorium on fishing in State waters in the fishery in question.

Background on the Commission's Noncompliance Referral

The summer flounder stock is subject to overfishing. Catch limits for the 2017 fishing year were reduced 30 percent from 2016 in an effort to end overfishing. For the recreational fishery, fishery managers adopted a set of coordinated conservation measures in state and federal waters to constrain recreational harvest to the catch limit in place for the year. In federal waters, the Mid-Atlantic Fishery Management Council (Council) establishes the recreational measures through the 2017 recreational management measures specifications. In state waters, the Commission and its member states coordinated 2017 recreational measures through Addendum XXVIII to the ISFMP.

New Jersey did not implement Addendum XXVIII's conservation measures in state waters.[1] Instead, New Jersey implemented size limits that are 1-inch lower in each region (i.e., 18 inches rather than 19 inches in the majority of its marine waters) and instituted a season of 104 days (rather than the prescribed 128 days). The bag limits remain the same as those required under the addendum. New Jersey asserts that its measures provide an equivalent amount of conservation. The Commission disagreed.

The Commission met on three separate occasions this year to discuss New Jersey's measures: May 10; May 22; and by conference call on June 1. The Commission's Technical Committee also reviewed and commented on New Jersey's measures. The Technical Committee found the New Jersey measures were not conservation equivalent in that they would not achieve the harvest reductions derived from the addendum's standard methodology. However, the Technical Committee commented that New Jersey's measures would potentially result in the same level of total mortality as Addendum XXVIII measures. The Technical Committee's May 18, 2017, memorandum outlining its findings is attached in Appendix A.

The Commission found New Jersey out of compliance during the June 1 conference call. All states except New Jersey voted in favor of this finding. The Commission formally

[1] For New Jersey, Addendum XXVIII required the following measures:

- Shore mode for Island Beach State Park only: 17-inch minimum size limit; 2-fish possession limit and 128-day open season.
- Delaware Bay only (west of the COLERG line): 18-inch minimum size limit; 3-fish possession limit and 128-day open season.
- All other marine waters (east of the COLERG line): 19-inch minimum size limit; 3-fish possession limit and 128-day open season.

referred its noncompliance finding to the Secretaries of Commerce and Interior in a letter dated June 8, 2017. NOAA received the letter on June 11th and began the Atlantic Coastal Act's 30-day determination clock on June 12th. We also advised the public of the referral in a *Federal Register* notice dated June 22, 2017 (82 FR 28476). Letters soliciting comments on the Commission's noncompliance determination were sent to the Commission, Council, New Jersey Governor Chris Christie, and U.S. Fish and Wildlife Service.

Consistent with the noncompliance provisions of the Act, New Jersey was invited to present the rationale for its assertion that the measures implemented for 2017 comply with the ISFMP. On June 20, 2017, Commissioner Bob Martin of the New Jersey Department of Environmental Protection (NJDEP), Russ Allen, chief of the NJDEP's Bureau of Marine Fisheries, other NJDEP staff, and NOAA and Department of Commerce staff met via conference call. During this meeting, New Jersey provided extensive background materials in support of its measures. The New Jersey officials stated these materials and analyses support that their measures are conservationally equivalent to Addendum XXVIII and therefore comply with the ISFMP. New Jersey outlined again, as it had for the Technical Committee and Commission, that its measures would reduce overall mortality of summer flounder and would conserve a greater number of total fish than would the addendum. They reiterated the points included in a previously submitted letter dated June 16, 2017 (Appendix B). New Jersey also provided an update on their public outreach and education efforts to minimize discard mortality. They anticipate preliminary results on the effectiveness of these efforts in August 2017.

We received one comment in response to our solicitation letters. On June 26, 2017, the Council sent us a letter indicating that summer flounder needed conservation and that New Jersey's measures provided insufficient conservation (Appendix C).

30-Day Determination

The basis for the 30-day determination under the Atlantic Coastal Act (16 U.S. Code § 5106(a)(1), (a)(2), and (c)(1)) is discussed below.

1) *New Jersey did not fulfill its responsibilities under the ASMFC ISFMP for Summer Flounder (Addendum XXVIII)*

The record is clear and New Jersey does not dispute that it did not implement the measures required under Addendum XXVIII. Addendum XXVIII required the states to implement specific recreational management measures developed to constrain catch within the 2017 summer flounder recreational harvest limit. New Jersey adopted measures with different minimum sizes and season lengths than those required by the Commission. Therefore, New Jersey failed to fulfill its responsibilities under the ISFMP.

2) *The measures that New Jersey failed to implement are not necessary for the conservation of summer flounder.*

Both the Federal FMP and state ISFMP require that management measures are tied to the available recreational harvest limit. The recreational harvest limit is a cap on landed catch (harvest), rather than on total catch (removals), which would include consideration of discards and discard mortality. Constraints on harvest are the tool used to ensure that the limit is not exceeded. All other states developed and implemented recreational management measures to achieve the necessary harvest reduction as the key to ensure consistency with the overarching ISFMP requirements. The New Jersey measures are inconsistent with this aspect of the ISFMP. Instead of the standard harvest-based management, New Jersey compares its measures with the Commission's in terms of total mortality of summer flounder. This creates a fundamental disconnect in considering the conservation need for the stock: The FMPs do not currently evaluate the total mortality on the stock directly. New Jersey personnel, the Technical Committee, and Commission members rightly point out that the New Jersey measures will increase harvest, projecting total harvest to increase by about 95,000 more fish than would have been expected under the Commission's addendum. If the conservation of the summer flounder stock was defined solely by being equivalent to this harvest metric, New Jersey would be out of compliance.

However, based on the analysis provided by the State, it is likely that New Jersey's measures will result in similar levels of total removals as the measures outlined in Addendum XXVIII. That is, although New Jersey's measures would result in higher harvest, they should result in lower discard mortality, and thus ultimately fewer dead summer flounder, the number of which is comparable to the target set forth in the Commission's addendum requirements (See correspondence Appendices A and B for additional detail). Importantly, the Technical Committee did not disagree with this assertion. In fact, although the Technical Committee noted uncertainty in New Jersey's new approach, the Technical Committee projected that New Jersey's measures could result in a similar level of overall removals–and thus conservation–as the Commission's plan.

3) A moratorium in New Jersey State waters is not required.

Although the first criterion outlined in the Atlantic Coastal Act regarding noncompliance was met, the second criterion was not. Because New Jersey's measures may achieve an equivalent amount of conservation in terms of total fishing mortality, we cannot conclude the Addendum XXVIII measures are necessary for the conservation of the summer flounder stock. As a result, a moratorium in State waters is not required under the Atlantic Coastal Act.

Attachments

Atlantic States Marine Fisheries Commission

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MEMORANDUM

May 18, 2017

To: Summer Flounder, Scup, and Black Sea Bass Management Board

From: Summer Flounder, Scup, and Black Sea Bass Technical Committee

RE: Review of New Jersey Proposal for 2017 Summer Flounder Recreational Management

List of Participants

John Maniscalco (NY)
T.D. VanMiddlesworth (NC)
Brandon Muffley (MAFMC)
Katie May Laumann (VA)
Kirby Rootes-Murdy (ASMFC)
Jason McNamee (RI)
Rich Wong (DE)
Tiffany Vidal (MA)
Bob Glenn (MA)
Toni Kerns (ASMFC)
Emily Gilbert (NMFS)
Kiley Dancy (MAFMC)
Mark Terceiro (NEFSC)
Jeff Brust (NJ)
Peter Clarke (NJ)
Jeff Kipp (ASMFC)
Justin Davis (CT)
Steve Doctor (MD)

The following memo contains the Summer Flounder, Scup, and Black Sea Bass Technical Committee (TC) Review of the New Jersey Proposal for 2017 Summer Flounder Recreational Management.

New Jersey Proposal

At the ASFMC Spring Meeting in May 2017, the Summer Flounder, Scup, and Black Sea Bass Board moved to approve proposed 2017 summer flounder recreational measures that were subject to review and approval of the TC and subsequent Board consideration and approval. Those measures were as follows:

- Shore mode for Island Beach State Park only: 16-inch minimum size limit; 2-fish possession limit and 104-day open season (May 25-Sept 5)
- Delaware Bay only (west of the COLREGS line): 17-inch minimum size limit; 3-fish possession limit and 104-day open season (May 25-Sept 5)
- All other marine waters: 18-inch minimum size limit; 3-fish possession limit and 104-day open season (May 25-Sept 5)

The proposed measures for New Jersey (NJ) differed from the Addendum XXVIII measures, which specified that all states within the management unit (with the exception of North Carolina) would increase their size limit by 1 inch and decrease their possession limit to no more than 4 fish from 2016 measures. In tasking the TC with reviewing the proposed measures, the Board requested that the TC evaluate the proposal under conservation equivalency and determine whether the harvest reduction from the proposed measures were equivalent to those required under

Addendum XXVIII. NJ staff sent the TC their proposal on Friday, May 12th. The proposal noted that proposed measures would reduce New Jersey's harvest in 2017 by 24% from 2016 levels and reduce total fish removals (harvest + dead discards) by 30% relative to the 2016 NJ state measures. The calculations in the proposal used preliminary 2016 MRIP harvest information through wave 5 (September/October) as well as the harvest to discard ratio derived from the NJ Volunteer Angler Survey (VAS).

The TC met via conference call on Tuesday, May 16th to review the proposal and provide comments for the Board's consideration. Below are summary points provided by the TC:

- TC members considered the NJ proposal specifically with regards to whether the proposed measures were conservationally equivalent to the harvest reductions prescribed in Addendum XXVIII. The TC found that when comparing the harvest reduction derived from the standard methodology using final 2016 MRIP harvest in numbers of fish, the reductions were not equivalent; there was a greater reduction in harvest under the Addendum XXVIII measures than the NJ proposed measures. NJ evaluated the proposed measures for the entire NJ coast, and did not break out reductions associated with proposed measures to Island Beach State Park nor for NJ waters in the Delaware Bay. The NJ proposal indicated the proposed measures, using preliminary MRIP data through wave 5, would result in a decrease of 24% in the NJ projected harvest in 2017; under the Addendum XXVIII measures NJ's projected harvest would decrease by 33%. The TC acknowledges that additional harvest from Delaware Bay and Island Beach State Park are likely to be minimal. During the call, the TC asked to evaluate the reductions from the two sets of measures using final 2016 MRIP harvest as it was the best available information. In using the final harvest estimates, the reduction from the NJ proposed measures decreased to 20.6% while the reduction associated with Addendum XXVIII measures remained 33% (see below, Table 1). Given that final 2016 MRIP harvest estimates are available and it does impact the reduction associated NJ proposed measures, the TC indicated that final MRIP harvest estimates should be used.

Table 1. New Jersey Projected 2017 Harvest (A+B1) under different scenarios

Approach	Area specific	Management Measures	Projected Harvest in numbers of fish (MRIP data A+B1)	Percentage Reduction
2016 Status quo measures	**New Jersey***	**18" 5 fish 128 days**	**754,706**	**0%**
	NJ/DE Bay COLREGS**	**17" 4 fish 128 days**		
NJ 2017 Proposed measures	New Jersey	18" 3 fish 104 days	**599,032**	**20.6%**
	NJ/DE Bay COLREGS	17" 3 fish 104 days		
ASMFC Addendum XXVIII Measures	New Jersey*	19" 3 fish 128 days	**505,201**	**33.1%**
	NJ/DE Bay COLREGS**	18" 3 fish 128 days		

*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 DE-VA, the same possession limit and the same season length as Connecticut – New York.

- The TC also reviewed whether the NJ proposal would reduce total fish removals (harvest + dead discards), a key argument of the proposal in conserving the summer flounder resource. The proposal outlined a methodology that incorporated NJ VAS data to calculate a harvest to discard ratio and through an outreach and education program, the number of fish killed through recreational harvest and discarding would be less than under the Addendum XXVIII measures. This was considered a new approach relative to previous analysis conducted by the TC, and the TC indicated some interest in further evaluating a harvest to discard ratio in developing measures. While the NJ VAS data was noted to have an adequate sample size, given concerns on how representative this data was of NJ anglers, the TC noted that the harvest to discard ratio should come from MRIP data to be consistent with data used to calculate harvest reductions, rather than the combination of NJ VAS and MRIP data in the proposal. After reviewing the NJ proposal using final MRIP estimates and a 10% discard mortality rate and prior to evaluating discards during the closed season, the NJ option achieved a 21% total fishing mortality savings compared to the 18% total fishing mortality observed in Addendum XXVIII (Table 2).

- The second step in evaluating reduction in total fish removals, was the application of a new discard mortality rate. The NJ proposal offered that through outreach and education, the recreational discard mortality rate of 10%- currently used in the peer reviewed 2013 stock assessment and subsequent updates, would be reduced by 2% to 8%. In considering the proposal's methodology for achieving a reduced recreational fishing discard mortality, the TC took issue with this assertion, most notably in the lack of data or peer-reviewed literature to support the assertion that the discard mortality rate would decrease by specifically 2%. Furthermore, NJ staff did not indicate how the 2% reduction in the recreational discard mortality rate could or would be quantifiable. When total fish removals under the measures specified in the NJ proposal were re-analyzed assuming only the 10% discard mortality rate, the difference between total recreational removal reductions under Addendum XXVIII and the NJ Option was decreased. Additional modifications were to incorporate the final 2016 MRIP estimates and use harvest: discard ratios developed from MRIP data as opposed to NJ VAS data in addition to reverting back to a 10% discard mortality; the results under these scenarios of different data and assumptions are included in Table 2 below.

Table 2. Reduction in Total Recreational Fishing Removals (based on MRIP harvest in number of fish)

	Recreational Discard mortality rate	**Measures**	**Total Harvested**	**Total Dead (Harvested + Dead Discards)**	**Total Recreational Fishing Removals Compared to 2016 Regulations**	**Total Recreational Fishing Removals Compared to ASMFC Addendum XXVIII**
Preliminary 2016 MRIP data through Wave 5 (Sept/Oct)*	10%*	Addendum XXVIII Measures	526,898	1,159,176	-14%	0%
	8%*	NJ 2017 Proposed	605,256	944,199	-30%	-19%
Final 2016 MRIP data**	10%	Addendum XXVIII Measures	**505,201**	**1,115,438**	**-18%**	0%
	10%**	NJ 2017 Proposed	**599,032**	**1,083,843**	-21%	-3%

***These data and assumptions were presented in the NJ proposal.**
****These data and assumptions were inputted and adjusted during the TC conference call.**

Note: Harvest to discard ratios were derived for final 2016 MRIP data analysis using MRIP data; the NJ proposal ratio were derived from NJ VAS data. Additionally, NJ proposed measures do not account for changes in discard mortality due to a shorter season in 2017.

- The point was made by members of the TC that the NJ proposal ignores the discards that would occur when the fishery was closed. This is problematic as it creates a logical inconsistency in the proposal, in that the crux of the proposal is that the new methodology accounts for all fishing removals, not just harvest. There was a discussion about the magnitude of these discards, and an alternate calculation was performed to try and account for these missing discards. There were different results presented from these additional analyses, resulting in the TC being unable to determine whether the NJ proposal would result in equivalent or reduced total recreational fishing removals relative to the Addendum XXVIII measures. As such, the TC did not agree with the NJ proposal that total recreational fishing removals would be reduced to a greater level under the NJ proposed measures than under the Addendum XXVIII measures given the uncertainty associated with the assumptions of no discarding of summer flounder once the fishing season is closed and reduced discard mortality through outreach efforts. Additionally, given the new analyses conducted on the call showed a range from increasing discard mortality to reducing discard mortality in the NJ proposal, it was impossible to make a judgement on equivalency without additional work being done on the proposal.

- Members of the TC also noted concern about the timing of the proposal relative to the current fishing season. TC members made clear that all other states had implemented 2017 measures per Addendum XXVIII requirements and that considering a radically different conservation equivalency proposal after other states regulations had been promulgated was problematic as the other states would not have an opportunity to apply this new methodology to their data.

- The TC considered the new methodology from the proposal used to develop NJ's proposed measures as well as the stated objective (reducing total recreational fishing removals rather than harvest alone). This approach was unique and different from the standard methodology for developing measures as well as the FMP requirement of constraining harvest to the annual coastwide Recreational Harvest Limit (RHL). The TC noted this would effectively set different standards for evaluating New Jersey measures relative to the other states resulting in a logical discrepancy between the various approaches creating issues of inequity. The TC also noted that the increased harvest by NJ under their proposal threatens the ability of the states to constrain harvest to the RHL.

- In considering the proposed objective in the NJ proposal of reducing total recreational fishing removals, the TC was in agreement that this was a concept that was a potential improvement to the current approach of constraining coastwide harvest to the RHL, but believes the NJ method warrants further refinement before it can be incorporated into recreational management. It should be noted that currently as part of the Summer Flounder FMP, the annual catch limit (ACL) takes into account both harvest and discards in setting the RHL, and that further evaluation of reducing discards should consider the ACL. The TC did commend the NJ staff for providing a novel approach to incorporating discards and discard mortality into consideration for setting recreational measures. The TC has argued in favor of using a fishing mortality based approach for managing recreational fisheries, including taking into account the status of the resource. For summer flounder, with the stock assessment indicating that the resource is experiencing overfishing, reducing mortality associated with discarding may provide additional conservation benefits in helping the stock. The TC is interested in pursuing more of a fishing mortality based approach to recreational management relative to the current harvest limit-based management; it was noted that the Mid-Atlantic Fishery Management Council is current accepting proposals on this concept specifically for summer flounder.

- Lastly, the TC was in favor and supportive of NJ's proposal of conducting more angler education and outreach to help reduce recreational discard mortality, despite the inability to quantify the benefits specifically.

In summary, the TC noted that in the standard comparison of harvest, the NJ proposal was not conservationally equivalent to the Addendum XXVIII measures. It is important to understand that this standard is a component of the Summer Flounder FMP as the recreational fishery performance is evaluated against the RHL. When examining the new and separate comparison of total recreational fishing removals (harvest and discard mortality in total), there was too much uncertainty to determine equivalency between the NJ proposal and the Addendum XXVIII measures due to unquantifiable reductions in discard mortality in the proposal and the unaccounted for discards during the closed seasons. Therefore, this work on total recreational fishing removals needs additional refinement before a determination can be made.

New Jersey 2017 Conservation Equivalency
Management Measures for
Recreational Summer Flounder

I. Introduction

The State of New Jersey has received a copy of the Atlantic States Marine Fisheries Commission's (ASMFC) letter to the Secretary of Commerce dated June 8, 2017 providing notice that ASMFC found New Jersey out of compliance "for not fully and effectively implementing and enforcing Addendum XXVIII to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan."

The State of New Jersey disagrees with the finding of the ASMFC and submits the following comments, pursuant to 16 U.S.C. § 5106, in support of its request that the State be found in compliance for 2017.

This document outlines New Jersey's management measures for recreational summer flounder for 2017 under conservation equivalency and the approach used to compare total mortality and harvest mortality reductions under the ASMFC Addendum XXVIII (Addendum) to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (FMP).

New Jersey has implemented regulations which reduce total fish mortality beyond the ASMFC's measures in the Addendum to the FMP. By establishing an 18-inch size limit, 104-day season, and 3-fish bag limit measures for its 2017 summer flounder recreational season New Jersey is meeting the objective set forth in the FMP to "reduce fishing mortality of summer flounder to assure overfishing does not occur...." New Jersey has also achieved conservation equivalency with the summer flounder management measures for 2017 established in the Addendum.

Regrettably, the ASMFC rejected these measures, even though New Jersey demonstrated that its measures preserve more of the summer flounder stock than if the measures required by ASMFC were in place. As explained below, New Jersey's measures represent responsible management of the summer flounder resource. Therefore, the State of New Jersey should be found in compliance due to its adoption and implementation of conservation equivalency for management of its summer flounder fishery for 2017.

II. Background

In 2014, 2015 and 2016, the New Jersey recreational summer flounder regulations followed a three-state regional approach where the regulations (size, season, and bag limit) have been consistent within all three states in the region (Connecticut, New York, and New Jersey). These regional measures included an 18-inch size limit, 128-day season, and 5-fish possession limit for all three years.

In December 2016, the ASMFC formally proposed an Addendum setting forth management measures to implement the reduced 2017 annual harvest limit established by the ASMFC and the

Mid-Atlantic Fishery Management Council (MAFMC), including five different options for meeting the goals of the management measures. The ASMFC accepted public comment on the Addendum until January 19, 2017.

The New Jersey Marine Fisheries Council (Council) met on January 5, 2017 to discuss concerns regarding both the enormous reduction to the Recreational Harvest Limit for 2017 and the avoidable harmful economic, social, and cultural impacts the proposed measures would have on New Jersey's recreational summer flounder fishery. The Council then unanimously opposed all options in the proposed Addendum. That same evening, ASMFC held a summer flounder public hearing in New Jersey regarding the Addendum with more than 150 people in attendance. Public participants unanimously opposed the Addendum.

At the ASMFC's Management Board (Board) meeting on February 2, 2017, the Commissioner Bob Martin of the New Jersey Department of Environmental Protection (DEP), testified to express New Jersey's concern about the strength of the science of the Addendum and the impact these decisions would have on the recreational fishing industry in New Jersey. Nevertheless, the Board voted to pass the Addendum, with New Jersey and two other states opposing.

The Board's action approving the Addendum and continuing regional management measures for 2017 require a 33% reduction from the 2016 harvest limit for the New Jersey, New York and Connecticut region. As a result, New Jersey was required to implement a 19-inch minimum size, 128-day season, and a 3-fish possession limit for 2017.

New Jersey filed a formal appeal of the Board's decision through the ASMFC's Charter Appeals Process. Within the appeal, New Jersey argued that the ASMFC:

1) Did not follow proper process in reaching its decision on Addendum;
2) Inappropriately used technical information in their decision-making process; and
3) Passed management measures that result in unforeseen impacts, including significant economic impacts.

The appeal was submitted to ASMFC on March 24, 2017. The appeal underwent preliminary review by the ASMFC leadership on April 14, 2017, which accepted only the procedural challenges for full review by the ASMFC Policy Board during its meeting on May 11, 2017. ASMFC dismissed out of hand those aspects of New Jersey's appeal based on flaws in the science ASMFC used and on the negative economic impact the regulation would have on the people of New Jersey who rely, directly and indirectly, on the ocean resources to earn their living.

The 19-inch size requirement would also be especially harmful to a major element of New Jersey's fishing industry – which employs more than 20,000 people and contributes $2.5 billion to the State's economy – because 19-inch fish are rarely found in the waters off the coast of New Jersey. Indeed, fewer than one in ten fish in New Jersey's waters reach 19 inches or above (see Table 1).

The appeal was postponed because on May 10, 2017, the ASMFC Board passed a motion to have the Summer Flounder, Scup, and Black Sea Bass Technical Committee (TC) review New Jersey's proposal for conservation equivalency. The appeal was subsequently rescheduled again on June 1, 2017, and is currently scheduled to be heard at the ASMFC August meeting.

On May 18, 2017, the TC sent a memo to the Board stating that "in the standard comparison of harvest" the New Jersey proposal would not achieve conservation equivalency. However, ASMFC has acknowledged that its approach contains many uncertainties and requires significant refinement. Many of these uncertainties and concerns were laid out in the April 5, 2017 letter from the ASMFC to the National Oceanic Atmospheric Administration (NOAA) regarding the conservation equivalency of Addendum XXVIII. Therein, ASMFC noted that the TC has expressed concern about the "volatility of MRIP and predictability of crafting measures to achieve a specified harvest target."

The letter also stated that "TC's evaluation of past performance [of management measures] includes inherently uncertain estimates to predict future harvest estimates that are equally uncertain" noting that this "creates problems for truly validating the performance of measures," and that in managing the recreational fishery "assumptions are made about data accuracy and precision . . . that are not true." Despite this, the TC disagreed with New Jersey's proposal because its proposed calculation methods contained "too much uncertainty" or "needed further refinement," holding the State of a New Jersey to a standard the TC has not, itself, meet.

The Board received the TC memo and met via conference call on May 22, 2017 to review the report and consider final action on New Jersey's measures. During that call, the Board determined that it would not accept New Jersey's measures because total mortality is not equivalent to the reduction in harvest found in the Addendum. What the Board did not consider is New Jersey's use of a different methodology to determine, not just the loss to the stock through harvest, but rather the entire loss to the stock – both harvested and dead discards – which more accurately accounts for mortality. The Board nevertheless passed a motion, over New Jersey's objection, to reject New Jersey's measures and to recommend finding New Jersey in non-compliance.

Following the Board's action, on June 1, 2017, the Interstate Fishery Management Policy Board (ISFMP Board) met by telephone and recommended that the full ASMFC find New Jersey out of compliance. On that same day, the ASMFC met by telephone, despite New Jersey's request for an in-person meeting, and found New Jersey out of compliance with the management measures contained in the Addendum to the FMP. The ASMFC then notified the Secretaries of Commerce and Interior of its findings by letter dated June 8, 2017.

III. New Jersey's 2017 Summer Flounder Management Measures Adopted by DEP Prior to Start of the Season

To meet the conservation measures required for summer flounder in 2017, on May 17, 2017 the New Jersey Marine Fisheries Council unanimously approved, and Commissioner Martin signed, summer flounder regulations for 2017.[1] New Jersey reduced the summer flounder season from 128 days to 104 days prior to the start of the season. The adopted regulations established:

- A minimum size of 18 inches;
- A 104-day season, to run from May 25, 2017 through September 5, 2017;
- A bag limit of 3 fish.

[1] N.J.A.C. 7:25-18.1.

In addition, the Council retained from New Jersey's 2016 measures the 16-inch size limit and 2-fish possession limit at Island Beach State Park (IBSP) but shortened the season to 104 days, and retained the 17-inch size limit for Delaware Bay but reduced the season length to 104 days and the possession limit to 3 fish. New Jersey expects as in past years, a limited number of landings from both Delaware Bay and IBSP adding fewer than 8,000 fish total, or about 1% of all recreational landings in New Jersey. This is consistent with the conclusion reached by the TC, that: "… additional harvest from Delaware Bay and Island Beach State Park are likely to be minimal."

The differences between New Jersey's measures and the ASMFC's measures are the minimum size and season length. By maintaining an 18-inch minimum size and reducing the season length, New Jersey will prevent discard mortality from exceeding harvest mortality and thereby minimize the erosion in mortality savings through discards. The anticipated increase in harvest numbers due to an 18-inch minimum size will be sufficiently offset by the corresponding decrease in dead discards. The result will be a similar net reduction in overall fish mortality as compared with the overall fish mortality expected to result from a 19-inch minimum size.

In addition to these regulations, the State, through the DEP, is implementing an outreach program that draws heavily on the resources available from NOAA Fisheries' "FishSmart" program. This outreach program is expected to reduce our discard mortality below 10%. New Jersey will disseminate information at tackle shops, angling locations including marinas, and for-hire vessels. Further, New Jersey already has an email distribution list of more than 138,000 marine recreational anglers, which will be used to distribute hooking and handling protocols and an additional 14,000 followers on the Division's social media Facebook page.

Notably, the Technical Committee concluded that it was, "…in favor and supportive of New Jersey's proposal of conducting more angler education and outreach to help reduce recreational discard mortality, despite the inability to quantify the benefits specifically."

In addition to this extensive public outreach and education effort, New Jersey also will be distributing, at no charge, more than 20,000 large "j-hooks" throughout the state which research studies (cited immediately below) show will reduce discard mortality by reducing the potential for lethal damage to the undersized fish when removing the hook. Therefore, New Jersey expects that a larger hook size also will contribute to reducing discard mortality below 10%.

A Fairleigh Dickinson University study demonstrated that larger hook size reduces discard mortality. In addition, the Lucy and Holton (1998) study used for the 1998 stock assessment concluded that hook removal and hook setting practices could significantly reduce mortality. Furthermore, historical studies have shown a range of discard mortality between 5% and 23% with a mean of 7% achieved through hook size and handling variation.

Finally, New Jersey also plans to engage an accredited state university to track and study the impacts based on these actions. This will allow New Jersey to truly understand the impact and potential benefits of the outreach and education program.

IV. Atlantic Coastal Fisheries Cooperative Management Act Standards

Pursuant to the Atlantic Coastal Fisheries Cooperative Management Act, 16 U.S.C. § 5106(a)1 and 2 (Atlantic Coastal Act), the Secretary is charged with making a finding as to whether New Jersey "has failed to carry out its responsibility under section 5104 of this title" and "if so, whether the measures that [New Jersey] has failed to implement and enforce are necessary for the conservation of the" summer flounder fishery. The 2017 summer flounder management measures that New Jersey has implemented comply with the FMP and conserve the summer flounder fishery better than would be achieved under the Addendum.

A. New Jersey's Measures Implement and Enforce Measures that are Conservationally Equivalent to Addendum XXVIII and Thus are in Compliance with the FMP.

16 U.S.C. 5104 (b) requires New Jersey to implement and enforce measures of the applicable fishery management plan. Addendum XXVIII to the FMP directed New Jersey, New York, and Connecticut to implement the following measures for 2017: 19-inch minimum size, 128-day season, and a 3-fish possession limit. However, Framework Adjustment 2 of the FMP authorized the States, including New Jersey to adopt conservationally equivalent measures. Conservation equivalency is defined by the ISFMP Charter as

> [a]ctions taken by a state which differ from the specific requirements of the FMP, but which achieve the same quantified level of conservation for the resource under management. One example can be, various combinations of size limits, gear restrictions, and season length can be demonstrated to achieve the same targeted level of fishing mortality (emphasis added).

By adopting an 18-inch minimum size, 104-day season, and 3-fish possession limit, New Jersey will reduce total fish mortality and ensure that the discard mortality rate does not exceed the harvest rate, which further conforms to one of the FMP's primary objectives to reduce the fishing mortality of summer flounder. As such, New Jersey is implementing and enforcing measures that are the conservation equivalent of the ASMFC measures set forth in the Addendum and thus comply with the FMP.

There will be a positive biologically significant difference between what the ASMFC seeks to achieve through its requirements and what the State of New Jersey will achieve through its management measures because New Jersey's approach will result in fewer dead fish. In fact, the regulation approved by the Council will instead reduce the overall mortality of the summer flounder stock when compared to those that the ASMFC would impose on the State. Accordingly, New Jersey has fulfilled its responsibility under the Atlantic Coastal Act to protect the summer flounder resource in accordance with the FMP.

Extensive analysis demonstrates that New Jersey's regulations will achieve an estimated 21% reduction in harvest for the state.[2] In fact, the TC stated: "[a]fter reviewing the NJ proposal

[2] The estimated savings were calculated as follows:

- Season and possession limit reductions were applied to the New Jersey 2016 harvest to estimate 2017 harvest;
- Applying a discard-to-keeper ratio as reported through MRIP[2] of 8.1 for 18-inch fish and 12.1 for 19-inch fish, total catch was estimated by multiplying harvest by 8.1, total dead discards was

using final MRIP estimates and a 10% discard mortality rate and prior to evaluating discards during the closed season, the NJ option achieved a 21% total fishing mortality savings compared to the 18% total fishing mortality observed in Addendum XXVIII" (see Table 2). Thus, **New Jersey's measures will reduce overall mortality, conserving a greater number of total fish than would the Addendum.**

Based on the final 2016 MRIP data, fewer than 8% of the fish caught in New Jersey's 2016 recreational fishery were equal to or greater than 19 inches (Table 1). Assuming a 10% discard mortality rate used in summer flounder stock assessments since 1998,[3] discard mortality in New Jersey's fishery would exceed harvest mortality under a 19-inch minimum size because the number of undersize fish anglers encounter will be greater than at 18 inches at a discard to keeper ratio of 12 to 1 rather than 8 to 1 (Table 2).

Such a large increase in discarded fish substantially impacts the estimated savings from the Addendum. Specifically, the 2016 stock assessment update indicated that fishing mortality exceeded the approved fishing mortality threshold by 26%.

The Addendum was developed to achieve a 30% reduction in harvest in the Connecticut-New York-New Jersey region to account for this excessive fishing mortality (F). However, when considering the increase in discard mortality associated with the increase in size limit from 18" to 19", the savings in total fishing mortality in New Jersey would only be 14%, less than half of the required reduction in fishing mortality needed to meet the F threshold. (Table 2).

Furthermore, should New Jersey's outreach and education initiative reduce discard mortality to 8%, we will have achieved a 27% total mortality savings compared to 2016. Although the exact percentage reduction in discard mortality cannot yet be determined with absolute certainty, the outreach and education efforts, as well as the use of the distributed hooks, will reduce discard mortality to some extent below 10%. Indeed, a recent survey analyzed by Montclair State University, which received responses from 26,000 anglers, found that 70% of those responding would "very likely", or "absolutely", change their angling or handling procedure voluntarily if it could reduce discard mortality. Therefore, even without the outreach and education components, and instead using only the 10% discard mortality rate, New Jersey's measures will conserve more fish than the Addendum.

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calculated by subtracting harvest from total caught and multiplying the result by the discard mortality rate of 10%;[2]

- The total number of dead fish was then estimated by adding total harvest to total dead discards.
- Harvest and total mortality reductions were calculated relative to the 2016 observed values and projected harvest and total mortality under the Addendum.

[3] Early stock assessments incorporated a recreational release mortality of 25 %, but over time this value drew criticism for being too high (Terceiro 2002). SAW 25 (NEFSC 1997) included a research recommendation to investigate recreational release mortality for fluke. Three studies were completed in 1998 to investigate potential factors affecting release mortality, using both tank studies and field trials in North Carolina, Virginia, and New York. Average release mortality in each of the studies ranged from 6 % to 14 %. The average of these studies provides an estimate of 10 % recreational release mortality, which was adopted for the 1998 stock assessment update (Terceiro 2002) and used in all subsequent assessments.

B. ASMFC's Specific Measures are not Necessary for Conservation Because New Jersey's Measures are More Protective of the Summer Flounder Fishery

As discussed above, the management measures New Jersey has implemented for the 2017 summer flounder season achieve the conservation required for 2017 as required by 16 U.S.C. § 5104. However, if NOAA determines that New Jersey has not fulfilled its obligations under 16 U.S.C. § 5104, New Jersey's measures are effective in conserving the fishery under 16 U.S.C. § 5106(a)(2). New Jersey's measures are in fact, more protective than the measures ASMFC would have New Jersey implement as fully explained in Section A above.

In addition, it is important to note that the 19-inch size requirement imposed by ASMFC would be particularly damaging to New Jersey's summer flounder fishery. Data collected from 2010-2017 through the New Jersey Summer Flounder biological sampling program shows that the clear majority of fish of that length or greater in New Jersey waters are reproducing females.

Size	MALE	FEMALE
0-17 INCHES	46%	54%
18-30 INCHES	4%	96%
TOTAL	37%	63%

Consequently, anglers would be removing from the fishery the very fish capable of replenishing the stock. Therefore, again, because New Jersey's measures better conserve the fishery than ASMFC's measures, the exact management measures ASMFC is requiring of New Jersey are not necessary for conservation of the fishery.

V. Despite the Technical Committee's Findings, New Jersey's Measures are Still Conservationally Equivalent and More Protective of the Fishery than Addendum XXVIII

In finding that New Jersey's measures do not meet the conservational equivalence to the Addendum, the TC took issue with the following:

1. The TC found that New Jersey should have used MRIP data to evaluate the percentage reductions and to calculate the discard ratio;
2. The TC found that New Jersey's method ignores discards which occurred during the closed season and that New Jersey did not account for changes in discard mortality due to the shorter season in 2017;
3. Other States' regulations are implemented already and only New Jersey would be getting the benefit of this new measure.
4. The TC found that New Jersey's measures are inconsistent with the FMP requirement of constraining harvest to the annual recreational harvest limit (RHL).
5. The TC generally found that New Jersey's method requires further refinement and further evaluation of discards should consider the Annual Catch Limit (ACL).

As explained below, none of these points support the finding that New Jersey's measures do not achieve conservation equivalence to the Addendum.

1. The New Jersey VAS data was appropriate to evaluate the percentage reductions and to calculate the discard ratio. However, even using the MRIP data, New Jersey's

measures are still more protective of the summer flounder resource than ASMFC's measures because there are fewer dead fish based on New Jersey's calculation of total savings. Furthermore, MRIP data corroborates New Jersey VAS data.

2. Discards after a closed season have never been factored for reduction calculations in the past for this species complex (Summer Flounder, Scup, Black Sea Bass). MRIP data shows that discards drop significantly during the closed season. Further, there will be no open or available bottom fishery in New Jersey between the closed season of September 5 and October 22 when the NJ black sea bass season re-opens, which means there will be virtually no discards during this period because there will be no fishing permitted.
3. The timing of the consideration of New Jersey's measures was a function of the ASMFC process, which New Jersey followed. The same process applies to all states, and other states could, and some did, use the opportunities and process available under ASMFC rules.
4. New Jersey understands the TC's concerns regarding the FMP requirement to constrain harvest to the RHL, but New Jersey's approach demonstrates that implementing the Addendum will result in more dead discards harvested fish.
5. Comparing the recreational ACL and RHL presented in the Addendum yields a discard-to-kept ratio of only about 1.3 to 1. Although this estimate may be valid for some parts of the coast, the MRIP data shown in Table 1 indicates that New Jersey's discard ratios are much higher. Therefore, it would be less accurate for New Jersey to use a coastwide ACL to inform the discard rate for flounder locally.

VI. The Technical Committee Recognizes the Value of New Jersey's Approach

Although the TC did not accept New Jersey's methodology for calculating total mortality, it did find that the State's approach had considerable value.

- The TC concluded that New Jersey's "approach was unique and different from the standard methodology for developing measures as well as the FMP requirement of constraining harvest to the annual coastwide Recreational Harvest Limit (RHL)."
- The TC stated that it "…was in agreement that this [New Jersey's methodology] was a concept that was a potential improvement to the current approach of constraining coastwide harvest to the RHL…."
- The TC "…commend[ed] the NJ staff for providing a novel approach to incorporating discards and discard mortality into consideration for setting recreational measures."
- The TC noted that it "…has argued in favor of using a fishing mortality based approach for managing recreational fisheries, including taking into account the status of the resource" and that "reducing mortality associated with discarding may provide additional conservation benefits in helping the stock."
- The TC clearly stated that it "is interested in pursuing more of a fishing mortality based approach to recreational management relative to the current harvest limit-based management; it was noted that the Mid-Atlantic Fishery Management Council is current accepting proposals on this concept specifically for summer flounder."

Clearly, the Technical Committee, while acting within the narrow confines of the existing methodology, nevertheless recognized that New Jersey's unique approach has merit.

VII. Conclusion:

The management measures New Jersey has implemented for the 2017 summer flounder season achieve a greater level of conservation for 2017 than does the Addendum. While the New Jersey measures do not achieve the required harvest reduction, the State's measures achieve a much greater biologically significant metric because they reduce total mortality of the population due to New Jersey anglers discarding fewer dead fish. Simply stated, New Jersey's proposed measures will conserve more fish, reduce the numbers of larger breeding females removed from the fishery (therefore providing stronger recruitment for the future), and reduce the economic, social, and cultural impact to the State of New Jersey.

Therefore, based on our analysis of the data provided in this memo, a 2017 size, season, and bag limit of 18-inches, 104 days, and 3 fish will achieve conservation equivalency for New Jersey's 2017 recreational summer flounder fishery.

In the final analysis, all interested parties are striving for the same thing – to preserve and manage our fisheries through responsible management processes. New Jersey's regulations are the more responsible approach to obtaining and achieving that goal and the State should, therefore, be found in compliance.

Table 1. CATCH RATIOS New Jersey ratio of fish released (B2) to fish kept (A+B1). The last two columns represent the average rate at which fish were kept and released under the 18 and 19 inch size bins during the 2016 fishing year.

Year	Wave	Observed Harvest (A)	Reported Harvest (B1)	Released Alive (B2)	DAYS	A+B1 FISH	18" FISH	2016 18" Released to Kept	2017 19" Released to Kept
2016	MAY/JUNE	127,191	32,345	1,060,560	39	159,536	49,281	6.6	10.1
2016	JULY/AUG	283,615	158,930	3,673,654	62	442,545	112,170	8.3	11.5
2016	SEPT/OCT	137,604	15,020	1,373,801	27	152,624	68,545	9.0	17.2
	TOTAL	548,410	206,295	6,108,015	128	754,705	229,996	8.1	12.1

Table 2. Comparison of New Jersey 2017 summer flounder option and the ASMFC Option 5 in terms of total Mortality versus harvest reduction.

Option	Total Caught	Total Dead Discards	Total Harvested	Total Dead (Harvested + Dead Discards)	Number of Fish Conserved Relative to ASMFC Addendum XXVIII	Total Mortality Savings Compared to NJ 2016 Regs	Total Mortality Change Compared to ASMFC Addendum XXVIII Measures
ASMFC Addendum XXVIII Measures	6,114,299	560,899	505,314	1,066,213	0	18%	0%
NJ 2017 Option (10% Discard)	4,852,159	425,313	599,032	1,024,345	41,868	21%	-4%
NJ 2017 Option (8% Discard)	4,852,159	340,250	599,032	939,282	126,930	27%	-8%

Mid-Atlantic Fishery Management Council
800 North State Street, Suite 201, Dover, DE 19901
Phone: 302-674-2331 | FAX: 302-674-5399 | www.mafmc.org
Michael P. Luisi, Chairman | G. Warren Elliott, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

June 26, 2017

Mr. John Bullard
Regional Administrator
NOAA Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

Dear John:

Please accept these comments from the Mid-Atlantic Fishery Management Council (Council) regarding the Atlantic States Marine Fisheries Commission's (Commission's) determination of the State of New Jersey's non-compliance with the Summer Flounder, Scup, and Black Sea Bass Interstate Fishery Management Plan (FMP).

The Council concurs with the Commission's determination that the State of New Jersey is out of compliance with the FMP for not fully implementing and enforcing the provisions of Addendum XXVIII to the Commission's FMP. Because summer flounder is jointly managed by the Council and the Commission, the management actions of the Commission and member states are of critical importance to achieving the Council's management objectives and meeting regulatory requirements for the summer flounder fishery. In December 2016, the Council and the Commission's Summer Flounder, Scup, and Black Sea Bass Board (Board) jointly voted to manage the 2017 recreational summer flounder fishery under conservation equivalency, with individual states and multi-state regions implementing recreational measures that in combination would achieve, but not exceed, the 2017 recreational harvest limit (RHL), as required by the Council and Commission's complementary FMPs and federal summer flounder regulations. The Board adopted Addendum XXVIII to set minimum criteria for management measures to achieve the reduction in summer flounder recreational landings required under the jointly approved 2017 RHL.

The State of New Jersey's recreational measures do not fully implement the provisions of Addendum XXVIII, resulting in an increased likelihood that the 2017 RHL will be exceeded. This in turn leads to an increased likelihood that the recreational Annual Catch Limit (ACL) and overall Acceptable Biological Catch (ABC) will be exceeded. According to the most recent stock assessment update, summer flounder is currently experiencing overfishing, and is only 8% above the overfished threshold.[1] Thus, New Jersey's non-compliance raises conservation concerns, as the jointly approved reductions in catch and landings limits for 2017 were determined by the Council's Scientific and Statistical Committee to be necessary to end overfishing and reverse the declining trend in summer flounder biomass.

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[1] Terceiro M. 2016. Stock Assessment of Summer Flounder for 2016. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 16-15; 117 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/publications/.

In addition, New Jersey's noncompliance threatens the integrity of the joint management process and may set a precedent for future noncompliant actions by Commission member states.

Please contact me or Chris Moore if you have any questions.

Sincerely,

Michael Luisi
Chairman, Mid-Atlantic Fishery Management Council

cc: C. Moore, S. Rauch, W. Elliott, R. O'Reilly, T. DiLernia, K. Dancy, E. Gilbert

UNITED STATES DEPARTMENT OF COMMERCE
The Secretary of Commerce
Washington, D.C. 20230

September 15, 2017

Mr. Douglas E. Grout
Chairman
Atlantic States Marine Fisheries Commission
1050 North Highland Street, Suite 200A-N
Arlington, VA 22201

Dear Mr. Grout:

My thanks for your letter requesting information on my decision regarding the Federal compliance review of the State of New Jersey's summer flounder management measures.

As you know, the Department of Commerce found the State of New Jersey compliant with the intent of the Commission's Summer Flounder, Scup, and Black Sea Bass Interstate Fishery Management Plan. As a result, a moratorium on summer flounder fishing in New Jersey state waters is not required.

It is my understanding that Chris Oliver, Assistant Administrator for Fisheries, met with you and other members of the Atlantic States Marine Fisheries Commission recently on July 31 to discuss that decision.

If you have any further questions, please contact Chris Oliver at (301) 427-8000.

Sincerely,

Wilbur Ross

Wilbur Ross

cc: Mr. Robert E. Beal, Executive Director, Atlantic States Marine Fisheries Commission
Mr. Michael Luisi, Summer Flounder Board Chair, Atlantic States Marine Fisheries Commission

Atlantic Striped Bass

Activity level: High

Committee Overlap Score: Medium (TC/SAS/TSC overlaps with BERP, Atlantic menhaden, American eel, horseshoe crab, shad/river herring)

Committee Task List

• TC – June 15th: Annual compliance reports due
• TC/SASC/TSC – All Year: benchmark stock assessment
  o Jan/Feb 2018: Modeling Workshop I
  o May 2018: Updated data submission for Assessment through 2017
  o July 2018: Modeling Workshop II
  o Sep 2018: Final SASC call/webinar to approve stock status determination
  o 1st week of Oct 2018: All Draft Report components due to staff
  o 2nd week of Nov 2018: Assessment Report due to external peer-review panel
  o 1st week of Dec 2018: Peer review

TC Members: Nicole Lengyel (RI, TC Chair), Kevin Sullivan (NH, Vice Chair), Alex Aspinwall (VA), Alexei Sharov (MD), Carol Hoffman (NY), Charlton Godwin (NC), Edward Hale (DE), Ellen Cosby (PRFC), Gail Wippelhauser (ME), Gary Nelson (MA), Heather Corbett (NJ), Jeremy McCargo (NC), Kurt Gottschall (CT), Luke Lyon (DC), Michael Kaufmann (PA), Peter Schuhmann (UNCW), Winnie Ryan, Gary Shepherd (NMFS), Steve Minkkinen (USFWS), Wilson Laney (USFWS), Katie Drew (ASMFC), Max Appelman (ASMFC)

SAS Members: Edward Hale (DE, Chair), Gary Nelson (MA, Vice Chair), Alexei Sharov (MD), Hank Liao (ODU), Justin Davis (CT), Michael Celestino (NJ), John Sweka (USFWS), Gary Shepherd (NMFS), Katie Drew (ASMFC), Max Appelman (ASMFC)

Tagging Subcommittee Members: Stuart Welsh (WVU, Chair), Heather Corbett (NJ, Vice Chair), Angela Giuliano (MD), Beth Versak (MD), Chris Bonzak (VIMS), Edward Hale (DE), Gary Nelson (MA), Ian Park (DE), Jessica Best (NY), Carol Hoffman (NY), Gary Shepherd (NMFS), Josh Newhard (USFWS), Wilson Laney (USFWS), Katie Drew (ASMFC), Max Appelman (ASMFC)

Atlantic States Marine Fisheries Commission

Interstate Fisheries Management Program Charter

Vision: Sustainably Managing Atlantic Coastal Fisheries

February 2016

Preface

This document outlines the standard operating procedures and policies of the Atlantic States Marine Fisheries Commission's Interstate Fisheries Management Program. It was first developed in response to passage of the Atlantic Coastal Fisheries Cooperative Management Act of 1993, which provided the Commission with responsibilities to ensure member state compliance with interstate fishery management plans. The Act authorizes the Secretary of Commerce to pre-empt any state fishery not in compliance with a Commission fishery management plan.

The Charter was first printed in April 1995 and subsequently revised in May 1996, October 2000, and November 2002. It was further edited in April 2001 (to reflect changes in the membership of the Atlantic Menhaden Management Board); July 2003 (to correct for incorrect references); January 2006 (to reflect a policy decision on voting by specific proxies); November 2008 (to reflect the addition of a habitat addendum provision); August 2009 (minor editorial changes); May 2013 (to reflect the Technical Support Group Guidance and Benchmark Stock Assessment Process Document). The last revisions were adopted in February 2016 to reflect current Commission practices regarding appealing noncompliance findings; defining final actions and two-thirds majority; public hearing requirements for public information documents, FMPs, amendments and addenda; the timing of advisory panel input on proposed management actions; and clarifying regional management council participation on species management boards that manage multiple species.

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Section One. Introduction and Policy

(a) **General.** The Atlantic States Marine Fisheries Commission (Commission) was formed in 1942. The purpose of the Commission is:

....to promote the better utilization of the fisheries, marine, shell and anadromous, of the Atlantic seaboard by the development of a joint program for the promotion and protection of such fisheries, and by the prevention of the physical waste of the fisheries from any cause. It is not the purpose....to authorize the states joining herein to limit the production of fish or fish products for the purpose of establishing or fixing the price thereof or creating and perpetuating monopoly.

(b) **Interstate Fisheries Management Program.** The Commission carries out an Interstate Fisheries Management Program (ISFMP), authorized by Article IV of the Commission's Rules and Regulations.

(c) It is the policy of the Commission that its ISFMP promote the conservation of Atlantic coastal fishery resources, be based on the best scientific information available, and provide adequate opportunity for public participation.

Section Two. Role of the Commission

(a) **General**. The Commission is responsible generally for the Commission's fishery management activities. These activities will be carried out through the ISFMP established under this charter.

(b) **Final Approval Authority**. The Commission will be the final approval authority for:

(1) Any fishery management plan (FMP) and FMP amendment; and

(2) Any final determination of a state's non-compliance with the provisions of a Commission approved FMP.

Section Three. ISFMP Policy Board

(a) **Membership.** The membership on the ISFMP Policy Board shall be comprised as follows:

(1) All member states of the Commission shall be voting members, and shall be represented by all of its Commissioners (or duly appointed proxies) in attendance. The position of a state on any matter before the Policy Board shall be determined by caucus of its Commissioners in attendance;

(2) One representative from the NOAA Fisheries and one representative from the U.S. Fish and Wildlife Service shall each be a voting member;

(3) One representative from the Potomac River Fisheries Commission and one representative from the government of the District of Columbia shall each be a member, eligible to vote, on any matter which may impose a regulatory requirement upon their respective jurisdictions; and

(4) One representative of the Commission's Law Enforcement Committee shall be a non-voting member.

(b) **Proxies**. Any Commissioner from a state, or duly authorized representative of a jurisdiction or agency, that is a member of the Policy Board may designate a permanent, ongoing, board or meeting specific proxy. A change in the designation of a permanent or ongoing proxy may be made only once during the year. In the case of extenuating circumstances, a Commissioner may appoint specific proxies as needed to ensure representation. Proxies must be from the same state, jurisdiction, or agency as the individual making the designation. The Commission's code of conduct shall apply to all proxies. Only an individual who is serving as a permanent or ongoing proxy may further designate a specific proxy.

(c) The **Chair and Vice-Chair** of the Commission shall respectively be the Chair and Vice-Chair of the ISFMP Policy Board.

(d) **Role and Functions**. The ISFMP Policy Board will be responsible for the overall administration and management of the Commission's fishery management programs. In this regard it will:

(1) Interpret and give guidance concerning the standards and procedures contained in Sections Six and Seven, and generally provide Commission policy governing the preparation and implementation of cooperative inter-jurisdictional fishery management for coastal fisheries of the Atlantic coast;

(2) Establish the priority species to be addressed by the Commission's fishery management program, taking into account the following criteria:

(i) The species constitutes a "coastal fishery resource" as defined in Section 803(2) of the Act;

(ii) The degree to which the species is of importance along the Atlantic coast; and

(iii) The probability that the species and associated fisheries will benefit from cooperative inter-jurisdictional management.

(3) Establish management boards/sections described in Section Four;

(4) Review and approve declarations of interest in species management by states according to the standards contained in the Commission Rules and Regulations;

(5) Monitor and review the implementation of FMPs for which no management board or section is currently operational;

(6) Review and approve action plans, including priorities for activities, for the ISFMP;

(7) Establish, for any matter that does not come under the purview of an existing management board or section, a committee to provide it with any relevant analysis, reviews, and recommendations;

(8) Recommend to the Commission that it make a determination of a state's non-compliance with the provisions of a Commission approved FMP, according to the procedures contained in Section Seven;

(9) Consider and decide upon appeals of states to actions of any management board or section under Section Four(h); and

(10) Take any other action that is consistent with this Charter and that is necessary and appropriate to carry out the fishery management program of the Commission; except that a final determination of a state's non-compliance with the provisions of a Commission-approved plan must be made by the Commission.

Section Four. Management Boards

(a) **Fishery Management Board**. Upon determining that a need exists in a fishery for the development of an FMP or amendment, the ISFMP Policy Board shall establish a management board for that fishery. A management board may be disbanded by the Policy Board upon a determination that it is no longer needed for the preparation, review, or ongoing monitoring of the implementation of an FMP or amendment.

(b) **Management Board Membership**. The voting membership of each management board shall be comprised as follows:

(1) Each state with an interest in the fishery covered by the management board shall be a voting member, and shall be represented by all of its Commissioners (or duly appointed proxies) in attendance. The position of a state on any matter before the management board shall be determined by caucus of its Commissioners in attendance;

(2) A representative from the Potomac River Fisheries Commission and the District of Columbia may each elect to serve as a voting member on any management board in which they have an interest or which may result in the imposition of regulatory requirements on their jurisdictions;

(3) NOAA Fisheries and the U.S. Fish and Wildlife Service may each elect to serve as a voting member of any management board; and

(4) Any one of the Executive Directors/Chairs of the Regional Fishery Management Councils may be invited to be a voting member of an ISFMP species management board when the management board determines that such membership would advance the inter-jurisdictional management of the specific species. When the management area includes more than one Council, the applicable Councils will need to identify one Executive Director/Chair to receive the invitation to participate on that board as a voting member. If a Council has been invited as a voting member of a Board/Section that manages multiple species, the Board/Section will designate which species can be discussed and voted on by the Council representative. A council staff member or member of the council may be appointed as a proxy for the Executive Director or Council Chair.

(c) **Proxies**. Any Commissioner from a state, or duly authorized representative of a jurisdiction or agency, that is a member of a management board may designate a permanent, ongoing, board specific or meeting specific proxy. A change in the designation of a permanent or ongoing proxy may be made only once during the year. In addition, a Commissioner may appoint specific proxies as needed to ensure representation. Proxies must be from the same state or jurisdiction or agency as the individual making the designation. The Commission's code of conduct shall apply to all proxies. Only an individual who is serving as a permanent or ongoing proxy may further designate a specific proxy.

(d) **Conduct of Meetings**.

(1) Meetings will generally be run according to the current edition of "Robert's Rules of Order."

(2) Any Commissioner or proxy of a Commissioner or duly authorized representative of a jurisdiction or agency that is a member of a management board may make or second any motion; provided that the maker of the motion and second (when necessary) must each come from a different state, jurisdiction, or agency.

(3) Any meeting specific proxy appointed by a Legislative or Governor's Appointee Commissioner may not vote on a final action being considered by a board, section, or committee. For this section a final action will be defined as: setting fishery specifications (including but not limited to quotas, trip limits, possession limits, size limits, seasons, area closures, gear requirements), allocation, final approval of FMPs/amendments/ addenda, emergency actions, conservation equivalency plans, and non-compliance recommendations. A meeting specific proxy may participate in the deliberations of the meeting, including making and seconding motions. Meeting specific proxies may vote on preliminary decisions such as issues to be included in a public hearing draft or approval of public information documents. Questions of procedure will be determined by the chair of the meeting upon the advice of the Executive Director or the senior Commission employee in attendance.

(4) Advisory Panel Chairs will only be reimbursed to attend Commission meetings if the advisory panel met between board/section meetings to provide feedback on an issue.

(e) **Functions**.

(1) Each management board shall be responsible for the development of an FMP, amendment, or addendum with respect to the fisheries under its jurisdiction as established by the ISFMP Policy Board.

(2) Management boards/sections shall solicit public participation during the development of FMPs, amendments, or addenda.

(3) A management board may, after the necessary FMP, amendment, or addendum has been approved, continue to monitor the implementation, enforcement, and effectiveness of the FMP, amendment, or addendum or take other actions specified in the applicable document that are necessary to ensure its full and effective implementation.

(4) Each management board shall select its own chair and vice-chair. The chair of management boards/sections will rotate among the voting members every two years, with the vice-chair acceding to the chair.

(f) **Sections under Amendment One**. Under Amendment One to the Compact creating the Commission, one or more states may agree to designate the Commission as a joint regulatory agency; Commissioners of these states shall constitute a separate section for these purposes. In any such instance the following procedures apply:

(1) Agreements among states under Amendment One shall be in writing, and open to participation by all states with an interest in any fishery to which the agreement applies;

(2) All Commissioners from states forming a section under Amendment One shall be members of the section; and

(3) Regulatory authority exercised by the Commission under Amendment One shall be carried out pursuant to an FMP prepared according to this Charter. For these purposes, including determinations of non-compliance under Section Seven, a section shall have the same authority and responsibility as set forth in this Charter for a management board.

(g) **Coordination with Regional Fishery Management Councils**. Each management board shall work with appropriate committees of the Regional Fishery Management Councils and appropriate federal officials to insure that state and federal fishery management programs are coordinated, consistent, and complementary. It will be the policy of the Commission to develop FMPs jointly with Regional Fishery Management Councils wherever applicable

(h) **Appeal Opportunity**. Any state that is aggrieved by an action of the management board may appeal that action to the Policy Board, with the exception of a non-compliance finding in accordance with Section Three (d)(9).

Section Five. Staff, Management, Technical, and Advisory Support

(a) **Staff Support**. The Commission's Executive Director or the ISFMP Director shall serve ex-officio as non-voting members of all management boards and sections. Commission staff shall serve as ex-officio members of all technical committees and will chair the plan development teams (PDTs) and plan review teams (PRTs). Staff will provide liaison among the PDTs, PRTs, species stock assessment subcommittees, technical committees, and advisory panels and the management boards/sections. Commission staff will also provide liaison among the Committee on Economics and Social Sciences, the Assessment Science, Habitat, Artificial Reef, Law Enforcement, and Management and Science Committees and the management boards/sections, and the Policy Board.

ISFMP and Science Program staffs have specific responsibilities with respect to supporting the activities of the technical support groups. These responsibilities are detailed in the *Technical Support Group Guidance and Benchmark Stock Assessment Process* (approved February 2016).

(b) **Committee Organization**. Unless otherwise specified, each group included in this section shall elect its own chair and chair-elect (or vice-chair), which shall rotate every other year among the Committee members, with the chair-elect acceding to the chair. Committees shall maintain a record of their meetings compiled by the chair-elect (vice-chair) in consultation with the chair and Commission staff.

(c) **PDTs** shall be appointed by the management boards/sections to draft FMPs, amendments and addenda.

(1) PDTs shall be comprised of personnel from state and federal agencies who have scientific and management ability, knowledge of a species and its habitat, and an interest in the management of a species under the jurisdiction of the relevant management board. Personnel from Regional Fishery Management Councils, academicians, and others as appropriate may be included on a PDT. The size of the PDT shall be based on specific need for expertise but shall generally be kept to a maximum of six persons.

(2) It shall be the responsibility of a PDT to prepare all documentation necessary for the development of an FMP, amendment, or addendum using the best scientific information available and the most current stock assessment information. Each FMP, amendment, or addendum shall be developed by the PDT in conformance with Section Six of the ISFMP Charter.

(3) PDTs shall be tasked directly by the management boards/sections. In carrying out its activities, the PDT shall seek advisement from the appropriate technical committee, stock assessment subcommittee, advisory panel, Committee on Economics and Social Sciences, and the Assessment Science, Habitat, Artificial Reef and Law Enforcement Committees, where appropriate.

(4) Following completion of its charge, the PDT will be disbanded unless otherwise determined by the board/section.

(d) **<u>PRT</u>** shall be appointed by the management boards/sections to review regulations and compliance. Members should be knowledgeable concerning the scientific data, stock and fishery condition, and fishery management issues. The PRT shall generally be kept to a maximum of six persons.

(1) PRTs will be responsible for providing advice concerning the implementation, review, monitoring, and enforcement of FMPs that have been adopted by the Commission, and as needed be charged by the management board/sections.

(2) Each PRT shall at least annually or as provided in a given FMP, conduct a review of the stock status and Commission member states' compliance for which implementation requirements are defined in the FMP. The PRT shall develop an annual plan review in order to evaluate the adequacy of the FMP. This report will address, at a minimum, the following topics: adequacy and achievement of the FMP goals and objectives (including targets and schedules), status of the stocks, status of the fisheries, status of state implementation and enforcement, status of the habitat, research activities, and other information relevant to the FMP. The PRT shall report all findings in writing to the management board/section for appropriate action. Compliance review shall be consistent with the requirements of Sections Six and Seven of the ISFMP Charter and the respective FMP requirements. In addition to the scheduled compliance reviews, the PRT may conduct a review of the implementation and compliance of the FMP at any time at the request of the management board/section, Policy Board, or the Commission. When a plan amendment process is initiated by the management boards/sections, the PRT will continue its annual review function applicable to the existing plan.

(3) In carrying out its activities, the PRT shall seek advisement from the appropriate technical committee, stock assessment subcommittee, advisory panel, Committee on Economics and Social Sciences, and the Assessment Science, Habitat, Artificial Reef Law Enforcement, and Management and Science Committees.

(e) **<u>Assessment Science Committee</u>**. The Assessment Science Committee (ASC) shall be appointed by the ISFMP Policy Board. All agencies should nominate individuals for appointment to the ASC based on stock assessment and population dynamics expertise. Agencies may nominate personnel that require some training prior to official appointment as a committee member. The ISFMP Policy Board should review all nominations and appoint members to the ASC based on expertise, as opposed to agency representation. The ISFMP Policy Board may appoint a limited number of ASC members that are currently being trained in stock assessment methods, with the intent of formalizing the appointment upon completion of training. ASC membership should be kept to a maximum of 25 members and periodic rotation of membership should be considered.

(1) ASC will assist the ISFMP Policy Board in setting overall priorities and timelines for conducting all Commission stock assessments in relation to current workloads.

(2) ASC will provide guidance to species stock assessment subcommittees, technical committees, and management boards on broad technical issues (e.g., stock assessment

methods, biological reference points, sampling targets, and other assessment issues common to multiple Commission-managed species).

(3) ASC may provide input and advice to the species stock assessment subcommittees mainly during a benchmark assessment, when a model change and/or a major revision of the data are conducted. The species stock assessment subcommittee will be responsible for conducting the species assessment and will report directly to the species technical committee. ASC may provide overall guidance to the development of the species assessment, but will not be involved in peer review of the assessment. Assessment updates will be conducted by the species stock assessment subcommittee, with input from the ASC upon written request.

(f) **Technical Committees**. A management board/section may appoint a technical committee to address specific technical or scientific needs requested periodically by the respective management board/section, PDT, PRT, or the Management and Science Committee.

(1) A technical committee shall be comprised of state, federal, Regional Fishery Management Council, Commission, university or other specialized personnel with scientific and technical expertise and knowledge of the fishery or issues pertaining to the fishery being managed, and should consist of only one representative from each state or agency with a declared interest in the fishery, unless otherwise required or directed by the management board.

(2) Technical committees are responsible for addressing specific technical or scientific needs requested periodically by the respective management board/section, PDT, PRT, or the Management and Science Committee. At times the board/section may task the technical committee to provide a technical analysis of species advisory panel recommendations. All requests to the technical committee should be in writing from the board/section chair and should include all specific tasks, the deliverable expected, and a timeline for presentation of recommendations to the board/section. Even though the technical committee may respond to requests from multiple committees, the management board/section provides the oversight to technical committee tasks and priorities. When tasked by multiple committees, it is the responsibility of the ISFMP staff in consultation with the technical committee and management board/section chairs to prioritize these tasks.

(3) It shall be the responsibility of a technical committee for addressing specific technical or scientific needs requested by the respective management board/section, PDT, and PRT in the development and monitoring of an FMP or amendment as requested, including evaluating fishery-dependent and fishery-independent data, evaluating state monitoring programs, and providing information on the status of the stock and the fishery to the PDT and PRT. At times the board/section may task the technical committee to provide a technical analysis of an advisory panel recommendation.

(4) Among its duties, the technical committee shall provide a range of management options, risk assessments, justifications, and probable outcomes of various management options.

(5) The technical committee will coordinate the process of developing stock assessments for Commission-managed species.

(6) It is not the responsibility of the technical committee to conduct a review of the Commission member states' compliance for which implementation requirements are defined in the FMP. This is a responsibility of the PRTs.

(g) **Species Stock Assessment Subcommittees**. Upon the request of a management board/section, the technical committee shall appoint individuals with appropriate expertise in stock assessment and fish population dynamics to a species stock assessment subcommittee, which will report to the technical committee and shall continue in existence so long as the management board/section requires.

(1) Membership to a species stock assessment subcommittee will be comprised of technical committee members with appropriate knowledge and experience in stock assessment and biology of the species being assessed. Individuals from outside the technical committee with expertise in stock assessment or biology of the species may also be nominated and appointed, if necessary. The technical committee chair will serve as an ex-officio member of the species stock assessment subcommittee. Overall membership should be kept to a maximum of six persons, unless otherwise required and directed by the management board/section.

(2) The species stock assessment subcommittee is responsible for conducting a stock assessment for use by the PDT in formulation of an FMP, amendment, or addendum; and conducting periodic stock assessments as requested for use by the technical committee in reporting status of the stock to the respective management board. A stock assessment update consists of adding the most recent years of data to an existing, peer-reviewed, and board-accepted stock assessment model without changing the model type or structure.

(3) The species stock assessment subcommittee is responsible for data analysis and preparation of a stock assessment report. Initial input on available data and stock assessment methods may be provided by ASC and technical committee. Additional input may be requested of the ASC upon written request of the species stock assessment subcommittee. The species stock assessment subcommittee shall use the best scientific information available and established stock assessment techniques. Stock assessment techniques should be consistent with the current state of scientific knowledge.

(4) The species stock assessment subcommittee will be tasked directly by the technical committee and will report to the technical committee for review and approval of work. All subcommittee recommendations and documents must be approved by the technical committee and forwarded by the technical committee to the management board/section. Any substantive issues and concerns raised by the technical committee during the

approval process should be referred back to the species stock assessment subcommittee to be addressed.

(h) **Other Technical Support Subcommittees** (e.g., tagging, stocking – with the exception of ISFMP socioeconomic subcommittees). Upon the approval of a management board/section, the technical committee shall appoint individuals with special expertise, as appropriate, to other technical support subcommittees in order to support technical committee deliberations on specific issues. All technical support subcommittees shall report to the technical committee and shall continue in existence so long as the management board/section requires. All technical support subcommittees should elect their own chair and vice-chair, who will be responsible for reporting to the technical committee. Overall membership should be kept to a maximum of six persons.

(1) Special subcommittees may be required to address specific scientific issues important to the assessment and management of the species. These subcommittees will be tasked directly by the technical committee and will report to the technical committee for review and approval of work. All subcommittee recommendations and documents must be approved by the technical committee before being forwarded to the management board/section. Any substantive issues and concerns raised by the technical committee during the approval process should be referred back to the technical support subcommittee to be addressed.

(i) **Advisory Panels**. A management board/section may at any time establish an advisory panel in conformance with the Commission's Advisory Committee Charter, to assist in carrying out the board's/section's responsibilities. Advisory panels shall also work with PDTs and PRTs, as requested. Advisory panel chairs should present reports to Boards/Sections and answer any specific questions relevant to their report. Chairs may not ask questions or present their own viewpoints during Board/Section deliberations. If the chair would like to present their own viewpoints, they must go to the public microphone during the public comment portion of the meeting.

(j) **Habitat Committee**. The Habitat Committee is a standing Commission committee appointed at the discretion of the Chair of the Commission. The purpose of the Habitat Committee is to review, research, and develop appropriate response to concerns of inadequate, damaged or insufficient habitat for Atlantic coastal species of concern to the Commission. Among its duties for the Commission, the Habitat Committee shall:

(1) Serve as a consultant to the ISFMP regarding habitat on which the species of concern to the Commission are dependent, whether salt, brackish or freshwater;

(2) Provide comment on the habitat sections of FMPs, and provide suggested text for these sections;

(3) Propose habitat mitigation measures, comment on proposed habitat mitigation measures, and proposed alternate measures if necessary to ensure appropriate habitat conservation;

(4) Establish subcommittees or other work groups as are necessary to research various habitat related issues; and

(5) Formulate habitat specific goals for consideration of and adoption by the Commission.

<u>(k) Artificial Reef Committee</u>. The Artificial Reef Committee is a standing Commission committee appointed at the discretion of the Commission Chair. The Committee advises the ISFMP Policy Board with the goal of enhancing marine habitat for fish and invertebrate species through the appropriate use of man-made materials. The Committee is comprised of the state artificial reef coordinators, representatives from NOAA Fisheries, and the U.S. Fish and Wildlife Service. The Artificial Reef Committee works in close coordination with Habitat Committee, and reports to the ISFMP Policy Board.

<u>(l) Law Enforcement Committee</u>. The Law Enforcement Committee (LEC) is a standing committee appointed by the Commission. LEC carries out assignments at the specific request of the Commission, the ISFMP Policy Board, the management boards/sections, the PDTs, and the PRTs. In general, the Committee provides information on law enforcement issues, brings resolutions addressing enforcement concerns before the Commission, coordinates enforcement efforts among states, exchanges data, identifies potential enforcement problems, and monitors enforcement of measures incorporated into the various interstate fishery management plans. LEC is comprised of law enforcement representatives from each member state, the U. S. Fish and Wildlife Service, NOAA Fisheries, the U. S. Coast Guard, and US Department of Justice. LEC convenes a working meeting in the spring, meets in conjunction with the Commission's Annual Meeting, and convenes other meetings as needed. Among its ISFMP duties, the LEC shall:

(1) Provide advice to PDTs regarding the enforceability of measures contemplated for inclusion in FMPs, including enforcement information needed for the Source Document and Background Summary pursuant to Section Six (b)(1)(v)(E); analysis of the enforceability of the proposed measures; and if the FMP provides for conservation equivalency, enforcement procedures for alternative management measures;

(2) Provide advice to each PRT at least annually or as provided in a given FMP regarding the adequacy and effectiveness of states' enforcement of the measures implemented pursuant to the FMP;

(3) Coordinate, among law enforcement personnel, the preparation of reports concerning state law enforcement and compliance in order to ensure these analyses are comparable; and

(4) Upon request or on its own initiative, provide enforcement advice and information regarding any FMP to any committee, team, board/section, or advisory panel in order to carry out activities under this Section.

(m) **Management and Science Committee**. The Management and Science Committee (MSC) is a standing committee appointed by the Commission. MSC carries out assignments at the specific request of the Commission, Executive Committee, or the ISFMP Policy Board, and generally provides advice to these bodies concerning fisheries management and the science of coastal marine fisheries. MSC is comprised of one representative from each member state, the NOAA Fisheries Greater Atlantic and Southeast Regional Offices, and the U.S. Fish and Wildlife Service's Regions 4 and 5 who possess scientific as well as management and administrative expertise. Among its duties for the Commission, MSC shall:

(1) Serve as the senior review body of the Commission, Executive Committee, and ISFMP Policy Board;

(2) Provide oversight to the Commission's Stock Assessment Peer Review Process;

(3) Upon request of the ISFMP Policy Board for any management board/section, review and provide advice on species specific issues;

(4) Evaluate the state of the science of species interactions and provide guidance to fisheries managers on multispecies and ecosystem issues. Evaluations and/or recommendations should focus on modifying the single-species approach in development of Commission FMPs and/or stock assessments;

(5) Evaluate and provide advice on cross-species issues and including, but not limited to tagging, invasive species and exotics, fish health and protected species issues; and

(6) Coordinate Commission technical and scientific workshops and seminars, when requested.

(n) **Committee on Economics and Social Sciences**. The Committee on Economics and Social Sciences (CESS) is a standing Commission committee. Committee membership is voluntary and preferably consists of a balance of economists and other social scientists knowledgeable about fisheries issues in their regions. An active base of members willing to help the CESS achieve their primary activities is a top priority, while ideally membership should be balanced geographically to provide coastwide representation. Up to twenty individuals should be maintained on the CESS. ~~CESS members of the Committee shall be appointed at the discretion of the Chair of the Commission. The membership should consist of one representative from each member state, two representatives from NOAA Fisheries headquarters (one economist and one social scientist), one representative each from NOAA Fisheries Greater Atlantic and Southeast Regional Offices, one representative each from the Atlantic Coast Regional Fishery Management Councils, and one representative from the U.S. Fish and Wildlife Service.~~

The purpose of CESS is to provide socioeconomic technical oversight for both the ISFMP and the Atlantic Coastal Cooperative Statistics Program. Among its duties for the Commission, CESS shall:

(1) Develop and implement mechanisms to make economic and social science analysis a functioning part of the Commission's decision making process;

(2) Nominate economists and social scientists to serve on each species technical committee or socioeconomic subcommittee, and PDT, in order to provide technical support and development of socioeconomic sections of FMPs (including amendments and addenda);

(3) Upon request by species management boards or the Policy Board, provide social and economic advice, information, and policy recommendations to these respective boards;

(4) Upon request by the Policy Board, provide social and economic advice, information, and policy recommendations to the Policy Board;

(5) Provide technical recommendations to the social and economic data collection and data management programs of the Atlantic Coastal Cooperative Statistics Program;

(6) Function as the technical review panel for social and economic analyses conducted by the Commission and the Atlantic Coastal Cooperative Statistics Program; and

(7) Establish CESS subcommittees or other work groups as are necessary to research various social and economic issues;

(o) **Other ASMFC Committees**. Other Commission committees, as appointed, shall upon request or on their own initiative provide advice and information to any other committee, in order to carry out activities under this Section.

Section Six. Standards and Procedures for Interstate Fishery Management Plans

(a) **Standards**. These standards are adopted pursuant to Section 805 of the Atlantic Coastal Fisheries Cooperative Management Act (P.L. 103-206), and serve as the guiding principles for the conservation and management programs set forth in the Commission's FMPs. The Commission recognizes that an effective fishery management program must be carefully designed in order to fully reflect the varying values and other considerations that are important to the various interest groups involved in coastal fisheries. Social and economic impacts and benefits must be taken into account. Management measures should focus on conservation while allowing states to make allocation decisions. Fishery management programs must be practically enforceable, including as much as possible the support of those being regulated, in order to be effective. Above all, an FMP must include conservation and management measures that ensure the long-term biological health and productivity of fishery resources under management. To this end, the Commission has adopted the following standards:

(1) Conservation programs and management measures shall be designed to prevent overfishing and maintain over time, abundant, self-sustaining stocks of coastal fishery resources. In cases where stocks have become depleted as a result of overfishing and/or other causes, such programs shall be designed to rebuild, restore, and subsequently maintain such stocks so as to assure their sustained availability in fishable abundance on a long-term basis.

(2) Conservation programs and management measures shall be based on the best scientific information available.

(3) Conservation programs and management measures shall be designed to achieve equivalent management results throughout the range of a stock or subgroups of that stock.

(4) Management measures shall be designed to minimize waste of fishery resources.

(5) Conservation programs and management measures shall be designed to protect fish habitats.

(6) Development and implementation of FMPs shall provide for public participation and comment, including public hearings when requested by the states.

(7) Fairness & equity.

(i) An FMP should allow internal flexibility within states to achieve its objectives while implemented and administered by the states; and

(ii) Fishery resources shall be fairly and equitably allocated or assigned among the states.

(b) **Contents**. An FMP should be a readily available, concise, and understandable document. It is designed to inform the Commission and the public of the need for and nature of management action, to provide for conservation of coastal fisheries, to allow the public to have effective participation in the management planning process, and to help Commissioners to make decisions on fishery management plans. Additionally, the FMP should facilitate implementation and enforcement of the fishery management program in the individual states. With this in mind, all FMPs of the Commission shall contain the following items:

(1) Management Program Elements:

(i) A statement of the problem being addressed by the FMP, and the objectives to be achieved through implementation, including the social and economic impacts.

(ii) The goals and objectives of the FMP, including a specification of the management unit, a plan-specific definition of overfishing when available, and, if a stock is determined to be depleted/overfished as a result of overfishing and/or other causes, a specific rebuilding program and schedule for the resource.
(iii) A statement of management strategies, options, and alternatives.

(iv) A complete statement of the management measures needed to conserve the fishery, including:

> (A) A detailed statement on a state-by-state basis of each specific regulatory, monitoring, and research requirement that each state must implement in order to be in compliance with the plan; provided that the relative burden of the plan's conservation program and management measures may vary from state to state relative to the importance of the fishery in that state as compared to its importance in other states throughout its range; and provided that each FMP shall address the extent to which states meeting *de minimis* criteria may be exempted from specific management requirements of the FMP to the extent that action by the particular states to implement and enforce the plan is not necessary for attainment of the FMP's objectives and the conservation of the fishery;
>
> (B) If the FMP so provides, procedures under which the states may implement and enforce alternative management measures that achieve conservation equivalency;
>
> (C) A complete schedule by which states must take particular actions in order to be in compliance with the plan;
>
> (D) A specification of the requirements for states' reports on compliance to be submitted to the PRT at least annually or as provided in a given FMP, including the requirement for submission within a specified time line of copies of relevant laws and regulations for the record; and
>
> (E) A detailed description of penalties and repayments that will result if a state/jurisdiction does not implement any management measure consistent with the compliance schedule established in an FMP, amendment, or addendum.
>
> (F) A statement of the minimum notification time that the Commission must provide a state/jurisdiction prior to requiring an in-season management adjustment; and establishment of a reporting and tracking system for management changes
>
> (G) A statement of those recommendations which states should implement in order to conserve fishery resources.

(v) Supporting Summary Information and Analyses:

(A) A review of the resource and its biological status;

(B) A review and status of fish habitat important to the stocks, and ecosystem considerations;

(C) A review of the fishery and its status, including commercial and recreational fisheries and non-consumptive considerations;

(D) A review of the social and economic characteristics of the fishery; and

(E) An analysis of the enforceability of the proposed measures.

(vi) Impacts: A summary evaluation of the biological, environmental, social, and economic impacts of the requirements and recommendations included in the FMP.

(vii) Source Document: In addition to the FMP, the PDT and the staff shall compile a Source Document that contains all of the scientific, management, and other analyses and references utilized in preparation of the FMP.

(2) A management board/section, by two-thirds vote, may extend, after giving the public one month's notice, the period of effectiveness for any FMP or provision that would otherwise expire for a period of up to six months, and may be extended for an additional six months, if the management board/section is actively working on an amendment or addendum to address the provisions that would otherwise expire. A two-thirds majority will be defined by the entire voting membership, however any abstentions from the federal services would not count when determining the total number of votes.

(3) Adaptive Management: Each FMP may provide for changes within the management program to adapt to changing circumstances. FMPs, which provide for adaptive management shall identify specifically the circumstances under which adaptive management changes may be made, the types of measures that may be changed, the schedule for state implementation of changes, and the procedural steps necessary to effect a change. Changes made under adaptive management shall be documented in writing through addenda to the FMP. Addenda to the FMP must provide for a minimum of 30 days for public comment in making adaptive management changes. The management board/section shall in coordination with each relevant state, utilizing that state's established public review process, ensure that the public has an opportunity to review and comment upon proposed adaptive management changes.

(4) Technical Addenda: The management board/section may make technical corrections to an approved FMP, amendment, or addendum without use of the public review process. This flexibility is for the correction of accidental omissions, erroneous inclusions, and/or to address non-substantive editorial issues.

(5) Habitat Addenda: The management board/section may utilize the Adaptive Management (Section Six (b)(3)) to modify/update a habitat section contained in an FMP or Amendment. The modifications to the habitat section will be documented in writing through addenda to the FMP. The adaptive management procedures detailed in the FMP will be used when developing and approving a habitat addendum.

(c) **Procedures.** All FMPs and amendments of the Commission shall be prepared according to the following procedures:

(1) Need for an FMP - Identification of priority species by the Policy Board will initiate the process to create an FMP. A management board or section will be created pursuant to Section Four. The management board or section will appoint a PDT to develop the FMP for a particular species according to the process described in Section Five (c)(1) through (4).

(2) Need for FMP Amendment - Each PRT shall evaluate the adequacy of each respective FMP at least annually and will submit to the management board/section a written report of its findings. The report will address, at a minimum, the following topics: adequacy and achievement of the FMP goals and objectives (including targets and schedules); status of the stocks; status of the fisheries; status of state implementation and enforcement; status of the habitat; research activities; and other information relevant to the FMP. The PRT shall also solicit and consider the input of the relevant advisory panel, in preparation of its report. The PRT may recommend to the management board or section that a PDT be reinstated or convened. Using this information, the management board/section will determine whether the FMP needs amendment, including issues to be addressed, such as updating data, including results of new research or a new stock assessment, needed changes in state rules and/or enforcement, and recommended options and strategies to address the concerns. All Draft FMP Amendments shall be subject to the public comment process described under Section Six (c)(8), and shall be approved by the process described in Section Six (c)(4) through (7).

(3) Public Information Document (PID) - The species PDT shall prepare a PID containing a preliminary review of biological information, fishery issues, and potential management options for the subject FMP or amendment being prepared. The PDT shall also solicit and consider the advisement of the relevant advisory panel, if any, under the Commission's Advisory Committee Charter, in preparation of the PID. The PDT Chair (Commission staff) shall also prepare appropriate audio-visual material to accompany the PID for presentation to the public. The PID, after approval by the management board/section, shall be made available to each state with an interest in the fishery and where applicable, Regional Fishery Management Councils, for the purpose of soliciting public comment as described in Section Six (c)(8).

(4) Preparation of Source Document and Background Summaries - During review and consideration of the PID, the PDT will begin to collate and prepare the Source Document as provided in Section Six (b)(1) (vii). After consideration of the reviews of the PID, the PDT shall prepare background summaries as provided in Section Six (b)(1)(v).

(5) Preparation of Draft FMP or Amendment - After consideration of comments and views developed in response to the PID, the PDT, at the direction of the management board/section, will prepare a Draft FMP or Amendment. Upon approval by the management board/section, the Draft FMP shall be referred to all relevant states and, where applicable, Regional Fishery Management Councils, for the purpose of conducting public hearings and soliciting other public comment as described in Section Six (c)(8).

(6) Preparation of the final FMP or Amendment - After consideration of the record developed in receiving comment on the Draft FMP or Amendment, the PDT shall, at the direction of the management board/section, prepare the final FMP or Amendment.

(7) Review and Approval - The management board/section shall approve the FMP or Amendment or refer it back to the PDT for revision. The management board/section will approve revisions to established FMPs (amendment or addendum). Final approval of FMPs and amendments shall be the decision of the Commission.

(8) Advisory Panel Participation – The advisory panel may provide feedback to the board/section on FMPs/Amendments as described below. The board/section may seek additional guidance outside of the below process if necessary.

- (i) **During the development of the PID**. Advisory panels provide guidance to the PDT before the Board reviews the document for public comment.
- (ii) **During the development of the Draft FMP.** After the Board gives the PDT guidance on issues to include in the draft, advisory panels provide feedback to the PDT on those issues.
- (iii) **During the public comment of the Draft FMP.** Advisory panels meet to give recommendations on the public comment draft of the FMP.

(9) Public Participation:

(i) The management board/section shall in coordination with each relevant state, utilizing that state's established public review process, ensure that the public has an opportunity to review and comment upon the problems and alternative solutions addressed by the PID (see Section Six [c][3]). Upon completion of a PID and its approval by the management board/section, the Commission shall again utilize the relevant states' established public review process to elicit public comment on the PID. The Commission shall ensure that a minimum of three public hearings are held, including at least one in each state that specifically requests a hearing. A hearing schedule will be published within 60 days following approval of the PID; hearings may be held in conjunction with state agencies. The hearing document will be made available to the public for review and comment at least 30 days prior to the date of the first public hearing; availability will be announced by a press release issued by the Commission. Written comments will be accepted for 14 days following the date of the last public hearing.

(ii) Upon completion of a draft FMP or amendment and its approval by the management board/section, the Commission shall again utilize the relevant states' established public review process to elicit public comment on the draft. The Commission shall ensure that a minimum of three public hearings are held, including at least one in each state that specifically requests a hearing. A hearing schedule will be published within 60 days following approval of the draft FMP or amendment; hearings may be held in conjunction with state agencies. The hearing document will be made available to the public for review and comment at least 30 days prior to the date of the first public hearing; availability will be announced by a press release issued by the Commission. Written comments will be accepted for 14 days following the date of the last public hearing. The Commission will make the draft FMP or amendment and the accompanying PID widely available to the public, including fishermen, consumers, government agencies and officials, environmental groups, and other interested parties throughout the geographic range of the draft FMP or amendment. Records of the public hearings and summaries of the written comments will be made available at cost to anyone requesting them. Summaries of verbal and written comments will be prepared by Commission staff and provided to Commissioners, the management board/section, and advisory panel members. Copies of the summaries will be made available to other parties at cost.

(iii) Agendas for meetings of the management board/section, the ISFMP Policy Board, or the Commission, as appropriate, will include an opportunity for public comment prior to the board, section, or Commission taking action on a fishery management issue consistent with the public comment guidelines.

(iv) Public comments will be evaluated and considered prior to deciding what modifications will be made to the draft FMP or amendment, or draft final FMP or amendment, and prior to approval of the FMP or amendment consistent with the public comment guidelines. .

(10) Administrative Record - The Commission staff, with support from the PDT, shall be responsible for collating and maintaining the administrative record for all FMPs.

(11) Emergencies - A management board/section may, without regard to the other provisions of Section Six (c), authorize or require any emergency action that is not covered by an FMP or is an exception or change to any provision in an FMP. Such action shall, during the time it is in effect, be treated as an amendment to the FMP.

(i) Such action must be approved by two-thirds of all voting members (a two-thirds majority will be defined by the entire voting membership, however any abstentions from the federal services would not count when determining the total number of votes) of the management board/section prior to taking effect. The decision may be made by meeting, mail, or electronic ballot in the case of an emergency.

(ii) Within 30 days of taking emergency action, the states and the Commission shall hold at least four public hearings concerning the action, including at least one in each state that requests it.

(iii) Any such action, with the exception of public health emergencies, shall originally be effective for a period not to exceed 180 days from the date of the management board/section's declaration of an emergency, but may be renewed by the management board/section for two additional periods of up to one year each, provided the board/section has initiated action to prepare an FMP, or initiated action to amend the FMP in accordance with Section Six(c). Emergency actions taken to address a public health emergency shall remain in effect until the public health concern ceases to exist (this determination to be made by the management board/section). The management board/section may terminate an emergency action at any time with approval of two-thirds of all voting members (i.e., entire membership).

(iv) Definition of Emergencies. The provisions of this subsection shall only apply in those circumstances under which public health or the conservation of coastal fishery resources or attainment of fishery management objectives has been placed substantially at risk by unanticipated changes in the ecosystem, the stock, or the fishery.

(12) Joint FMPs with Regional Fishery Management Councils - The Commission recognizes that fish species and fisheries are transboundary across state and federal jurisdictions, and that proper and efficient fisheries conservation can only be achieved by close coordination between state and federal management systems. The Commission is committed to close cooperation with the Regional Fishery Management Councils in providing for coordinated and compatible fisheries management. To this end, each management board shall work closely with appropriate Council committees to develop coordinated approaches to management.

(i) A management board may decide with a Regional Fishery Management Council to prepare an FMP jointly with that Council, with the intent that the Council and the Commission will approve the same FMP document. In such instances the management board and the Council will establish the specific procedures and schedules to follow during FMP development, including assignments of staff responsibilities on PDTs, technical committees and other fishery management program staffing and support groups, including advisory panels.

(ii) A management board shall endeavor whether or not a joint FMP is being prepared, to coordinate its meetings, meetings of the relevant advisory panel, and public hearings with relevant Council meetings and hearings.

Section Seven. Compliance

(a) **Implementation and Enforcement** - All states are responsible for the full and effective implementation and enforcement of FMPs within areas subject to their jurisdiction. Each state shall submit a written report on compliance with required measures of a specific FMP in conformance with reporting requirements and schedules specified in the plan, which shall include submission of copies of relevant laws and regulations for the Commission's record. At any time, according to the procedures contained in this Section, the Commission may determine a state is not fully and effectively implementing and enforcing the required provisions of an FMP, and is therefore not in compliance with that plan. All evaluations, findings, and recommendations regarding compliance determinations shall be in writing.

(b) **Schedule for Reviews** - Implementation and compliance for FMPs will be reviewed according to the Commission's Action Plan. The schedule shall provide for review of each FMP at least annually, or more frequently as provided in a given FMP. In addition to the scheduled reviews, the PRT may conduct a review of the implementation and compliance of the FMP at any time at the request of the management board/section, Policy Board, or the Commission.

(c) **Role of the Management Board/Section** - Each management board/section shall, within 60 days of receipt of a state's compliance report, review the written findings of the PRT developed according to the previous subsection. Based upon that written review, as well as other information that it has or may receive, the management board/section may recommend to the Policy Board that a state be found out of compliance, including the rationale for the recommended finding of non-compliance. The recommendation shall specifically address the required measures of the FMP that the state has not implemented or enforced, a statement of how that failure to implement or enforce the required measures jeopardizes the conservation of the resource, and the actions a state must take in order to comply with requirements of the FMP.

(d) **Role of the Policy Board** - The Policy Board shall, within 30 days of receiving a recommendation of non-compliance from a management board/section, review that recommendation of non-compliance. If it concurs in the decision, it shall recommend at that time to the Commission that a state be found out of compliance. A recommendation regarding non-compliance from the Policy Board will be submitted to the Commission in writing provided there is sufficient time between meetings to develop such documentation.

(e) **Review and Determination by the Commission** - The Commission shall consider any recommendation forwarded under Subsection(d), as quickly as possible and within 30 days of receiving a recommendation of non-compliance from the Policy Board. Any state which is the subject of a recommendation for a finding of non-compliance shall be given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. The state may request that the Commission's consideration be held at a formal meeting by roll call vote. With the consent of the Commissioners from the state subject to the recommendation, the Commission's decision may be made by electronic ballot. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with the relevant FMP, and specify the actions the state must take to come into compliance. Upon a non-compliance determination, the Executive Director shall within ten working days notify the state, the Secretary of Commerce, and the Secretary of the Interior of the Commission's determination.

(f) **Withdrawal of Determination** - Any state subject to a moratorium that has revised its conservation program in response to a determination of non-compliance may request that the Commission rescind its findings of non-compliance.

(1) If the state provides written documentation to the Commission of implementation of every measure required of it, the withdrawal will be automatic upon issuance of a letter from the Commission Chair to the state, Secretary of Commerce, and the Secretary of the Interior.

(2) If the measures implemented deviate from those required of the state, the state shall provide a written statement on its actions that justify a determination of compliance. The management board/section shall promptly conduct such re-evaluation and make a recommendation to the Policy Board that the recommendation or determination of non-compliance be withdrawn. Upon the recommendation of the Policy Board, the Commission may withdraw its determination of non-compliance, whereupon the Executive Director shall promptly notify the state, the Secretary of Commerce, and the Secretary of the Interior. The re-evaluation by the Management board/section, review by the Policy Board, and action by the Commission shall be made within 45 days of the receipt by the Commission of the request for reconsideration by the State. It may be made by electronic ballot with the consent of the Commissioners from the subject state.

(g) **Procedure to Address Management Program Implementation Delays** - Each species management board shall evaluate the current FMP, amendment, and/or addendum to determine if delays in implementation have impacted, or may negatively impact, the achievement of the goals and objectives of the management program. Each of the species management boards, with the assistance of the respective technical committee if necessary, will conduct this evaluation and provide, in writing, a summary of its findings to the ISFMP Policy Board. Each species management board that determines that there is a negative impact due to delayed implementation will provide the ISFMP Policy Board a proposed timeline to develop an amendment or addendum to address delayed implementation.

If the ISFMP Policy Board determines that an amendment or addendum should be developed to address delayed implementation, the amendment or addendum should, at a minimum, include any penalties and repayments for delays in implementation, the minimum notification time that Commission staff must provide a state/jurisdiction prior to requiring an in-season management adjustment; and establishment of a reporting and tracking system for management changes.

Section Eight. Definitions

(a) **Act** - The Atlantic Coastal Fisheries Cooperative Management Act, 1993. 16 U.S.C. Chapter 71, et seq.

(b) **Action plan** - A document prepared annually by Commission staff and approved by the Policy Board to provide priorities and schedules for the specific activities of the ISFMP during a given year.
(c) **Adaptive management** - An iterative process which includes evaluation of the response of the managed fishery and stock to specific management measures and adjusting such measures based on that evaluation.

(d) **Advisory Panel (AP)** - A group of interested and knowledgeable persons convened under the Commission's Advisory Committee Charter to assist in development of an FMP or amendment.

(e) **Assessment Science Committee (ASC)** - A group consisting of experts in fish population dynamics and appointed and convened by a Technical Committee, at the request of a Management Board, to prepare a stock assessment for a specified fish stock using the best scientific data available and established techniques.

(f) **Best scientific information available** - Includes but is not limited to that body of biological, environmental, ecological, economic, and social data concerning the fish stock and fisheries which are the subject of an FMP or amendment, provided that the methods of collecting such information are clearly described and are generally accepted as scientifically valid. Data may come from state, federal, or private databases and from published and unpublished sources. Information that becomes available during preparation of an FMP or amendment should be incorporated to the extent practicable.

(g) **Bycatch** - That portion of a catch taken in addition to the targeted species because of non-selectivity of gear to either species or size differences; may include non-directed, threatened, or endangered and protected species.

(h) **Compliance** - Condition in which a state has implemented and is enforcing all measures required by an FMP. States are presumed to be in compliance unless determined to be out of compliance pursuant to Section Seven.

(i) **Conservation** (from the Act, Section 803[4]) - The restoring, rebuilding, and maintaining of any coastal fishery resource and the marine environment, in order to assure the availability of coastal fishery resources on a long-term basis.

(j) **Conservation equivalency** - Actions taken by a state which differ from the specific requirements of the FMP, but which achieve the same quantified level of conservation for the resource under management. For example, various combinations of size limits, gear restrictions, and season length can be demonstrated to achieve the same targeted level of fishing mortality. The appropriate Management Board/Section will determine conservation equivalency.

(k) **Conservation program** - Enactment of rules or statutes, research, biological monitoring, collection of statistics, stock enhancement, and enforcement activities conducted by a state to maintain, restore, and/or rebuild a fish stock and its habitat.

(l) ***De minimis*** - A situation in which, under existing conditions of the stock and scope of the fishery, conservation, and enforcement actions taken by an individual state would be expected to contribute insignificantly to a coastwide conservation program required by an FMP or amendment.

(m) **Directed fishery** - Fishing for a stock using gear or strategies intended to catch a given target species, group of species, or size class.

(n) **Emergency** - Unanticipated changes in the ecosystem, the stock, or the fishery which place public health, the conservation of coastal fishery resources, or attainment of fishery management objectives substantially at risk.

(o) **Endangered, threatened, or protected species –** Species that are regulated under the jurisdiction of the federal or a state's endangered species act (threatened or endangered) or are provided other special protection.

(p) **Fish** (from the Act, Section 803[7]) - "Finfish, mollusks, crustaceans, and all other forms of marine animal life other than marine mammals and birds."

(q) **Fishable abundance** - Numbers of fish in a stock sufficient to provide continuing harvests in the range of historic average levels without overfishing the stock.

(r) **Fishery** (from the Act, Section 803[8])

> (1) "One or more stocks of fish that can be treated as a unit for purposes of conservation and management and that are identified on the basis of geographical, scientific, technical, commercial, recreational, or economic characteristics; or
>
> (2) Any fishing for such stocks."

(s) **Fish habitat** - The environment upon which a fish stock is dependent as it conducts its normal life history functions of spawning, feeding, and migration; including biological, physical, and chemical factors which influence the choices of such areas.

(t) **Fishery management** - All activities conducted by a government to improve, restore, rebuild, or maintain fish stocks and fisheries, including statutory action and rule-making, enforcement, research, monitoring, collection of statistics, enhancement, protection, development, and habitat conservation.

(u) **Habitat Committee (HC)** - The principal body, established by the Commission, which advises the Commission on issues of habitat, habitat management, habitat requirements by the managed species, enforceability of proposed habitat management measures.

(v) **Implementation of an FMP** - Conducting a state conservation program that meets all requirements for that state as provided in an FMP or amendment.

(w) **Law Enforcement Committee (LEC)** - The principal body, established by the Commission, which advises the Commission on issues of law enforcement and enforceability of potential management measures, comprised of representatives of each member state, Washington, D.C., NOAA Fisheries, U.S. Fish and Wildlife Service, and the U.S. Coast Guard.

(x) **Management measure** - A statute or rule enacted by a state to conserve a fishery and/or protect its habitat.

(y) **Management and Science Committee (MSC)** - The principal scientific advisory body of the Commission, comprised of representatives from member states, NOAA Fisheries, and U. S. Fish and Wildlife Service.

(z) **Minimize waste** - Process of taking specific actions, which reduce the effects of fishing activities on non-target resources (habitat and bycatch) and promote full, efficient utilization of the catch.

(aa) **Non-compliance** - A condition under which the Commission has determined that a state has failed to implement and enforce a conservation program as required in an FMP or amendment.

(bb) **Non-indigenous species** - A species of fish, plant or other organism that is not native to a particular geographic area.

(cc) **Overfishing** - In the context of the ISFMP, harvesting from a stock at a rate greater than the stock's reproductive capacity to replace the fish removed through harvest. Each FMP contains a plan-specific definition of overfishing.

(dd) **Plan Development Team (PDT)** - A group of individuals who are knowledgeable concerning the scientific facts and fishery management issues concerning a designated fish stock and who are appointed and convened by a Management Board to prepare an FMP or amendment and its supporting Source Document.

(ee) **Plan review** - An evaluation of an FMP, considering adequacy and relevance of the goals and objectives, stock status, fishery status, implementation status, research activities, and recommendations.

(ff) **Plan Review Team (PRT)** - A group of individuals who are knowledgeable concerning the scientific facts, stock and fishery condition, and fishery management issues concerning a designated fish stock and who are appointed and convened by a Management Board for the purpose of conducting an annual plan review for an FMP.

(gg) **Public Information Document (PID)** - A document of the Commission which contains preliminary discussions of biological, environmental, social, and economic information, fishery issues, and potential management options for a proposed FMP or amendment.

(hh) **Range (functional)** - The geographic area utilized by a fish stock and its dependent fishery as defined in an FMP.

(ii) **Recommendations** - Actions identified in an FMP which should be taken by the states, but are not required, such as enactment of rules, research, monitoring, collection of statistics, and enhancement, which collectively will promote restoration, rebuilding, or maintenance of a stock.

(jj) **Regulatory** - Of or pertaining to any administrative or legislative measure in a sense that requires compliance by individuals involved in the fishery.

(kk) **Requirements** - Actions set forth in an FMP which must be taken by the states specified in such FMP, such as enactment of rules, research, monitoring, collection of statistics, and enhancement, which collectively will promote attainment of the FMP's objectives for restoration, rebuilding, or maintenance of a stock, and are the measures against which compliance is judged. Failure of a specified state to implement a required action may result in a finding of non-compliance under the Act.

(ll) **Source document** - The comprehensive support document to an FMP which is compiled by the Plan Development Team and Commission staff and contains all the scientific, management, and other analyses and references utilized in preparation of the FMP; the Source Document is kept on file with the Commission.

(mm) **State** - (from the Act, Section 803[13]) For purposes of the Act, one of the following East Coast jurisdictional entities: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida; also includes the District of Columbia, or the Potomac River Fisheries Commission.

(nn) **Stock** - A group of fish of the same species which behave (spawn, migrate, feed) as a unit.

(oo) **Subgroup** - A group of fish from the same stock which consistently conducts itself as an identifiable unit.

(pp) **Target species** - A species or group of species of fish which certain fishing gear or strategies are designed to catch.

(qq) **Technical Committee (TC)** - A group of persons who are expert in the scientific and technical matters relating to a specific fish stock and who are appointed and convened by a Management Board to provide scientific and technical advice in the process of developing and monitoring FMPs and amendments.

(rr) **Trigger** - A measure of a specific attribute of a fish stock or fishery for which values above or below an established level initiates a pre-specified management action.

Atlantic States Marine Fisheries Commission

Business Session

October 18, 2017; 1:15 – 2:15 p.m.
October 19, 2017; 11:30 a.m. – Noon

Norfolk, VA

Draft Agenda

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

October 18

1.	Welcome/Call to Order (*D. Grout)*	1:15 p.m.
2.	Committee Consent • Approval of Agenda • Approval of Proceedings from May 2017	1:15 p.m.
3.	Public Comment	1:15 p.m.
4.	Review and Consider Approval of 2018 Action Plan **Action**	1:20 p.m.
5.	Elect Chair and Vice Chair **Action**	2:00 p.m.
6.	Recess	2:25 p.m.

October 19

1.	Consider Final Approval of Northern Shrimp and Tautog Amendments **Final Action**	11:30 a.m.
2.	Consider Non-compliance Recommendations (If Necessary) **Final Action**	11:45 a.m.
3.	Other Business/Adjourn	12:00 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk VA; 757.627.4200

Vision: Sustainably Managing Atlantic Coastal Fisheries

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

BUSINESS SESSION

The Westin Alexandria
Alexandria, Virginia
May 11, 2017

These minutes are draft and subject to approval by the Business Session
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. **On behalf of the ISFMP Policy Board move the full Commission find the state of New Jersey be out of compliance for not fully and effectively implementing and enforcing Addendum XXVIII to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan if the State does not implement the following measures or equivalent measures as approved by the Summer Flounder Board by May 21, 2017:**

    - **Shore mode for Island Beach State Park only: 17-inch minimum size limit; 2-fish possession limit and 128-day open season.**
    - **Delaware Bay only (west of the colregs line): 18-inch minimum size limit; 3-fish possession limit and 128-day open season.**
    - **All other marine waters (east of the colregs line): 19-inch minimum size limit; 3-fish possession limit and 128-day open season**

    The implementation of these regulations is necessary to achieve the conservation goals and objectives of the FMP to end overfishing of the summer flounder stock. In order to come back into compliance, the state of New Jersey must implement all of the measures listed above as contained in Addendum XXVIII to the Summer Flounder FMP (Page 1).

    Motion made by Mr. Grout on behalf of the ISFMP Policy Board. Motion carries (Roll Call Vote: In Favor – RI, CT, NY, NJ, PA, DE, MD, VA, NC, SC, GA, FL; Abstentions – NH) (Page 2).

3. **Move to Adjourn** by consent (Page 2).

ATTENDANCE

Board Members

Dennis Abbott, NH, proxy for Sen. Watters (LA)
Doug Grout, NH (AA)
Ritchie White, NH (GA)
Raymond Kane, MA (GA)
David Pierce, MA (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Jason McNamee, RI, proxy for J. Coit (AA)
David Borden, RI (GA)
Mark Alexander, CT (AA)
James Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
Russ Allen, NJ, proxy for L. Herrighty (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Andy Shiels, PA, proxy for J. Arway (AA)
Roy Miller, DE (GA)
John Clark, DE, proxy for D. Saveikis (AA)
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)
Chris Batsavage, NC, proxy for B. Davis (AA)
David Bush, NC, proxy for Rep. Steinburg (LA)
Robert Boyles, SC (AA)
Malcolm Rhodes, SC (GA)
Spud Woodward, GA (AA)
Pat Geer, GA, proxy for Rep. Nimmer (LA)
Rep. Thad Altman, FL (LA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Wilson Laney, proxy for Sherry White, USFWS
Kelly Denit, NMFS

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

Ex-Officio Members

Staff

Bob Beal
Toni Kerns
Katie Drew
Ashton Harp

Guests

The Business Session of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, May 11, 2017, and was called to order at 11:28 o'clock a.m. by Chairman Douglas E. Grout.

CALL TO ORDER

CHAIRMAN DOUGLAS E. GROUT: Okay, everybody stand up, take a stretch, and then sit back down immediately and we'll go right into this Business Session so we can give the South Atlantic Board an opportunity to do their work before their flights go out. I'm calling to order the Business Session of the Full Commission.

APPROVAL OF AGENDA

CHAIRMAN GROUT: We have an agenda before us. I'm going to modify it. I'm going to take out the proceedings.

There were no proceedings from January, 2017. Are there any other changes or additions to this agenda? Seeing none; any objections to approving the agenda as modified? Seeing none; the agenda is approved.

Is there any public comment on items not on the agenda?

REVIEW NON-COMPLIANCE FINDINGS

CHAIRMAN GROUT: Seeing none; we'll move on to Item 4; Noncompliance Finding. We have a motion from the Policy Board, which is up on the board. Because it's a Board motion it doesn't need a second. Is there any discussion on this motion? Okay, I'm going to read this into the record; and while I'm reading it into the record, please caucus within your states.

On behalf of the ISFMP Policy Board, move the Full Commission find the state of New Jersey be out of compliance for not fully and effectively implementing and enforcing Addendum XXVIII of the Summer Flounder, Scup and Black Sea Bass Fishery Management Plan; if the State does not implement the following measures, or equivalent measures as approved by the Summer Flounder Board by May 21, 2017.

Shore mode for Island Beach State Park only: 17-inch minimum size limit, 2-fish possession limit and 128-day open season. Delaware Bay only (west of the colregs line): 18-inch minimum size limit, 3-fish possession limit and 128-day open season. All other marine waters (east of the colregs line): 19-inch minimum size limit, 3-fish possession limit and 128-day open season.

The implantation of these regulations is necessary to the achievement of conservation goals and objectives of the FMP to end overfishing of the summer flounder stock. In order to come back into compliance, the state of New Jersey must implement all of the measures listed above as contained in Addendum XXVIII to the Summer Flounder FMP.

Are you ready to vote? Roll call vote.

MS. TONI KERNS: Maine is absent. New Hampshire.

CHAIRMAN GROUT: As the Chair I am not going to vote.

MS. KERNS: Massachusetts, absent. I didn't realize he left, I'm sorry. Rhode Island.

MR. JASON McNAMEE: Yes.

MS. KERNS: Connecticut.

MR. MARK ALEXANDER: Yes.

MS. KERNS: New York.

MR. STEVE HEINS: Yes.

MS. KERNS: New Jersey.

MR. TOM BAUM: No.

MS. KERNS: Pennsylvania.

MR. ANDY SHIELS: Yes.

MS. KERNS: Delaware.

MR. JOHN CLARK: Yes.

MS. KERNS: Maryland.

MR. DAVID BLAZER: Yes.

MS. KERNS: Virginia.

MR. JOE CIMINO: Yes.

MS. KERNS: North Carolina.

DR. MICHELLE DUVAL: Yes.

MS. KERNS: South Carolina.

DR. MALCOLM RHODES: Yes.

MS. KERNS: Georgia.

MR. PAT GEER: Yes.

MS. KERNS: Florida.

MR. JIM ESTES: Yes.

CHAIRMAN GROUT: The motion carries 11 to 1 to 1; and there were two absences.

ADJOURNMENT

Is there anything else to come before the Business Session? Seeing none; this meeting is adjourned.

(Whereupon the meeting was adjourned at 11:32 o'clock a.m. on May 11, 2017.)

Atlantic States Marine Fisheries Commission

South Atlantic State/Federal Fisheries Management Board

October 19, 2017
12:30 – 3:00 p.m.
Norfolk, Virginia

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)* 12:30 p.m.

2. Board Consent 12:30 p.m.
   - Approval of Agenda
   - Approval of Proceedings from August 2017

3. Public Comment 12:35 p.m.

4. Cobia Fishery Management Plan (FMP) for Final Approval (*L. Daniel*) **Final Action** 12:45 p.m.
   - Review Options and Public Comment Summary
   - Review Committee Reports
   - Consider Final Approval of Cobia FMP

5. Review Maryland Proposal for Black Drum Commercial Harvest (*L. Fegley*) **Action** 1:30 p.m.
   - Black Drum Technical Committee Memo on Maryland Proposal (*M. Schmidtke*)

6. Progress Report on Potential Adjustments to Atlantic Croaker and Spot Traffic Light Analyses (*J. Kipp*) 2:10 p.m.

7. Consider 2017 FMP Reviews and State Compliance Reports for Red Drum, Black Drum, and Spotted Seatrout (*M. Schmidtke*) **Action** 2:20 p.m.

8. Discuss Removal of Spotted Seatrout from Commission Management (*M. Duval*) **Possible Action** 2:40 p.m.

9. Other Business/Adjourn 3:00 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk, Virginia 23510; 757.627.4200.

MEETING OVERVIEW

South Atlantic State/Federal Fisheries Management Board Meeting
Thursday, October 19, 2017
12:30 – 3:00 p.m.
Norfolk, Virginia

Chair: Jim Estes (FL) Assumed Chairmanship: 02/16	Technical Committee (TC) Chairs: Red Drum: Ryan Jiorle (VA) Atlantic Croaker: Chris McDonough (SC) Black Drum: Harry Rickabaugh (MD)	Law Enforcement Committee Representative: Capt. Bob Lynn (GA)
Vice Chair: Pat Geer	Advisory Panel Chair: Tom Powers (VA)	Previous Board Meeting: August 1, 2017
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 1, 2017

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. Cobia Fishery Management Plan (FMP) for Final Approval (12:45 – 1:30 p.m.) Final Action
Background • In August, 2017, the Board approved a Draft Fishery Management Plan (FMP), developed as a complement to the federal FMP, for Public Comment. (**Briefing Materials**) • Written Public Comment was accepted through October 10, 2017. • Public hearings were held in Virginia, North Carolina, and South Carolina, and a public hearing webinar was held for Georgia. (**Supplemental Materials**)
Presentations • Public Comment Summary by L. Daniel
Board actions for consideration at this meeting • Consider final approval of the Cobia FMP.

5. Review Maryland Proposal for Black Drum Commercial Harvest (1:30 – 2:10 p.m.) Action
Background • In September, 2017, Maryland submitted a proposal that would allow their commercial fishery for black drum to be re-opened in the Chesapeake Bay (**Briefing Materials**)

- The Black Drum TC met via conference call in September, 2017, to review this proposal and provide a recommendation for the Board.

Presentations

- Maryland Proposal for Black Drum Commercial Harvest by L. Fegley

Board actions for consideration at this meeting

- Consider initiation of an addendum to the Black Drum FMP that would re-open Maryland's commercial fishery for black drum in the Chesapeake Bay.

6. Progress Report on Potential Adjustments to Atlantic Croaker and Spot Traffic Light Analyses (TLA) (2:10 – 2:20 p.m.)

Background

- In May, 2017, the Board directed the Technical Committee (TC) to conduct exploratory analyses to potentially incorporate additional indices and adjustments into the TLAs; the TC has begun working on this task and has preliminary results for both TLAs.
- The TC met via conference call in October, 2017. The TC will further discuss results to provide a formal recommendation for Board consideration at a future meeting. (**Supplemental Materials**)

Presentations

- Progress Report by J. Kipp

7. 2017 FMP Reviews for Black Drum, Red Drum, and Spotted Seatrout (2:20 – 2:40 p.m.) Action

Background

- Black Drum State Compliance Reports are due on August 1. The Plan Review Team reviewed each state report and compiled the annual FMP Review. (**Briefing Materials**)
- Red Drum State Compliance Reports are due on July 1. The Plan Review Team reviewed each state report and compiled the annual FMP Review. New Jersey and Delaware have applied for *de minimis*. (**Supplemental Materials**)
- Spotted Seatrout State Compliance 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*. (**Supplemental Materials**)

Presentations

- Overview of the Black Drum, Red Drum, and Spotted Seatrout FMP Reviews by M. Schmidtke

Board actions for consideration at this meeting

- Accept 2017 FMP Reviews and State Compliance Reports
- Approve *de minimis* requests for NJ and DE for red drum and spotted seatrout.

8. Discuss Removal of Spotted Seatrout from Commission Management (2:40 – 3:00 p.m.) Possible Action

Background

- In November, 2015, the Board passed a motion recommending that the ISFMP Policy Board withdraw the Spotted Seatrout FMP.
- In February, 2016, this motion was postponed indefinitely, due to the dependence of some states' abilities to manage spotted seatrout on the interstate FMP.

• One of the states that was previously unable to manage spotted seatrout outside of the interstate FMP, North Carolina, has established policies that would allow management in the absence of an interstate FMP.
Board actions for consideration at this meeting • Consider renewed action on the indefinitely postponed motion to recommend that the ISFMP Policy Board withdraw the Spotted Seatrout FMP.

9. 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 1, 2017

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INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).

2. **Approval of Proceedings of May 2017** by consent (Page 1).

3. **Move to add an option for a 36 inch fork length or total length equivalent minimum size limit for the commercial fishery** (Page 13). Motion by Roy Miller; second by Tom Fote. Motion failed (Page 19).

4. **Move to approve the Cobia Fishery Management Plan for public comment as amended** (Page 21). Motion by Michelle Duval; second by Lynn Fegley. Motion carried (Page 21).

5. **Motion to adjourn by Consent** (Page 38).

ATTENDANCE

BOARD MEMBERS

Roy Miller, DE (GA)
Rachel Dean, MD (GA)
Ed O'Brien, MD, proxy for D. Stein (LA)
Tom Fote, NJ (GA)
Lynn Fegley, MD, proxy for D. Blazer (AA)
Kyle Schick, VA, proxy for J. Bull (AA)
David Bush, NC, proxy for Rep. Steinburg (LA)
Doug Brady, NC (GA)
Michelle Duval, NC, proxy for B. Davis (AA)
Robert Boyles, SC (AA)
Malcolm Rhodes, SC (GA)
Sen. Ronnie Cromer, SC (LA)
Patrick Geer, GA, proxy for Rep. Nimmer (LA)
Spud Woodward, GA (AA)
Rep. Thad Altman, FL (LA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
John Carmichael, SAFMC

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

Ex-Officio Members

Chris McDonough, Technical Committee Chair
(Atlantic Croaker)

Staff

Toni Kerns
Robert Beal
Pat Campfield
Kristen Anstead
Mike Schmidtke
Louis Daniel
Max Appelman

Guests

Joe Cimino, VMRC
Richard Cody, NOAA
Heather Corbett, NJ DFW
Roy Crabtree, NMFS
Jeff Deem VMRC
Joseph Gordon, PEW
Zack Greenberg, PEW
Jack Travelstead, CCA

The South Atlantic State/Federal Fisheries Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 1, 2017, and was called to order at 10:45 o'clock a.m. by Chairman Jim Estes.

CALL TO ORDER

CHAIRMAN JIM ESTES: The South Atlantic State/Federal Fisheries Management Board is now meeting. My name is Jim Estes; I am the administrative proxy from Florida. I am going to try to speed us up through this meeting today, because we are a little bit behind.

APPROVAL OF AGENDA

CHAIRMAN ESTES: The first thing is approval of the agenda.

Are there any suggestions to be made to change the agenda? I have one myself; are there any other ones? What we're going to do is we are going to consider management response to the benchmark stock assessment; after we hear the traffic-light analysis for spot and croaker. If that's okay and there are no other suggestions, the agenda is approved by consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN ESTES: Proceedings from our last meeting in May, are there any suggestions for changes to the proceedings? Seeing none; the proceedings are approved by consent. We have no one signed up from the public to speak on items not on the agenda. Is there anyone in that large crowd over there that would like to speak on an item not on the agenda?

REVIEW AND CONSIDER COBIA DRAFT FISHERY MANAGEMENT PLAN FOR PUBLIC COMMENT

CHAIRMAN ESTES: Seeing none; we will go on and Dr. Daniel will quickly go through our Cobia Draft Fishery Management Plan.

What I would like to do with this is he is going to go through each item. We can have questions; and then we can make some suggestions, some changes if there are any. I would like to do this without going through the formality of motions. I would like to see consent for everybody to agree on doing this. If we can't find consent, then we will go through the motions.

DR. LOUIS B. DANIEL: Good morning everybody; it is good to be here. Just since your last meeting we've had several PDT calls. We also had an Advisory Panel conference call. We had three members of your advisory panel attend the call; and had very little substantive comments on the management options that we'll be providing; I'll be putting forward to you here in just a minute.

Quickly I would like to go through the primary objectives as set forth by the Board to complement the South Atlantic's coastal migratory pelagics FMP; to constrain harvest to the ACL established by the South Atlantic Council, and to provide the states with maximum flexibility to manage their specific cobia fisheries. Those were your principal objectives in developing the plan.

Real quickly a background, the significant overages of the recreational ACL in '15 and '16 resulted in closures to the EEZ. Those overages raised concerns for upcoming stock assessment and the stock status of cobia. The disproportionate impacts on closures within the management area, and recognition that the majority of fisheries occur in state waters, prompted your action in development of the FMP. Management unit has been a sticky topic. The Atlantic migratory group has been set at their range from Georgia through New York. Microsatellite DNA analysis and tag recapture data support these current boundaries as they were accepted by the Council's SSC.

But to be clear there is a lot of effort by the states to collecting additional data, and analysis that will continue and hopefully better delineate the stock, and better define mixing areas, if what we have in place is not adequate. That will be a component of the upcoming stock assessment. The stock status, SEDAR 28 is the most recent stock assessment for cobia; that is with data through 2011.

At that time the stock was deemed to be not overfished, and overfishing not occurring. But there were concerns with the declining SSB over the last decade or so; culminating in a fairly low terminal estimate in 2011. The recent overages by as much as 100 percent over the allowable catch limits or annual catch limits raise even further concerns for the 2018 assessment.

Briefly, and all of this is in the draft fishery management plan, so I just wanted to make sure that folks had an opportunity to know what we're dealing with here. Cobia life history, very difficult to get a handle on cobia life history, many of the states try to get information as they can. But the fact that these fish are only available in our various waters for short periods of time, make it very difficult to get good annual estimates of things like DSIs and the like.

There is a lot of information that we would like to continue to collect on cobia life history; due to their episodic appearance in coastal waters. The recreational fisheries real quickly, is a very valuable recreational fishery particularly from Georgia through Virginia, with landings north of Virginia being episodic.

We've heard a lot from the for-hire and tackle manufacturing as playing a large role in the value of this fishery; and the directed fisheries earlier in the season tend to give way to more bycatch fisheries as the season progresses in some locations, not all. The current ACL for cobia is 620,000 pounds.

Landings in '15 and '16 exceeded a million pounds; and the federal closure of the EEZ as a result of the overages had a disproportionate impact on the states from Georgia through Virginia. Clearly those states that have primarily a fishery in the EEZ, like Georgia and South Carolina were more disadvantaged than those states that have more fishery in state waters.

Just to give you an idea as we begin to talk about seasonality. This is the best information that we have at this time from the last several years; showing that the fishery primarily operates from generally around April through October, with fisheries occurring a little earlier probably in the further south areas, and a little later in the season. But the vast majority of the catches occur in that May-June, June-July period.

Based on numerous iterations of the landings information, this just gives you a general idea if you just look across the bottom, and look at the averages for each state. These are their average landings over the last five years; just to give you a sense of where the landings have been, with a total in 2015 at 1.5 million pounds, with an ACL of 620. Our average is quite a bit at 793, is quite a bit above the 620,000 pound recreational ACL. In the commercial fishery the ACL is 50,000 pounds, average landings during the five-year time series is around 56,000 pounds. It is historically a bycatch fishery. More directed activity appears to be developing in some jurisdictions. How that will impact the current catch rates is yet to be determined.

North Carolina accounts for about 67 percent of the current commercial landings. A large percentage of that actually comes from bycatch in the large mesh gillnet fishery. But typically that is limited to one or two fish. Again, similar to the recreational fishery this is the average landings by state.

The Georgia/South Carolina data are combined due to confidentiality. You can see that the commercial landings and value don't quite compare with the magnitude of the fishery in the recreational fishery. Socioeconomic data are sparse in this fishery; certainly a very important and valuable bycatch to commercial fisheries.

These fish are typically high value and they are available for a short period of time, so demand is typically high. When a commercial fisherman does have a cobia, it typically is a high dollar fish. The larger recreational fishery is far more difficult to characterize; and again because of its episodic occurrence there has not been a lot of information directly attributable to the cobia fishery.

What data we do have is in Framework 4 with the South Atlantic; but further study is needed to adequately characterize all the cobia dependent fisheries. Habitat issues again, because of their episodic nature, and also because they are fairly rare, for whatever reason. There are few, if any, studies that directly characterize habitat preferences and needs for cobia.

Information on early life history is limited; and data are primarily based on incidental captures of limited numbers of fish in various fishery independent programs. I'm personally not aware of any program that lands any kind of quantity of juvenile or small cobia; and most of them are again bycatch in either directed fisheries, recreational and commercial, or in various trawl surveys or gillnet surveys or other types, haul seine surveys and the like.

Juvenile cobias are taken incidental to both commercial and recreational activities; as well as fishery dependent collections. These collections tend to occur in estuaries in the nearshore coastal ocean. Adults tend to migrate north and south, as well as inshore and offshore; tending to be closer to shore during spawning activities.

The ongoing tagging efforts should provide more information on their migratory habits. A lot of questions right now about their actual migratory routes, and that is an ongoing issue. Research and data needs, virtually anything that we could add to our existing understanding would be helpful. Any biological information, reproductive, ecology, movements, habitat, needs and preferences are mostly lacking or incomplete; and the socioeconomic needs I've mentioned.

Protected species in North Carolina commercial gillnets take a high percentage of North Carolina's commercial cobia catch, as bycatch in primarily the southern flounder fishery. But this fishery is held to very strict observer program requirements; and any information on cobia and the bycatch of cobia in that fishery would be available, as well as any concerns related to endangered species interactions in that fishery as bycatch. But really no specific threats to protected species from cobia fisheries have been identified yet. At least in the state of North Carolina there was some observer coverage information on the recreational fishery; and I don't believe they actually had an observed turtle interaction, although anecdotal data says that there are some turtle interactions in some of our nearshore bottom fish fisheries, cobia being one of those.

Into the management program, management options for cobia were developed based on the efforts to complement these actions. Those actions proposed by the South Atlantic Framework 4, and options developed by the Board working group and the Plan Development Team. All approved management options would need to be implemented by April 1 of 2018; to affect the 2018 season.

I'll run through these real quickly. Obviously if there are any questions, I am happy to answer those as we move forward. Recreational size limit, Option 1 is status quo, not having a coastwide size limit. Option 2 is the minimum size limit of 36 inches fork length, which is currently the proposed size in the South Atlantic Framework 4.

What we noticed is that basically from Virginia north they tend to use total length. It was requested that we include a total length equivalent could be considered by the Technical Committee and the management board, if a state wanted to elect to use total length as opposed to fork length. Yes sir.

CHAIRMAN ESTES: Okay, are there any questions to Dr. Daniel's preamble or the recreational size limit options; any questions? Robert.

MR. ROBERT H. BOYLES, JR.: Not a question as much as a statement; to Dr. Daniel's point about measures need to be implemented by April 1. Of course you all know in South Carolina, we have to go through our legislative process. The likelihood of getting that probably is relatively low. But I just want to make sure the Board is aware that whatever we're required to do, we'll do as quickly as we can with our legislature. But the probability of having something done in place by April 1 is probably low.

CHAIRMAN ESTES: Okay thank you. Michelle.

DR. MICHELLE DUVAL: Just a quick addition to the protected species information that Louis provided. We did actually have two interactions with sea turtles from private anglers during the observer program study that we had; and that was in 2013. There weren't any in 2015, but we did have a couple in 2013; so just to note that for the draft.

CHAIRMAN ESTES: What is the comfort level of the Board with the two options that Dr. Daniel described? Are there any changes that are suggested, seeing none; if we would go through the next section?

DR. DANIEL: The next is a recreational bag limit option, again status quo, no coastwide bag limit option; and Option 2 would be to complement the Framework 4 option of one fish per person.

CHAIRMAN ESTES: Are there any questions about that or discussion about those options, suggestions for additions or deletions? Seeing none; you're making my job really easy.

DR. DANIEL: There will be some additional information for de minimis states coming up in the presentation. I saw some of the northern states start to ask questions; and I'll try to let you know that is coming. The next issue is recreational vessel limit options. This one has been confusing; Option 1, status quo, no coastwide vessel limit. Option 2 was a state specific daily vessel limits of no more than 6 fish per vessel.

I think it would be helpful here to explain that when the states begin developing their plans. If you would like to move forward with some type of a seasonal option, then you would be able to look at various vessel limits, in order to either lengthen your season or shorten your season, and allow more fish to the vessel. This is consistent with the South Atlantic Council's Framework 4; that would allow up to but no more than six fish per vessel.

CHAIRMAN ESTES: Okay questions; Dr. Rhodes.

DR. MALCOLM RHODES: Well, some current regulations in certain states are three fish. Can we throw a third option in with three; or would that just muddy the waters even more? I'm sure you've discussed it already.

DR. DANIEL: Yes, thank you, Dr. Rhodes. The situation as we have it now is states have implemented some measures to try to reduce harvest; and I think those numbers range from one fish to four fish to the vessel. I think what we would see if the plan is approved, and compliance plans are developed that in order to extend the season those numbers would probably be reduced, in order to extend the season.

That is what we've heard from the Working Group that's what we've heard from the Board and from the public that they want the longest season possible. I think by having up to six fish, it covers all the various options that I think the states would want to try to consider when developing their plan.

CHAIRMAN ESTES: Are you good with that? You could have a three-fish vessel limit for your implementation plan; and that would suffice. Are you good with that?

DR. RHODES: Yes that's fine. I was just at this point wondering if we need to put out all the different options. I understand having a maximum; states being allowed to limit their in-water to smaller amounts to increase the season. But I'm fine with that; just that it's another point of discussion.

CHAIRMAN ESTES: Are there any other comments or further discussion on this issue? Roy.

MR. ROY W. MILLER: Just a follow up on Dr. Rhodes point. Some of the states don't have the flexibility of offering a more restrictive regulation than what the plan calls for. I kind of go along with Dr. Rhodes. I would sort of like to see something less than six in there as well.

DR. DANIEL: If you all will keep that idea in mind, and once we get through the options I think it will become a little clearer of what the options are and how they work together. But if not, I'll address this issue in just a couple of minutes; if that's okay. Next are the recreational season and allocation options; and I'm sure there will be a lot of comments or questions on this. I will do my best to get through these three options as clearly as I possibly can; and take questions if that's okay. We had a lot of difficulty trying to come up with exactly how to do this, and so here is what we've got.

Option 1 is a state defined season and harvest control measures; each state would receive a hard recreational quota share of the federal ACL. Now there is some concern that has been raised that we can't allocate the recreational ACL. But we can call it something else if that would help. That is based on some sub-options that I'll show you here in just a minute.

The shares would be divided among the non de minimis states only; and the overharvest would be paid back in the following year, and underharvest would not carry over. Looking at Option 1, and looking at the various alternatives. This is the reference period sub-options for Option 1. These are based on the 3, 5, 10, and the 5 and 10 year average landings for the states; based on numbers of fish, which we've all agreed that's the way we want to look at this "allocation."

You can see across the options how the various percentages of the allocation to the various states changes, based on the years that you're looking at. More recent time period tends to disadvantage certain states. The longer time series tends to disadvantage certain states. Interestingly, the five and ten year average that was a recommendation from the Working Group does tend to smooth it out a little bit, and tend to have less of an impact in terms of disproportion.

But those are the various options that we were able to come up with through the Working Group and the Plan Development Team. If we look at the historical landings reference period sub-options; for Option 1, considering an ACL of 620,000 pounds, based on the various scenarios these would be the specific allocations or the specific targets that you would want to try to reach when you set your season annual vessel limit.

That is what you're going to have, essentially – and this kind of gets back to the questions from Dr. Rhodes and Roy – is your options are really limited in terms of how you reach this target; be it a soft quota or a hard quota, in that you can either lengthen your season, get a longer season with a lower vessel limit, or you can have a larger vessel limit and a shorter season.

Those are really the only option that we have available; if we go with a state-by-state target for recreational catches. The hard quota, the hard payback, immediate payback was not very attractive to a lot of folks; and so we looked at a different alternative, and that's how we developed Option 2.

It is very similar, but instead of the hard quota it is more of a soft quota share. The average annual landings would be evaluated against the state targets or allocated quotas over multiple years. You wouldn't be depending on that one year; which we've seen through the landing time series that can have some wild swings in the landings data for cobia, based on the MRIP data.

In this option you would be selecting from an average landings monitoring timeframe of two, three or more years. That way you wouldn't have to act every year if you have an overage; but it would be done over a time series of years. With this option the overharvest would be paid back over multiple year periods; and relaxed measures would be considered if underharvest. If a state was chronically under harvesting, and they wanted to increase their limit a little bit, or increase their season, they would be able to submit that plan to the Technical Committee and receive Board approval for that. The same numbers, in terms of the options and allocation or the targets across the states as Option 1, and essentially the same targets in terms of the numbers of amount of fish that would be allocated, based on the 620,000 pound recreational ACL.

The final option that we were able to come up with, Option 3, is essentially Framework 4; which would limit one fish per person bag limit, and a 36 inch fork length. But the coastwide overages would have to be paid back with reductions in the recreational ACL in the following year. If you look at the Option 3, these are directly out of Framework 4.

This is a coastwide season; it is not a state-specific season. It provides those seasons that were estimated with a January 1 start date, now they could be different for a May 1 start date. But based on a one fish, two fish, all the way up to a six-fish vessel limit. You can see how the seasons narrow considerably after you get past one or two fish.

But that again removes the flexibility that the Board indicated that they wanted to see, but this is one other option that is currently contained in Framework 4. Those are the seasonal allocation options; Options 1, 2, and 3, and I would be happy to try to address any questions the Board may have on those options.

CHAIRMAN ESTES: Let's make sure that we have the options that you're comfortable with. This is not like menhaden, but it certainly is more complicated than Louis's bluegills. Let's start out with some questions, if we could; Spud.

MR. A. G. "SPUD" WOODWARD: Let me give you a hypothetical. If the state of Georgia would like to have a season that extended, let's say from a March 1 start date into the fall, so that we could capture some fall fishing opportunities. This draft would allow us to put together bag limits, the size limits, and demonstrate that we would stay at or hopefully under what our allocation is.

DR. DANIEL: It would not allow you to modify your size limit. I mean right now the options for size limit is 36 inches for the recreational fishery, and a one-fish bag limit. What the state of Georgia would need to do is look at their catch rates; and probably end up, if you wanted to have a season that long then you would have a one-fish vessel limit, and then determine how long your season could be.

Then if you really wanted to extend it, you may have to have some mid-season closures in order to get into the fall. But in order to achieve what you're asking for would require an analysis by your state, submitting a plan to the Technical Committee. But as long as you stay within your target, your recreational catch target, and then you would be able to set up whatever seasonality you would like. Does that answer your question?

MR. WOODWARD: Yes, could we increase our minimum size limit and then run an analysis of the benefits of the increased minimum size limit in the context of the season?

DR. DANIEL: The discussions that occurred through the working group and the PDT were not to reduce the size limit any lower than 36 inches; because of concerns over the numbers of fish. Any increase in size limit, because it's based on numbers, could result in increasing harvest and increasing pounds of harvest. It also could result in increasing discard mortality and difficulties of handling the fish boat side. At the present time the document would not allow you, or the current document would not provide for you to be able to increase your size limit from a 36 inch size limit in order to extend your season longer.

CHAIRMAN ESTES: Robert.

MR. BOYLES: To follow up on Spud's comment. Could they not make a petition on conservation equivalency under just general conservation equivalency provisions?

DR. DANIEL: There is no conservation equivalency for the size limit, no. I mean in this plan the options that you had in the present time, based on the discussions that we've had over the last while, have been through seasonal lengths and vessel limits. You have the flexibility to use vessel limits and season length to stay within your catch limit. That's it at this particular moment in time. The only other option I can think of is a size limit; but increasing the size limit is not a present option.

CHAIRMAN ESTES: Other questions before we look at the options. Yes, sir.

MR. JOE CIMINO: I think Dr. Daniel did a good job at describing some of the issues with an increased size limit; but if I'm not mistaken the Southeast Regional Office, as well as what Virginia did. Their analysis also suggested that increasing size limits would also be targeting the larger, productive females; that we're really at that point where we're shifting to all female catch if we start moving up. I think that was another issue that had come up at the Council.

DR. DANIEL: I would just add the additional discard mortality of those smaller fish. We are seeing at least the anecdotal information of the coastwide fishery at this point is that the fishery is targeting on smaller fish at the present time; and so there is probably a lot of releases and discards that we're not capturing.

CHAIRMAN ESTES: Okay, are there suggestions, I guess specifically to Spud about some addition options then? Do we need to go back a little bit?

MR. WOODWARD: I think I'm getting the gist of this. It's just a little different than what we typically deal with; because we're using a pound, you know a pound is target in a predominantly recreational fishery. It sounded like if I wanted a plan that would allow some harvest of cobia during the fall migration run back past Georgia.

Then I would have to have basically two seasons. I would have a spring season, and then I would have to close it during the summer, and then open it up at some other period in the fall; and then demonstrate that the catches within those two periods would keep Georgia within its soft cap, or whatever. Is that correct?

DR. DANIEL: Yes, sir. I think that's correct, and I think also there was a lot of discussion about numbers, and it is different than what we've done in the past. But one of the primary reasons was because there was such a big difference between the MRIP estimates of harvest, pounds, and the Southeast Fisheries Science Center pounds. After a lot of back and forth and discussion at the Working Group level and the PDT, we made the recommendation to go with the numbers; to avoid and eliminate that discrepancy between the two methods to estimate harvest. But you're correct in that if you wanted to try to come up with something that was going to extend your season for longer than you can get. You are going to have to come up with a closed season period in there, in order to allow the fishery in the fall.

CHAIRMAN ESTES: Yes, sir.

MR. WOODWARD: Within the framework of this draft plan, so I if I came up with that scenario, it was approved by the Board. It would basically be in place for some period of time, three years, four years or so. Then to keep us from falling victim to the volatility of these, because all it would take was one fish in October, and next thing I know we're completely out of whack. That would be the intent of this is to establish it, leave it in there and then reevaluate it after some period. We could sort of normalize what was happening. Is that correct?

DR. DANIEL: Spud, from my perspective that is the beauty of Option 2. That is what Option 2 allows, and it would yes. If the state of Georgia has a 60,000 pound target and in the first year they catch 100, the next year they catch 20, the next year they catch 45. They averaged out to be under 60, you're good.

CHAIRMAN ESTES: Are there any questions about allocation schemes specifically. Seeing none; yes, Michelle.

DR. DUVAL: Maybe not so much a question, I just had a few comments and suggestions; just with regard to, and I spoke to Louis about this earlier. I think some of the language in those options; I just want to make sure that it's very clear that it's a soft target.

I've provided our PDT member with some suggestions for making sure that the language is appropriate, so that everybody understands that it is a soft state target. I'm just a little bit concerned that with some of the words that are in there right now; that stakeholders are going to focus more on the words, as opposed to the concept that we're trying to get across.

CHAIRMAN ESTES: Let's make sure that the Board is all on the same page about what this means. Are there any questions about what our intent is here? Yes, John.

MR. JOHN CARMICHAEL: I guess the way I read it I wasn't reading Option 2 as requiring payback; which is what it says in this last bullet, so that's the question. Is there actual payback as opposed to adjustment to stay on target?

DR. DANIEL: Yes, thank you John, and that is correct. Based on some discussions I had with some of the Board members, yes it is exactly as you described. It's not a payback as much as it is if the situation I described in Georgia, if they were found to be going chronically over their quota, and they may have to narrow their season a little bit or reduce their vessel limits a little bit, in order to accommodate and get back down to their average landings. But no payback, I will make sure that is clear in the document.

CHAIRMAN ESTES: Dr. Duval we will make sure that language is incorporated, thank you.

DR. DANIEL: Yes, and if your PDT from North Carolina can provide that language that would be very helpful. Thank you all very much. That was far less painless than I anticipated. The next issue is the commercial size limit options; and again we have Option1 is status quo, no coastwide size limit option.

Option 2 is a coastwide size limit, the current minimum size limit of 33 inches fork length; and then I included the total length equivalent in here as well for the commercial fishery that could be considered by the Technical Committee and the Board. That is the current Framework 4 option that is currently in headquarters. Those are the two options for commercial size limits.

CHAIRMAN ESTES: Yes, Robert.

MR. BOYLES: Just for the record, I want the Board to recognize that cobia are game fish in South Carolina, so there is no commercial harvest sale; they may not be bought, sold, bartered, traded or otherwise enter commerce under current law in South Carolina.

CHAIRMAN ESTES: Any other comments or discussion about these options; seeing none?

DR. DANIEL: All right next is commercial possession limit options. I'm sure there will be some discussion on this one. The status quo would be no coastwide possession limit option, and Option 2 would be the state-specific possession limit of no more than two fish per license holder; not to exceed six fish per vessel.

CHAIRMAN ESTES: Yes, Joe.

MR. CIMINO: As promised. Virginia has set something up for what isn't a bycatch fishery. Our commercial fishery is mostly commercial hook and line. We have a cap number of hook and line fishermen that are allowed to fish; and we have seen some movement into that fishery. A few years back, before cobia was an issue, we had a request from some of those commercial hook and liners to say I don't necessarily want to have to go out and find other licensed commercial fishermen to have six per vessel.

Would it be okay to just say six per vessel, no matter how many people on board? At a time when there was no cobia issue, we allowed that and we still currently do. As this moves forward, Virginia wouldn't be in compliance with that two-fish per vessel. However, I think the accounting for the commercial fishery may be a little bit off. I think what's happening right now is just using federal dealer reports. My belief is that in the last two years the commercial fishery has exceeded its harvest limits.

I believe moving forward, Virginia will have to do something; and perhaps the easiest first accountability measure is to get us back in compliance with this, so this may not be a large issue for us. I know we have to do something for our commercial fishery; even though it is small relative to the recreational catch. I just wanted to point out that right now as it stands, we have that six per vessel it is just not two per person.

CHAIRMAN ESTES: To be clear, you're not suggesting any additional options here, correct?

MR. CIMINO: Yes that is correct. I think at a minimum, as this moves forward, we in Virginia may be moving back to requiring two per license holder.

CHAIRMAN ESTES: Yes, sir.

MR. DAVID BUSH: Just a quick question. We do have some options on the recreational side for state-specific type management measures. Would it not be prudent to allow for such an option on the commercial side as well? Depending on how things move it may be a tool that might be vital to keep some tensions down within the state. I just don't know what the thought is. If there might be other discussion on allowing for some sort of a state-specific management of the commercial sector.

DR. DANIEL: That was discussed at the Working Group and the PDT level, the landings not nearly as concerning in the commercial side than the essentially over doubling of the ACL in the recreational fishery. There was a sense that the shares would be so small for the various states that the general consensus was to maintain the current ACL at the 50,000 pounds for the coastwide commercial fishery.

Based on what Joe just indicated from Virginia, and I think possibly in North Carolina. There are concerns about increasing harvest and increasing effort in the commercial fishery. Whether that happens or not, I guess we'll have to wait and see. But the general position of the Working Group was not to allocate that.

It also was the concern, well their point that we were able to manage the commercial cap or commercial quota with a census type of trip reporting that is real time, gave the states I believe, at that time at least, more comfort in maintaining a coastwide limit. If there is an interest by the Board to go with specific commercial allocations, then that would certainly be an option that we would have to develop and put together for your consideration. It is certainly possible.

MR. BUSH: Just a brief follow up. What you're looking at is a coastwide allocation for the commercial sector versus the commercial sector falling under the state quota that is being allotted to them. Is that what I understand? What you're suggesting is that we would have to provide for that separately if we took this route.

DR. DANIEL: Yes.

CHAIRMAN ESTES: I think Robert was next I believe, and then Lynn and then Dr. Duval. Lynn.

MS. LYNN FEGLEY: I just want to clarify a little bit in my own mind. If you're a de minimis state, the 50,000 pound commercial coastwide allocation. If an option was chosen to go for a coastwide size limit and possession limit, would a de minimis state follow that and then be de minimis for their recreational? I'm just trying to understand how the commercial and the recreational de minimis interface, and maybe we'll get to that later.

DR. DANIEL: Well this is probably as good a time as any to discuss that now, from my perspective. The coastwide ACL is 670,000 pounds. The commercial allocation is 50,000 pounds. The Board would need to decide as we discuss here in a second on de minimis, if they want to set aside any quota or target or share to the de minimis states; and if they do would it include commercial? In which case the commercial de minimis states would have a specific commercial allocation; which would be inconsistent with the way the commercial fisheries are being managed in the southern states.

The alternative is to set aside just recreational de minimis quota to the de minimis states; which would be 6,200 pounds if you decided to do 1 percent, and have the commercial fishery 50,000 pounds based on the coastwide ACL, clear as 40-weight, I'm sure.

CHAIRMAN ESTES: Dr. Duval.

DR. DUVAL: Just to make sure everybody understands. Right now under the federal FMP, the coastwide commercial fishery, which runs from Georgia through New York, is managed under this 50,000 pound commercial annual catch limit. Right now the regulations are still two fish per person. There is no qualification for it being a license holder or anything; because there is no federal permit for cobia commercially.

It's just a two fish per person, 33 inch minimum size limit and that's it. When we were discussing Framework Amendment 4 at the council level, commercial representatives themselves, who were concerned about the fact that this bycatch fishery was starting to push up against its own annual catch limit, brought forward the suggestion to implement a two fish per person, no more than six per vessel limit for the commercial fishery coastwide.

I think trying to go down the road of state-by-state quotas for the commercial fishery under this ACL would be over complicating things. I think that the two fish per person has worked. I do think that cap of having no more than six per vessel is probably necessary; given how harvests have increased, both in Virginia and in North Carolina over the past couple of years.

Certainly the commercial fishery is I guess maybe subject to the availability of these fish as it waxes and wanes; just as the recreational sector is as well. I just want to make sure everybody was clear what the regulations are right now versus what the Framework 4 regulations are; which is what is being suggested in this draft document for the commercial fishery.

CHAIRMAN ESTES: Okay before I go to Roy, Lynn, are you comfortable with that explanation that it has kind of been taken care of and considered at the Council level? Okay, Roy.

MR. MILLER: I have two questions. The first one is regarding the size limit. I'm frequently asked; what is the rationale for a differential between a recreational size limit for a given species, and a commercial size limit? My question is, how shall I answer? What is the rationale for the 33 inches as opposed to the 36 inches? That is the first question.

DR. DANIEL: Well, I'm not sure I can answer that in that the 33 inch size limit was maintained as status quo in the commercial fishery. I can only assume why the Council did that was to maintain the current harvest levels, but also there was no need for reduction in the commercial fishery at 33 inches. If you go to 36 that means they're getting a reduction, which they didn't need. It would probably result in more discard mortality if they went to 36 inches in the commercial fishery; particularly owing to the fact that a lot of those fish are taken in the large mesh gillnet fishery, where mortality rates may be a little higher than they are in commercial hook and line. That is the best I can do. I would hope that maybe perhaps one of the Council members would be able to explain why that decision was made in Framework 4, because where we were complementing that action, and I can't do any better explanation that that.

DR. DUVAL: Roy, Louis I think has captured the rationale quite well. You know we were focused on the recreational fishery. We were looking for additional means to provide harvest savings, so an increase in the size limit was one way to do that. There is a tipping point there beyond which, you know you increase that size limit and you're actually not really saving much of anything, as well as the concerns that Joe Cimino raised earlier that were discussed at the Council level about impacting female harvest.

On the commercial side, there was more concern about simply making sure that there was a cap to keep harvest within the 50,000 pound limit; and that establishing a vessel limit was sufficient to do so. Again, as Dr. Daniel indicated, you know the majority of these fish are taken in a gillnet fishery, so the discard mortality is likely higher.

CHAIRMAN ESTES: Yes sir, Roy.

MR. MILLER: If I could follow up. I'm just envisioning a commercial hook and line fisherman being allowed to keep a 33 inch fish. Everyone acknowledges the episodic occurrence in the areas that I'm familiar with. As opposed to a recreational fisherman has to throw anything back under 36 inches, the reasons don't sound compelling to me. That's just my opinion for having a differential size limit. That's my two cents on that.

CHAIRMAN ESTES: Would you suggest that we add an option for a 36 inch minimum size limit for the commercial fishery?

MR. MILLER: That would be my suggestion.

CHAIRMAN ESTES: What does the Board think about that? Yes, sir. Kyle, go ahead.

MR. KYLE SCHICK: I think we have a precedent. In other fish we have this disparity also, because of various reasons; black sea bass, flounder, and what not. I think that I'm a person that says if something's not broken let's not try to fix it and make it more complicated. I don't see that there is really a need to do that if the commercial fishery is under control.

CHAIRMAN ESTES: Tom.

MR. THOMAS P. FOTE: I was a little confused, because if there is no permit required for fishing commercially in federal waters, then a recreational person can say I'm out here fishing commercially and then would be allowed to keep a 33 inch fish? I'm just wondering how that would work.

CHAIRMAN ESTES: Well, Michelle and then I think Lynn.

DR. DUVAL: Yes Tom, so that's a conversation that the Council has walked down a couple times; in terms of whether or not to require a federal permit of any sort. We've recently discussed it, having had some concerns that there might be folks trying to exploit a loophole, so to speak, because there are a lot of recreational fishermen who do have a commercial fishing license. I know this has been a concern. In South Carolina it's been a bit of a concern in North Carolina that someone could just go and buy a commercial fishing license, in our case on the internet, off Craigslist, and they would be really fishing for pleasure.

But they would be a commercial fisherman; because they had that commercial license, but not necessarily selling those fish once they returned to shore. What we have been told from NOAA GC is that it would technically be illegal for them to fail to sell those fish once they returned to shore; since federal waters are currently closed to recreational harvest. Policing that I think is a different matter.

In North Carolina we do not require commercial fishermen to actually, they don't have to sell all the catch that they bring in. They are allowed to keep some for personal consumption. It is an issue. We have discussed it, and I think that is probably one of the reasons why the options that you see in this draft fishery management plan include two fish per license holder.

CHAIRMAN ESTES: Lynn, I think you were next.

MS. FEGLEY: I just wanted to clarify to Roy's point that a state could be more conservative, correct? If there was some sort of user conflict in the state where you had a recreational and a commercial hook and liner fishing side by side catching different sizes, the state could opt to increase that size limit to 36. I just want to clarify it, since we had that conversation about the 36 inch lock down on the recreational side. How would that play?

DR. DANIEL: I think, I'll look over here to my right too, but any time the states want to be more conservative that is perfectly legit. I mean if the state of Delaware decided that they wanted to go to 36 across the board for their cobia fishery, commercial and recreational, I can't imagine the Board would object to that. There are some options coming up, and for de minimis states it would address that Roy.

CHAIRMAN ESTES: I would point out though that raising the minimum size limit if we were already going up against our ACL that raising the minimum size limit could actually exacerbate that. That is something to think about. Tom.

MR. FOTE: I'm just uncomfortable with a loophole like that being left into the document, when you could easily solve it by just going to the same size limit; and not look for people to wiggle room into doing it commercially when it's not commercial.

CHAIRMAN ESTES: Dr. Duval.

DR. DUVAL: Tom, I just want to be clear that the issue that the Council has been discussing really has nothing to do with size limit. It's all about whether or not there is a federal permit required for sale.

CHAIRMAN ESTES: Right now I think I have a suggestion from Roy that we add an option for a 36 inch minimum size limit. I want to see kind of where we're at. Kyle you expressed that you didn't think that we need to have that; but would there be a problem as having that as an option, because we certainly are going to vote these things up and down? Then David first, I guess.

MR. BUSH: At this point obviously it's been said if it's not broke, don't fix it. We've got enough stuff that we throw out at the public, weeding through it is a nightmare half the time. It's obviously not necessary, and if there are states that wish to go forward with something a little more conservative that's already available to them. I think this is sufficient as it is, maybe even more sufficient than it needs to be.

DR. DANIEL: To that point to some degree, I would just also point out that Framework 4, which is currently in Headquarters, currently has it, so you would have a disconnect between federal waters would be at 33 and if states elected to go to 36, it's not to say don't do it. But you could make a motion to add if that was accepted by the Chair, to add a 36 inch size limit. But again, where that has been an issue, where it could be an issue in the de minimis states is addressed in the next option.

CHAIRMAN ESTES: Roy, tell me where you're thinking about. Would you be comfortable not adding it as an option, but allow the states to become more restrictive or not?

MR. MILLER: I still favor including it as an option. But I've heard the arguments to the contrary, and I'm willing to do what the majority feel is most important in this regard.

CHAIRMAN ESTES: I don't think that we have a consensus on this issue, and so perhaps we need to have a motion so we can figure out what we're going to go do. Yes sir.

MR. MILLER: Well, then I move that we add an option for a 36 inch size limit for the commercial fishery.

CHAIRMAN ESTES: Okay, do I have a second? Tom Fote seconds. Discussion, Roy, do you want to discuss it any more or any others? Okay, if it's all right with you let's leave this motion on the table for right now and look at the de minimis options and see if this takes care of it.

DR. DANIEL: De minimis options, Option 1 is not to have a de minimis program at all. Option 2 would be to include the de minimis program. At present the states average total, commercial plus recreational landings from the previous two years must be less than 1 percent of the average total coastwide landings for the same period.

The regulations would be one fish per vessel limit, with a minimum size limit. The Option 2 regulations would be the minimum size limits for de minimis would be the 33 inches for commercial and 36 inches for recreational, or 36 inches for both. Those are the two options that would go out to public comment under *de minimis.*

Going back, if you look at the landings data in the draft document over the last ten years, I believe I'm correct in saying, and I'm sure I'll be corrected if I were to say it wrong. In the last ten years, I think Maryland has had two years of landings, New Jersey's had two years of landings, and Delaware has had one year of landings. Delaware had 400 pounds in one year. Maryland averaged about 1,200 pounds in one year, and New Jersey had that strange situation where one fish equaled 66,000 pounds. That was based on the Southeast Fisheries Science Center data; not the MRFSS data. The landings in the de minimis states are extremely episodic. There are many years that go by when they don't land any fish. But there have been anecdotal reports that there is at least in Maryland, some additional catches going on. From some of our advisors, both from the South Atlantic and from the ASMFC, they indicate that it is just anecdotal information that there are more fish being taken in Maryland.

They're not showing up in the MRFSS data, and they're not showing up in the Southeast Fisheries Science Center data. Right now I think it's important, and this is from a holistic standpoint, to recognize that we've got two pretty substantive issues going on with cobia right now outside of this FMP; one being the decision by the Council at their June meeting to move forward with options to transfer authority to the Commission, or in some way, shape or form, plus the upcoming stock assessment.

There are two big issues that are going to be arising for us in about the next two years. It is really likely that this plan is really more short term; as these issues at the council level and at the SEDAR process work their way through the process. I want to make sure as we're thinking about these things we're not, at least from my perspective, we're not looking at a long term

fishery management plan that's going to be in place for 10 years and everybody's stuck.
One of the very important components of this from the Plan Development Team, and from talking to some of the Board members, was making sure that these allocations were not etched in stone. What's going to happen over the next couple of years with de minimis is anybody's guess.

If these fish start moving north, and we start having to adjust de minimis, then that little bit of quota that is currently being allocated to the primary states is going to be reduced somewhat to account for those. That is a long winded way to say that the de minimis thing is a very difficult thing to try to develop under the current plan.

The way it's set up right now is that all four states, Maryland, Delaware, New Jersey and New York would be considered a de minimis state; for lack of a better term. It would not be 6,200 pounds per state; it would basically be 6,200 pounds for the region, if you looked at 1 percent of the coastwide landings. That's the way we're looking at it right now.

CHAIRMAN ESTES: Okay, I think I have Roy, Robert, and Lynn.

MR. MILLER: I mentioned that I wanted to address one more topic, and this is it. Specifically with regard to de minimis, for those states like Maryland northward, wouldn't this de minimis classification as it presently reads serve as sort of a disincentive for declaring de minimis?

If we didn't declare de minimis, I presume that we could fish recreationally at one fish, 36 inches with a boat and a vessel limit of six, whereas if we're de minimis it would be one fish per vessel. Why would we want to declare de minimis under just those circumstances? Do you see where I'm going?

DR. DANIEL: If you are a non de minimis state then you would be subjected to a target. The state of Delaware's target would be 40 pounds, so then you would be expected to develop a season and a lesser limit to maintain your catch at 40 pounds, if you're not a de minimis state. The benefits of being de minimis, at least from my perspective is that the de minimis states are allowed one fish per vessel year round. They don't have to worry about a seasonal; which is going to be an issue for those states that have to reduce their harvest down to the current ACL. The difficult problem we have is that the current Framework 4, the current management in the states north of Virginia, basically complements the federal actions in state waters. It looks like; yes it looks like you've got six fish.

But it's going to depend on how NMFS implements the Framework 4 option. One of the possibilities is that the federal restrictions would mirror the specific state restrictions in state waters. I don't anticipate an opportunity where the states would be able to operate on a six fish limit, and have us be able to maintain the current ACL.

CHAIRMAN ESTES: Robert.

MR. BOYLES: Not necessarily on de minimis, but just following up on Dr. Daniel's comments about the efficacy, and how long this plan may last. I noted, I believe it was last week, Senate, Commerce, Justice, State Appropriations Committee report that specifically mentioned and requested NOAA spend a lot of time quickly updating the cobia stock assessment.

CHAIRMAN ESTES: Dr. Crabtree, or Dr. Carmichael, can you give us any ideas about how that might be going?

MR. CARMICHAEL: The stock assessment, yes. Well, it is planned and the intention is to evaluate stock ID, beginning the early part of next year; and then to be in position to begin the assessment proper with the data workshop in the latter half of next year.

CHAIRMAN ESTES: Lynn.

MS. FEGLEY: I have comments and concerns about a list. I'm not sure how you want to handle that. But I guess I'll start with the criteria for de minimis. Assuming that we have a 620,000 pound coastwide ACL, and that's assuming that we're taking 50,000 pounds out for the commercial. If we go to 620,000 pounds, and the de minimis states are working on, so 1 percent of that would be 6,200 pounds.

If any one of our states on a two-year average harvests 15,000 pounds in one year, we could go over that 1 percent very quickly. Then we wouldn't be de minimis anymore, and then we would be taking quota out from under the non de minimis states. I wonder if the de minimis criteria, because of the high variability in these data.

I wonder if the de minimis criteria should be somewhat consistent with the soft cap idea for the non de minimis states. In other words, if you go over 1 percent in one year, the following year you are under observation; and the Board will decide after that second year. I worry about the variability. I worry about these really large spikes that arrive. I guess I would be suggesting adding an option on the criteria that somehow deals with that. I'm not sure I have the wording off the top of my head, so that's my first issue. I have two more; however you want to handle it.

CHAIRMAN ESTES: Let's do that one first. Toni has a comment.

MS. TONI KERNS: Lynn, what if we averaged for a longer period of time. Do you think that that would help us out? Especially if these landings are somewhat sporadic, and can jump, do you think that that would cover it?

MS. FEGLEY: It might. Not having thought really hard about the math. I guess what I would suggest is if maybe, could the Plan Development Team think about a strategy that would buffer a little bit from this variability, and add such an option? It might, Toni. I'm not sure. I just don't want to compromise the non de minimis states, and suddenly have to be allocating quota away from them; because of some anomalous or not, some spike in MRIP landings data.

CHAIRAMN ESTES: Go ahead, Toni.

MS. KERNS: The other thing is that the Board does have some ability to look at a state's landings and say to that state, just as you said right now under all the plans. We recognize you went over, but we're still going to give you the de minimis status.

I think we've done that before in the lobster plan for a state. The Board does have some flexibility there to give the states a grace period from year to year, even if they do go over a little bit. But I think you could add an option in here averaging two years, averaging three years, or you could take one out. It's up to the Board.

CHAIRMAN ESTES: Okay before we get to that I have Joe and John on this subject here. Joe.

MR. CIMINO: I guess I have to start with a confession. I'm not sure what de minimis means in the commercial fishery; but I would think that it might be prudent to decouple the two, since we shouldn't assume that there is going to be that same variability. I've looked at these numbers for far too long.

I have no question that Maryland, Delaware, or New Jersey is going to be bouncing around in and out of de minimis status for the recreational fishery. If one intercept could equal 66,000 pounds of fish, we're going to be seeing that a lot. It may provide some benefit to the commercial fishery; if they're able to be on their own, and apply for de minimis status just based on their harvest estimates.

CHAIRMAN ESTES: Dr. Carmichael.

MR. CARMICHAEL: Yes, I was looking at the New Jersey; you know they had 69,000 pounds in 2012. It seems you stretch that out to ten years they're still going to be over that 1 percent. Then you would put them into that fold with the other four states for ten years, based on a one-year event.

It shows Jersey having landings in 2006 and 2012. I think that gets at one of the issues that the Council dealt with a lot when setting accountability measures for spiky recreational data. There is a big difference between spiky data like this, and just having generally uncertain data; which varies around some central tendency.

This is just sort of all or nothing. The trouble with averages of all or nothing, is when you get that all, instead of having an issue for one year, well suddenly you have an issue potentially for however many years you've decided to average. If you took that one thing of Jersey, you know they would be in for two years or three years or five years or ten years. It really wouldn't matter, because the magnitude of their landings was so great. It's overwhelming that period, and like Joe said, it comes down to what the inflation is for the intercept that had a fish and the amount of effort in that cell, and how it works out in MRIP.

I think the idea of not having this hard limit, and having some way of seeing if you have a persistent problem versus a one-year data situation. MRIP is a survey, it's not going to be the same as a census or something type situation. It's a survey. The PSEs are high on a state level; and we're looking at a state level when we look at these, you know, 60, 70 percent is not unheard of on the PSEs on a state level.

I think anything that's tied to the MRIP data in an absolute percentage is going to be trouble, and if we can have it written up so there is no question that you would be monitoring it for persistence to see if there really is a situation developing with fish shifting or effort shifting or something going on that is compelling people to catch more fish than they have, and what they've been expected to catch. It would probably serve us a lot better, and we wouldn't have to be justifying why we're not considering this state being over a problem.

CHAIRMAN ESTES: What if we instead of doing the averaging, what if we said – this is just a suggestion – what if we said that if they went over the 1 percent for two or three consecutive years, then we would consider them non de minimis. Would that take care of the concern if we had those two options in there?

MR. CARMICHAEL: Yes, I think that would help, two or three years, or two consecutive, or two out of three, some things like that would really help.

CHARIMRAN ESTES: Can we do that?

DR. DANIEL: Yes sir, we can do anything you want us to do. I think one of the beauties of the Commission too, is being able to do as John indicated. I mean we come in here, and if you look at the allocation for Georgia is around 60,000 pounds and one fish at 3.3 pounds in New Jersey resulted in 66,000 pounds. Obviously that's an issue that the Board can look at and say, wow!

That one fish happened to be caught had a high effort level, and it's really meaningless; and it may not even be a cobia, and move on. I don't think people are going to be shut down because of that. I think with the trends as we move forward, if we start to see more than five or six fish being intercepted then we may have an issue.

But until then, this would be a way to avoid what John indicated in terms of paying back for one year for ten years. We can certainly add that option to the document to accommodate the multiple years; to make sure that folks aren't flipping, flopping back and forth between de minimis and not de minimis, if that is the pleasure of the Board.

CHAIRMAN ESTES: Does anybody have a problem with that; any objection? No, so I was hoping, Roy that these de minimis options would satisfy your interest in the size limit; but I don't know that it does.

MR. MILLER: Well, we haven't discussed the size limit in this most recent conversation, but I think the suggestion is a good one to allow some flexibility in terms of the timeframe; so that the rare event of an intercept detecting a cobia in the catch doesn't become problematic for the state. Because it is a rare event, and it's just a matter of chance as to whether that particular person happens to get interviewed. I don't think a state should be penalized for that rare event.

CHAIRMAN ESTES: Okay with that I think we need to go back to our motion. We're done with the options right now; excuse me, Lynn.

MS. FEGLEY: I'm still working on this list. Really the two subjects that I had on these were the commercial, the delineation between the commercial and the recreational, and also on the size limit. For the commercial de minimis, it seems like the option under commercial, the de minimis option where you would have 36 inches for both commercial and recreational; that assumes that you're going to have some sort of commercial set aside for the de minimis states. It's at odd with the 50,000 pound coastwide commercial ACL, correct?

Because if you go 50,000 pounds coastwide, the option there was 33 inches, two fish per vessel. Two fish per license, no more than six per vessel. But in the de minimis, if I'm a de minimis state, I either get 36 inches or 33 inches, one fish. What's my set aside? I would suggest that the public understands that they have a choice there. You choose to go with the coastwide 50,000 pound ACL; you decouple the two, like Joe Cimino was saying, or your working on some sort of de minimis set aside.

DR. DANIEL: Just bear with me for just a second. I think that setting aside commercial quota to de minimis states creates a problem. If you decouple, as Mr. Cimino indicated that would separate out. You would be dealing with the recreational fishery; which seems to be the more concerning.

One option would be to manage the de minimis commercial fishery the same way you manage the coastwide commercial fishery. I mean there is no difference between a commercial fisherman in Georgia, and a commercial fisherman in New Jersey; in terms of the Framework 4. What Framework 4 does is it sets up the commercial allocation, and a Georgia to New York commercial limit.

Now whether or not that's going to create the you-know-what storm. If the commercial folks are allowed two fish per license holder up to six per vessel at 33 inches, which is the current Framework 4 option, and the current non de minimis option, and the recreational are limited to one fish at 36.

I don't know how that's going to play out. I can imagine how it's going to play out, but that is one option. At the present the intent and purpose behind de minimis here is to allow that rare event to be retained in the de minimis states. Whether or not you have any evidence from landings data that anybody catches more than one fish, I don't know. I haven't seen it. That was the intent and purpose.

CHAIRMAN ESTES: Okay, Lynn.

MS. FEGLEY: I'll just go to my last one, since I'm muddying the waters right and left. The final one, the concern with de minimis is the size limit options. Just to make the point that in the Maryland portion of the Chesapeake Bay, we're not going to see a lot of 36 inch fish. We do have some charterboats that are encountering these fish.

We talk a lot in Maryland about our charterboats loosing ability to diversify their fisheries. I have concerns about seeing our recreational fisheries locked out with a 36 inch size limit. I wanted to propose that two things, potentially two options. One is that in exchange for the ability to collect some information on smaller cobia that the de minimis states could do a 28 inch fork length, one fish per vessel. That would be one option.

The other would be to provide an option for de minimis states to match, in terms of their recreational regulations, a non de minimis state. What I mean by that is for example, if the state of Virginia hypothetically had a two-fish vessel limit at 36 inches, and a three-month season. The state of Maryland could implement like regulations as a de minimis state.

DR. DANIEL: Let me recap, and make sure I understand what you're saying. A second option would be a 28 inch size limit for recreational de minimis; one fish, 28 inches fork length, to try to account for the smaller fish that tend to be encountered north of Virginia.

The other would be that a de minimis state could select from the four existing state's implementation plans that would include one fish, 36 inches; but have a vessel limit and a season, and that those de minimis states could mirror a selected states management plan and implement that as their own. Does that capture what you?

MS. FEGLEY: You recapped that brilliantly, yes thank you.

DR. DANIEL: Those are not in the current draft FMP. One or both of those options would need to be offered by the Board.

CHAIRMAN ESTES: Michelle.

DR. DUVAL: Lynn, I just want to make sure I understand your second option. It's not like you would be able to pick from any one of the other four state's implementation plans. I thought I heard you say that the other option would be for you to complement the regulations of an adjacent jurisdiction. That's what I thought I heard you say.

In other words, Virginia is adjacent to Maryland, so you could look at it complementing in implementing the same regulations as Virginia. In other words, I wouldn't expect you to implement the same regulations as North Carolina, because things are a little bit different. I just want to make sure I understand.

MS. FEGLEY: Well, the intent was to ensure that we have the flexibility to match Virginia; so that's correct. It really is to make sure that we don't find ourselves at odds with a border state; because we're so close and we have boats running back and forth. Obviously maximum flexibility would be Louis's recap. But functionally I don't see us just playing multiple-choice from states implementation plans.

CHAIRMAN ESTES: David.

MR. BUSH: Just a quick question. What are the current landings that we've been quoted for these de minimis states? What are their regulations based on it, and is that based on the charts of what the regulations were previously, or are there no regulations at all; so whether they had 40 pounds or 200 pounds it's just whatever they caught.

MS. FEGLEY: We have no regulations in Maryland. We actually don't have authority to write them until this plan goes through.

DR. RHODES: Well, just one question from like a law enforcement perspective. I guess this would Virginia. If your fishermen had a 30 inch fish in possession, said yes but we were fishing in Maryland, you know Maryland borders and we caught it there. Would that present a problem to law enforcement, or if the fish is in Virginia waters no matter where it was caught?

MR. CIMINO: Yes the latter. The possession limit, or excuse me, it's written as possession, so if you're in possession of that fish then that is what you have to comply with.

CHAIRMAN ESTES: Lynn suggested two additional options for de minimis states. Is there anybody that has some concerns about that? Okay seeing none; we'll add those options to the document. Hang on, Toni has a correction here.

MS. KERNS: Just to clarify, because I'm not clear what the two options are now. Lynn, are you saying one of them is to allow for the states to adopt the regulations of a neighboring state? Then what's the second option?

MS. FEGLEY: The second option was to lower the minimum size for the de minimis states; so it would be one fish per vessel per day. But rather than 36 inches fork length, it would be 28 inches fork length. The reason for that is because the intent there is to make that size limit somewhat equivalent with a 50 percent maturity.

I don't know that I have that right, but that was the idea there. The further idea is to get some information from our fishermen about these fish; since as I understand the movements of these smaller fish, there is very little information about these littler fish out there. That might be helpful.

DR. DANIEL: I'm not trying to get into the discussion here. But I will point out that one of the issues that came up in this discussion was these fish are moving towards the northern extreme. If they're up there in late September, October, do they ever get back south? I mean is there an opportunity for those fish to join the spawning stock and actually contribute to the fishery?

That's a point that I bring up, just for your consideration to think about. I can't tell you one way or the other. But if you've got fish in New Jersey in October, the chances of them getting back to the South Atlantic and joining the spawning stock is probably pretty remote. Is it a population, is it something that is outside the range that normally wouldn't survive or not? I don't know.

CHAIRMAN ESTES: Speaking of New Jersey, Tom, I think that you had your hand up a long time ago.

MR. FOTE: I just was wondering if we were going to withdraw Roy's motion and my second, or just still wait to handle that later.

MR. ESTES: Nope, I think we are about time to go back to that motion; if we can bring it up on the screen. Okay the motion is; move to add an option for a 36 inch fork length or total length equivalent minimum size limit for the commercial fishery; motion by Mr. Miller, seconded by Mr. Fote. Is there need for further discussion on this motion? David.

MR. BUSH: Just one brief comment. Based on what I've heard here this morning, correct me if I'm wrong, there is no biological necessity for this motion. Is that correct?

CHAIRMAN ESTES: I think it was a philosophical issue, I think if I'm not mistaken, Roy. Is that correct?

MR. MILLER: That's correct.

CHAIRMAN ESTES: Joe.

MR. CIMINO: Just quickly, because Tom did mention he was concerned about a loophole. I do want to say that most of the commercial fishery, I believe, and Michelle could correct me if I'm wrong, is occurring in state waters. For our fishery, there is no loophole there. You would be a commercial fisherman if you are commercial fishing those. I did just want to point that out.

CHAIRMAN ESTES: Okay, any further discussion? **Seeing none; all in favor raise your right hand, please, all opposed like sign, abstentions, null votes. The motion fails; 3 to 6 to 1.** Okay Louis, if you'll continue please.

DR. DANIEL: All right that takes us through the management options for the draft fishery management plan for cobia. What I was going to do real quickly, since we have Dr. Crabtree and Mr. Carmichael here, just review real quickly the Framework 4 recreational actions that are in Headquarters now; that would be implemented once approved. It's a 620,000 pound ACL, one fish per person, 36 inch fork length size limit, and a vessel limit up to six per vessel.

Commercial is 50,000 pound ACL, two fish per person, 33 inch fork length size limit, with a limit up to six per vessel. Then just because this is an issue that has come up on multiple occasions, once approved measures would be implemented to control harvest to the ACL. The methods or the accountability measures to address overharvest, would be reduce vessel limits, shorten the season, or close the fishery or EEZ.

From discussions it appears that the first line of defense in trying to maintain the catches within the ACL is to reduce the vessel limits for the current up to six fish. But that will be determined; and I think once our implementation plans are reviewed by the Technical Committee and approved by the Board in February. I think that gives the NMFS administrator ample time to determine how best to implement the measures from Framework 4 for the 2018 season. Are there any questions on the Framework 4 implementation; while we have the deciders here at the table? All right, finally we have a proposed public hearing and compliance schedule. Just to go through, our intent and hope is we've got a short window of opportunity between now and the annual meeting is mid-October. We would like to try to get these public hearings conducted as quickly as possible. We would like to get those done in the first half of September.

It may be possible, I know from talking to North Carolina, would like to have the meeting held outside of the Council meeting week. Virginia would be a possibility as well, prior to the meeting week, which is September 11 through 15. Then there is a possibility of having a hearing with the Council at their meeting in Charleston on Tuesday night in Charleston; if that's satisfactory to the South Carolina delegation and the Council.

Then potentially having the Georgia meeting the following day down either in Savannah or Brunswick, or wherever Georgia would like to have it. That would knock it out pretty quickly. I think that does stretch us towards the end of that line, so if folks would like to have them earlier than that that is fine.

But we will need to set up hearing dates very quickly in the next day or two, in order to get these scheduled and set up to receive public comment. In October at the annual meeting you will review the public comment; from both the public comments, the public e-mails, and the advisors will review and deliberate on the draft, as well as the Enforcement Committee, and consider final approval of the plan.

I put down January 1, 2018. I figured that gives states about two months to submit an implementation plan to the Technical Committee/Plan Development Team for review; and Board approval at the February meeting, with an April 1, 2018 implementation date. In discussions with your PDT members, those of you that have them, they felt like July 1 of each year would be appropriate for state compliance reports to be due. That concludes my report.

CHAIRMAN ESTES: Thank you, Louis. I appreciate all the hard work that you and your team did. Toni wanted to request a clarification.

MS. KERNS: I just checked with Lynn, and I just want to clarify for the record that we'll look to see what size limit the 50 percent maturity is; and we will use that size limit to add for the option, just so everyone is clear; if it's a different size limit that is why.

MR. MILLER: Louis, could I request that you review what we decided with regard to de minimis states and commercial?

DR. DANIEL: For the de minimis Option 2, it would be one fish per vessel commercial, and it would be either a 33 inch size limit or a 36 inch size limit. Those would be the options for public comment.

MR. MILLER: That's interesting that going to public hearing we have either 33 or 36 for commercial; but we don't, okay. In spite of our vote to the contrary to reject the option for a 36 inch commercial. You're saying its back in there for de minimis states.

DR. DANIEL: That was an option that was requested by the Working Group and the PDT was to include a potential for a 36 across the board in the de minimis, and that's what was in the FMP. Now it can be taken out. But that is what we were requested to include. We did not include what we talked about earlier, having all the states comply with the Federal Framework 4 commercial options. That was not brought forward by the Board and included as an option. At the present time that is not an option that would be going out to public comment. It seemed like that was something that the Board should have at least had nodding interest in. But nobody moved on that so that would not be included at this time.

MS. FEGLEY: I think that might have been what I was trying to say, which I did a really bad job of saying. That it should be an option for all the states. When we say coastwide 50,000 pound ACL for commercial. That is everybody coastwide.

DR. DUVAL: Yes, I agree with that and I think that that is less complicated from a commercial perspective than trying to have a commercial de minimis. I think Louis was trying to clarify that as well. Again, I'll just emphasize that all the states from Georgia through New York, or in federal waters off the states of Georgia through New York.

You know that 33 inch minimum size limit, two fish per person, existing commercial regulations applies to all those states. Obviously it applies in federal waters, it's not state waters. But any harvest coming in from federal waters, and any harvest from state waters all counts against that federal ACL. I just want to make sure people understand that; again on the commercial side.

DR. DANIEL: What I'm hearing I guess, or seeing, is a general consensus to include that option as an option for all the states. That would be a no de minimis commercial option; to make it as clear as I possibly can. If everybody is comfortable with that we can add that to the list of options in de minimis. Mr. Chairman, I don't see anybody looking like they want to oppose that.

CHAIRMAN ESTES: Right, I think that's what they were trying to get at. We will add that as an option. Is there any more discussion on the document? Michelle.

DR. DUVAL: Let me stand between you and lunch. Just maybe to make sure that Lynn's concern is completely addressed, maybe just a little bit more clarification under the commercial fisheries management options that coastwide means it would apply to everybody; Georgia through New York. That way I think that would assuage some of people's concerns.

CHAIRMAN ESTES: Okay, done**. Is there any more discussion? If there is not, I would entertain a motion to accept the document for public comment. Michelle.**

DR. DUVAL: So moved, Mr. Chairman.

CHAIRMAN ESTES: Do I have a second? Lynn Fegley. I hate to ask this. Is there any more discussion? Seeing none; let me read the motion. **Move to approve the Cobia Fishery Management Plan for public comment as amended; motion by Dr. Duval, second by Ms. Fegley. Is there any objection to the motion? Seeing none; the motion passes.**

I never thought I would see evolution occurring. Although I'm old enough I should have seen it.

But I think I saw cobia evolving towards menhaden status. What we're going to do now is we're going to break for lunch, and we'll come back and have some more fun.

(Whereupon a recess was taken.)

CHAIRMAN ESTES: Okay, we are ready to resume. At the end of our agenda today we had the Atlantic Croaker FMP Review. I think what we're going to do with it is we're going to do it via e-mail, and so we're going to delete that item off our agenda for now.

2017 SPOT BENCHMARK STOCK ASSESSMENT

CHAIRMAN ESTES: Right now we're going to hear about the Spot Stock Assessment.

Then we'll hear about the Peer Review. Then we're going to go directly into Traffic-Light Analysis. We'll have questions in the middle of that; but before we talk about accepting the stock assessment for management purposes, we'll do the traffic-light review. If we can start, Chris, if you're ready go ahead.

MR. CHRIS McDONOUGH: Just a quick note starting out. Some of the stuff in the datasets and the methods we used for the spot stock assessment is very similar, it is the same stuff we did for the croaker stock assessment. This is going to be a little more abbreviated than what we went over for the croaker assessment.

For the outline, just what we're going to cover. The assessment was using commercial and recreational data. We're looking at the shrimp trawl fishery discards another fishery dependent source and three fishery independent surveys. The NMFS fall ground fish survey, SEAMAP, and the North Carolina DMF Program 195. Then we're going to cover the modeling approaches and results, and then finally the reference points and the stock status.

Then one note, we'll talk a little bit more about this as we get into it. But the fishery independent datasets were split between, we used split indices and they were split by age group between Age 0 or pre-recruits, and Age 1 plus, which were the fully recruited fish; primarily in the catch survey analysis model.

Okay, start out with the commercial landings. Commercial landings from 1950 to present have fluctuated from about 638 to 6,500 metric tons; the majority of spot that are landed coming from Virginia and North Carolina. The long term trend has been a fairly steady decline; and there has been a lot more inter-annual variability in the last ten years or so. Landings have been negligible from states north of New Jersey; however landings in these states have been increasing in recent years.

The lowest year for commercial landings for the entire dataset occurred in 2012; which was within the assessment time period. The shrimp trawl discards, discards were relatively high prior to 1996, when bycatch reduction devices were not required; but did begin decreasing in the early 1990s. There were particularly high discards in '91, which was due to high effort and catch-per-unit effort. Then discards became relatively stable through the 2000s.

Despite slightly declining or stable trends in effort during the 2010s, they actually have kind of turned up a little bit in recent years; and that increase was due to increasing catch-per-unit effort. Generally the trends in the discard estimates follow the same trends that you see in the shrimp landings by the trawlers; which are pretty much what you would expect.

For the recreational catch along the Atlantic coast, this is from during the MRIP time period '91 through 2014. Angler recreational harvest, spot has ranged from a low of about just under 4.5 million fish to a high of just under 25 million fish, and the harvest has generally declined over the time series; although not as much as the commercial catch has. The proportion between the harvest and the fish that were released alive has stayed relatively consistent over that entire time period. For our fishery independent datasets, starting off with the North Carolina data and this is where we split them between the Age 0 and the Age 1 abundance indices. Both Age 0 and Age 1 abundance indices for spot varied throughout the time series.

They were both somewhat lower in the 1990s, with larger peaks through the mid-2000s. The highest Age 0 abundance occurred in 2008, and the highest Age 1 plus abundance occurred in 2006. For the NMFS Trawl Survey, abundance was high in the beginning of the time series; particularly in 1989 as you can see in the figure, and then dropped and remained relatively low in comparison throughout the 1990s and the early 2000s for both stages.

Abundance for Age 0 and Age 1 plus increased in the mid-2000s to the high point in the time series that occurred in 2012; after which it declined fairly quickly in 2013 and ’14. This was in numbers. For relative biomass, it was at its highest in 1989, which was followed by a low relative biomass; same similar trend as with numbers through the early ’90s.

Then a little bit more variability through the 2000s, again reaching the 20 year high point in 2012, followed by that decline in 2013 and ’14. One thing to point out with the NMFS Trawl data was that the CVs for the index of abundance were relatively small. They ranged from like 0.03 to 0.31, and averaged right about 0.09.

The low CV values actually give this index a lot of weight in the model; compared to some of the other indices that were used. That was something that we actually examined in the sensitivity analysis. For SEAMAP, the index of relative biomass indicated that abundance was low in ’89, and then began to increase a little bit in the early ’90s.

From the mid ’90s to the early 2000s, it remained relatively low. Then there was a large increase in 2005, followed by a decade of ups and downs in abundance; so you saw a great deal more of variability in the SEAMAP index. For our modeling approaches, we looked at the spot with two different models. The first was a surplus production model; the aggregated indices that tracked the exploitable relative biomass, and then the time series of fishery removals in biomass.

Then the other model we used was a modified catch survey analysis. Now the catch survey analysis is a forward projecting two-stage population model, this is where we were using the Age 0s and Age 1 plus. You can use data or literature information that informs on the life history characteristics of the species; which is helpful for spot, because they are relatively short lived.

The indices tracking the relative abundance of the stock can then be split into stages with similar life history, or fishery characteristics. In this case we were using it in terms of selectivity of pre-recruits and recruits of the fishery. Then the modified CSA used the time series of fishery removals in numbers.

Then one thing about spot, particularly compared to croaker was that we really lacked a reliable time series of catch-at-age data with spot compared to croaker. We just didn’t have as much age data, so it wasn’t as easy to run through the different models and how we were looking at it. The time series for both of the models ran from 1989 through 2014. The modified catch-survey analysis was chosen as the preferred model. Now, to start off, our surplus production model basically showed that biomass has been increasing steadily since late the late ‘90s; ’99 was the lowest point in the time series. Then fishing mortality was at its highest in ’91, and then kind of was variable through the ’90s, but then it has essentially been declining since about the mid ‘90s to where it has been in a steady state for about the last ten years or so.

For the modified-catch-survey analysis, both recruitment and post-recruit abundance were relatively high at the beginning of the time series in 1989. Recruitment remained high through ’91, and then post-recruit abundance begins to steadily decline. Total abundance is highly variable throughout the mid-1990s, and recruitment did fluctuate quite a bit.

Recruitment and total abundance hit the time series low in 1997. Then recruitment in post-recruit abundance then kind of fluctuates around it, but overall has an increasing trend through 2013; although there was a time period from 2006 to 2009 where there were some poor recruitment years in there.

The 2014 recruitment was relatively poor, which resulted in the decline of total abundance; despite the post-recruit abundance was increasing at that time. Then post-recruit abundance at the end of the time series has actually increased; close to the levels at the beginning of the time series, while recruitment in recent years excluding that terminal year has increased to about half the magnitude of the peak recruitments at the beginning of the time period.

For spawning stock biomass, it followed a similar trajectory as total abundance, generally increasing since 1996, with the exception of 2001 where you have that dip. There was a slight downturn of spawning stock biomass at the terminal year in 2014; however, that estimate was still the second highest in the time series.

Even if it had dropped off a little bit, it was still higher than where it started out. Post recruit abundance is a larger component of the total abundance in recent years; and that resulted in higher spawning stock biomass than during the periods with high abundances early in the time series. Fishing mortality, initial fishing mortality in the data series started out at 1.06.

It fluctuated over the next couple of years, increasing. Full fishing mortality then generally fluctuates around a declining trend throughout the time series from the mid ’90s or so, and there were some exceptionally large peaks in the fishing mortality due to upticks and removals; in ’91, 1995, and 2001, which you can see right on the figure.

Then the static-spawning-potential ratio, if I get my terms correct, is an inverse function of fishing mortality. SSPR has fluctuated about an increasing trend, opposite of what we see with fishing mortality throughout the time series. Very low SSPR occur in the beginning of the time series. This was the timeframe when shrimp trawl discards were at their highest, and also when those peaks in fishing mortality occurred for the most part.

SSPR has fluctuated around a mean over the last five years of about 0.48, which was about seven times greater than the mean SPR during years when the bycatch reduction devices were not required; at which point it averaged about 0.07 from 1989 through 1995. Comparing the two models, the general trends in the population estimates from the surplus-production model and the modified catch-survey analysis overall were similar, and verified kind of the general dynamics of the stock over the model time series. The surplus production model tended to underestimate F and overestimate biomass; compared to the modified CSA model. The fishing mortality estimates, in terms of the different units, biomass for the surplus production model, and numbers for the modified CSA still had very similar exploitation patterns.

The modified CSA model appears to better capture the inter-annual variability in abundance and fishing mortality that was observed from the stock; and indicated by the input data. Those different patterns may be due; at least in the surplus-production model was a bit more rigid and restrictive, possibly as a function of the constant intrinsic-growth-rate parameter.

The terminal year of the spawning-stock-biomass estimate from the modified-catch-survey analysis, is more reflective of the decline in relative abundance observed in some of the indices. Given those points, the Stock

Assessment Committee recommended that the modified CSA that is why we picked that as the preferred modeling approach; to inform on stock status.

Now we did compare this to the traffic light, which the traffic-light analysis, which we're going to talk about more after this, was compared to the assessment results to determine the utility and reliability of using the traffic light to inform on stock status. The traffic light is currently used to inform on stock status annually.

We use it in our management-trigger exercises, and then the modified-catch-survey analysis is proposed to inform stock status moving forward on an intermittent basis; according to future stock assessment needs as they occur, and however that schedule happens. However, the traffic light still has the potential to inform on stock status in the future, between stock assessments, so it's important to understand how the two approaches compare and contrast.

The pattern in the estimates for the spawning stock biomass from the modified-catch-survey analysis were generally in agreement with the abundance metric, which was the fishery independent surveys for the traffic light. There is no recruitment reference point estimated for the modified CSA; but qualitatively the annual recruitment estimates did match up in many of the years with the young-of-the-year metric used in the traffic light, but not in all years.

That one was a little fuzzier. That wouldn't be unexpected in that some of the differences, particularly for juvenile indexes, shouldn't be surprising because between the two approach, because you get a lot more inter-annual variability in juvenile indices due to recruitment variances as opposed to changes in population.

Now the harvest biomass did not match up quite as well. The harvest metrics from the traffic light were not in as close an agreement, in this case the matching up with SSPR, and then the established harvest metric from the traffic light does not include the discard information that was used within the modified CSA model, so it doesn't account for those removals.

The discrepancy there may not be surprising; just because of the high proportion of fishery removals that the shrimp trawl fishery accounts for that was used in the modified CSA. One consideration in improving the traffic light in the future would be to incorporate the fishery removals as an added metric. The way these are treated, if you look at the treat the spawning stock biomass that is above the target, or not overfished level the same as the traffic-light proportion have red less than 30 percent, where everything is good and we're not concerned. Then the spawning stock biomass between the target thresholds, I'm not overfished but the spawning stock biomass is still below the target as that 30 to 60 percent range of moderate concern. Then any spawning stock biomass below threshold, or actually overfished the same as that traffic-light proportion of greater than 60 percent.

If you look at it within that context, those two approaches agreed about 65 percent of the time between the model results and the traffic light. Even though there were some differences, the status from the two approaches, you know they weren't opposite trends. There were some similarities.

The traffic-light analysis was a little more conservative in the final two years; suggesting moderate concern particularly with the harvest, whereas the modified CSA was a little bit more optimistic, less concern. For our F reference points, the static-spawning-potential ratios were used due to the uncertainty in the stock recruitment relationship.

We were using a 30 percent SPR threshold, and a 40 percent SSBR target. The fishing reference points were based on fishing mortality necessary to achieve that SSPR. The biomass reference points would also be estimated from that F percentage reference points, so that our mortality threshold at F 30 percent was 0.5, and then our target threshold was a fishing mortality of 0.36.

Then finally we got down to stock status. The stock status or the model showed that the stock was not overfished at the beginning of 2014, with a spawning-stock biomass of just over 19,000 metric tons, which is well above the target of 7,800 metric tons and overfishing did not occur in 2014. The 2014 fishing mortality was 0.249, which is below the target of 0.36 and the SSPR was estimated at 0.507. With that I will take some questions. I went through that awful quick.

PEER REVIEW PANEL REPORT

CHAIRMAN ESTES: Thank you. Before we go to questions, could we hear Pat talk about the Peer Review Panel report first, and then we can have questions about all of that if that is okay.

MR. McDONOUGH: Oh okay that's good.

MR. PATRICK A. CAMPFIELD: The stock assessment review for spot occurred back in April. We had a panel of three reviewers with expertise in spot biology and population dynamics; as well as statistics and general stock assessment modeling. If we could jump a slide or two, those are the panel members.

The panelists were tasked with providing scientific review based on the data inputs, model results, and sensitivity; and providing their opinion on the overall assessment quality. The panel concluded that the stock assessment provides the best available science on spot. They think the Assessment Team did a really great job of turning over every stone and looking for spot data, and attempting a variety of different analyses, and as Chris described, a couple of different modeling approaches.

However, they thought that the stock status determinations were uncertain; due essentially to conflicts in that the biomass was increasing in all the model runs. But the various assessment data components showed conflicting population trends; specifically the contrast between decreasing landings and increasing indices. In some cases the model struggled to reconcile the differences between indices; for example, the NMFS Trawl showed a very rapid increase in spot in recent years, roughly six-fold, whereas the other primary index, the North Carolina Trawl showed only about a 10 percent increase. There were other surveys like ChesMMAP, which were included in sensitivity runs, which actually showed a declining trend; so the panel had concerns about these conflicts.

Therefore they do not recommend using the absolute estimates of population size; however the trends in landings and surveys suggest that current removals of spot are sustainable. I'll just quickly touch on the highlights for the review terms of reference. The first one was evaluate how the data were used in the assessment. Again the panel found that all potential data sources were considered.

A subset of data was selected correctly and weighted correctly, and the uncertainties were characterized in the appropriate manner. They did have two recommendations, one to develop fishery dependent CPUE indices that might improve our understanding of the fishery trends. Of course we had the landings, harvest information and some recreational effort information, but not commercial effort information. The second recommendation was to consider standardizing all the survey indices.

The next TOR was specific to estimating bycatch and discards. The Panel really applauded the Assessment Team and improving the methods this time around for spot as a new assessment, and for croaker; and that they used the latest and most innovative approach characterizing shrimp trawl fishery bycatch, through a combination of shrimp fishery observer data, as well as the SEAMAP Coastal Trawl Survey data, and sort of calibrating that backwards, based on when the bycatch reduction devices were implemented in the mid '90s.

The third term of reference was to evaluate the methods and models in the assessment. The Panel commended the Assessment Team in attempting multiple models, as Chris described the CSA and surplus-production models; and agreed that the catch-survey analysis is preferred, because it incorporates more of the available data.

However, the Panel was concerned about different trends in total mortality, when comparing between the catch-survey analysis and catch-curve analyses that the Assessment Team brought forward. As I mentioned, the model also struggled to reconcile differences between trends in indices, and recommended considering an age-length-combined-structured model; for example scale models to allow fuller use of all available data.

They also had an important recommendation about exploring time-varying catchability, specifically for the indices that are used in the assessment; that that may help hash out some of the distinctions and disagreement between the survey indices. Term of reference 4 was to evaluate how the assessment characterized the sensitivity or did sensitivity runs and characterized retrospective bias in the assessment.

The Panel found that that was all done correctly, and there was relatively minimal retrospective pattern. They concluded the model was sensitive to index selection, and that some of the sensitivity runs using year-by-year total mortality or Z estimates, resulted in a different stock status than using an average total mortality. This was one of their major concerns about drawing absolute conclusions about stock status and numbers from the assessment. The next term of reference was to characterize uncertainty in the stock assessment. The Panel felt that the Assessment Team did everything correctly there. Moving on to estimates of stock biomass, abundance and exploitation, again although the Panel does not recommend using the absolute estimates, they did have several take homes that they were confident in from the stock assessment; first that the abundance indices generally are stable or increasing across the stocks range.

Secondly, that catch appears to be stable or declining over time and that in combination, the catch and indices patterns indicate declining fishing mortality rates relative to the status of the stock in recent years. The relative status of the stock in recent years is better than the late ’80s and early ’90s.

The shrimp fishery effort and spot bycatch magnitude appears to be declining, and the Panel recommended reviewing the shrimp bycatch estimates annually, and folding that into the traffic-light analysis that Chris presented and we’ll hear a little bit more on. That final take home seems to be most important, because the shrimp bycatch can comprise 70, 80, and 90 percent of the total mortality for spot.

The next term was to evaluate the choice of reference points, and the methods used to estimate them. The Panel did agree with the SPR target of 40 percent and a threshold of 30 percent. Those are similar levels for other sciaenids and species are related to spot, so they were comfortable with that. However, again the stock status cannot be determined reliably, because models with alternative assumptions resulted in different stock status.

Finally, the Panel commented on the research recommendations. The first was to request an increase shrimp trawl fishery observer coverage, again that’s critical to spot and croaker assessments, and is relatively poorly sampled. We did the best we could in this assessment, and also to increase the collection of lengths and ages in those bycatch fish. The second, to expand the collection of lengths and ages, especially for fishery dependent data, and third to organize an otolith exchange to develop a standard aging protocol for spot.

The last term was to have the Panel comment on timing of future assessments. They agreed with the Assessment Team to do the next benchmark in five years, but given some conflicting trends with spot, especially in years after the assessment, to continue the traffic-light analysis and to try to fold in the shrimp bycatch estimates in to the TLA.

CHAIRMAN ESTES: Okay are there questions, or what are the questions? Yes sir, Mr. Bush.

MR. BUSH: I guess I just felt like somebody should ask something after this. It seems like things are at least not going bad in this fishery. I think North Carolina is one place that very proud of the work that these guys have done down there. They haven't implemented measures based on their current research.

But the work that they've done in North Carolina over the past few years, and this being the third year of their bycatch reduction efforts, should make a continual improvement in this fishery. But if I understand right, correct me if I'm wrong, the general idea is that the spot fishery is showing at least a stable if not positive trend; given that bycatch composes a significant part of its mortality, is that correct?

MR. McDONOUGH: That is correct. The shrimp fishery component of, in terms of removals, whether you're talking biomass or numbers is an order of magnitude above everything else combined. It's very significant, even though the numbers have come off in the last 10; 15 years are much lower than what they were in the early '90s. But they're still there.

This was the first assessment where we really included them in the model. We've looked at the previous two assessments; it was considered, but we didn't really have a good way to incorporate it in the model, so this is the first time we've actually been able to incorporate it into the model. But as I'm going to go over it with the traffic light stuff after this, there are some concerns with recreational and commercial numbers that have been declining fairly steadily. There are definitely still some issues.

CHAIRMAN ESTES: Mr. Miller.

MR. MILLER: Chris, in light of what you just said. The effect of shrimp trawl bycatch has been decreasing in recent years; and yet apparently we're not seeing a concomitant increase in commercial and recreational landings. I was wondering if you have any speculative cause and effect comments in that regard, or is there no relationship between those two?

MR. McDONOUGH: I'm not going to say there is no relationship. But they do seem to be decoupled. I mean you're getting those kinds of different trends, and one thing at least in the shrimp fishery. You know if you go back to that time period in the late '80s, early '90s. The overall effort in the shrimp fishery has been declining for years.

I mean you've seen a reduction in the fleet. The guys maybe have become more efficient, but you see far fewer boats. I would tend towards the reduction in the overall effort that we've seen in the decline in the shrimp fishery over the last 20 odd years, more so then or it seems from the datasets then something biological necessarily.

That is part of why we've been spending so much time on the traffic light stuff, is to try and tease out some of the differences in why we're seeing such differing trends. Croaker, they seem to match up a lot better between different datasets, and spot just don't track as well across commercial data, recreational data in the fishery independent indices. Does that answer your question?

MR. MILLER: Yes, of course I'm calling for speculation, but it sort of begs the question is there an environmental component that is driving this stock that we're not accounting for; you know with landings and that kind of thing? Maybe that environmental component has been depressing the expected increase we would hope to see as a result of bringing the shrimp bycatch under management.

MR. McDONOUGH: Actually that is something that we did discuss at the review workshop. Ken Able brought that up numerous times. Some of the explanations from that perspective could have been, especially given the timeframe when the fishery independent surveys that we were using, a lot of that occurs in the fall shifts that kind of go back to temperature shifts, and when fish are moving in and out of the estuary offshore environments, where they're being necessarily subject to the bigger offshore surveys.

There definitely could be and likely are some environmental components. We did tease around with some of the data, trying to figure out if we could incorporate environmental data; and we didn't really come up with an effective way to look at it. But it has been discussed certainly, and we've talked about it.

CHAIRMAN ESTES: Mr. Bush.

MR. BUSH: Just to address one point there, Mr. Chairman. One of the things that might be looked at as well is reductions in effort in that fishery. We've got areas where we had exemptions that fishermen would fish on the shoreline, and those are no longer exempted. That is due to interactions with marine mammals.

But there are other fisheries where we have other species that they can only fish for a certain amount of time before those interactions pile up. That particular fishery is shut down as well. I'm sure that has got to have quite a bit to do with the landings numbers, probably not all of it, but I'm sure it's substantial.

CHAIRMAN ESTES: Chris.

MR. CHRIS BATSAVAGE: Similar to Roy's question about environmental factors. I guess Joe and I were kind of side barring during the presentation of the similarities of weakfish that we've seen in previous assessments, where there seemed to be maybe a bottleneck somewhere in the life span of weakfish, where we're seeing with this species the indices for the Age 0 and at least some Age 1 plus fish that may or not be at the point that recruit to the commercial and recreational fisheries.

They aren't really showing any troubling trends yet. The landings have really fallen off, especially even in the last couple years since this assessment. Has the Stock Assessment Group discussed maybe exploring maybe changes in natural mortality over the time period, similar to what we've seen with weakfish?

MR. McDONOUGH: No, we really didn't look at that in terms of changing natural mortality over the timeframe of the data. I was going to say Jeff ran the CSA model, and I don't think of anything else that we necessarily covered in the workshops. I just can't think of anything else. It's a good point. We did consider looking at different selectivity periods of the fishery and some other things that were run in the sensitivity analysis. We didn't really cover as much here; but not that now.

CHAIRMAN ESTES: Are there any other questions before we get into the traffic light analysis? Seeing none; Chris if you're ready to go we can do that.

CONSIDER 2017 TRAFFIC LIGHT ANALYSIS FOR ATLANTIC CROAKER AND SPOT

MR. McDONOUGH: Just a quick review for a traffic light. The traffic light management framework was established in 2014 under Addendum II to Amendment 1 for Croaker, and Addendum I to the Omnibus Amendment for Spot, to evaluate fisheries trends and develop state specified management actions.

The traffic light is a statistically robust way to incorporate multiple data sources; whether they be fishery dependent or independent, into a single, easily understood metric for management advice. The name simply comes from assigning different colors, red, yellow and green to categorize relative levels of indicators on the condition of either the fishery or the population or whatever metric you're going to use. Then state specified management action would be initiated when the proportion of red in the index exceeds the specified thresholds, 30 percent or 60 percent for both harvest and abundance over three consecutive years for croaker, and two consecutive years for spot. That would be all the indices, not just one or two of them.

I'm going to start off and talk about croaker first, and then I'll cover spot. The croaker traffic light uses a 1996 to 2008 reference period, which is based on the timeframe from the 2010 stock assessment data. The indices in the traffic light included both commercial and recreational harvest, as well as four fishery independent surveys; the NMFS Fall Groundfish Survey, the VIMS Trawl Survey, North Carolina DMF Program 195 Survey, and then the SEAMAP Survey in the southeast.

For the harvest here, the traffic light, and I'm going to look at them individually and then show you the composite. The traffic light for the commercial landings has been above 30 percent every year since 2011; and this was actually the fourth year in a row where landings were, that red proportion was above 30 percent, and has been above 30 percent since 2011, and would have tripped at those three consecutive years from 2013 through 2016.

The bottom one, the recreational harvest level in 2015 was among one of the lowest annual harvest levels in the entire time series, and 2016 was actually the lowest recreational harvest the entire data series. That is going from 1981. The red proportion in the recreational index was 54 percent in 2015, and just under 6 1 percent in 2016; and would have been the second consecutive year where that index had tripped.

Again, this has to have that level for three consecutive years. Now the composite index for the two combined, the red proportions have been above 30 percent since 2011, with the index tripping from 2013 through 2016. The harvest composite index would indicate, or certainly doesn't necessarily indicate directly by itself that a management response is necessary; but it certainly is cause for concern.

The important trend to point out is a decline in both commercial and recreational landings that have been occurring for Atlantic croaker. All right for the fishery independent surveys, the NMFS Survey, which is the top one, actually saw an increase in 2015. Actually I'm covering both 2015 and '16 with the croaker here, because we didn't run a traffic light assessment last year, because we were in the midst of the stock assessment.

But it showed an increase in 2015, and it declined a little bit in 2016. But there was still no red in the index, so we were staying above the long term mean, which it's been above since 2011. Then the SEAMAP Index also increased in 2015, and then declined a little bit in 2016. The index values remained above the long-term mean for both years, which is why you've got that yellow-green proportion color range, and there was no red in the traffic light for SEAMAP.

SEAMAP you have to go all the way back to the mid to late '90s before you are getting those low levels. The composite index showed high proportions of green in 2015 and 2016, mainly because of the increases in both NMFS as well as SEAMAP Index. However, they did stay above the long-term mean and that target threshold for the last couple of years.
We're seeing an example of what we've been talking about, what is kind of decoupling what we're seeing in the fishery dependent metrics versus what we're seeing in the fishery independent surveys. The juvenile fish, this is the two surveys that we're using for that were the North Carolina Index, as well as the VIMS Index.

North Carolina Index declined in 2015, increased slightly in 2016, but also did not drop below the long-term mean for the data series, which is why we've still got yellow and proportions of green in the index. The traffic light does indicate declining index values, because you're seeing progressive decreasing in a proportion of green in the index, which is heading back towards long-term mean or below it.

However, it's still above, and that's going from its peak value in 2012. The VIMS Index increased significantly in 2015, going from 2014 it went up like 1,600 percent. But 2014 was one of the lowest years in that particular index. Then it declined a little bit again in 2016. But the index value was still above the long-term mean for both 2015 and 16, and hasn't had three consecutive years above 30 percent since 2008.

With these juvenile indices you are going to get a much more high degree of variability going from year to year; compared to the adult surveys typically. Then for the composite index, the juvenile composite traffic light didn't have any red for either 2015 or '16, and so it did not trip. It didn't trip in either year.

Then as I said that high-angle variability in the different color proportions is generally a characteristic more of changes in recruitment levels versus changes in population trends. To sum up the croaker stuff, the harvest composite traffic light did trip in both 2015 and '16; however the abundance traffic light composite showed the opposite trend, with increasing abundance any of those being above that red percentage threshold.

With only the harvest traffic light tripping, and not either of the fishery independent composites, management action is not required under Amendment 2. However, those discrepancies between what is happening in the harvest index, and not seeing similar trends in the abundance indices, does warrant further study; which is what we've been looking into.
Likely explanations for that include differing size and age structure in the sample populations, regional differences, or temporal shifts in movement patterns between inshore and offshore, and that timing that's involved; and indirectly that could be some type of environmental variable. The croaker TC has begun some preliminary investigation into using some age-partitioned traffic light analysis, which we're going to cover a little bit after this, to see if we could get better clarification and synchrony between the indices to maybe help us see what's going on better.

That is it for the croaker traffic light, and we can just continue on. I'll go to the next slide, now we're going to talk about spot. Spot uses a 1989 to 2012 reference period, which was based on available datasets; and again it triggers if two consecutive years of our red proportions are greater than 30 percent.

One note, with the recent completion of the spot stock assessment, in addition to looking at the age proportion or age-partition traffic light, one of the things we may end up looking at is re-examining the reference time period; depending on what datasets are being used and if we incorporate any more. But just like with the croaker, the indexes used are both commercial and recreational harvest, as well as three fishery independent monitoring surveys. The NMFS Fall Groundfish Survey, the SEAMAP Survey, and then the Maryland Department of Natural Resources Juvenile Fish Survey, which was used strictly to look at Age-0 spot.

Okay for the harvest indices, commercial landings for spot in the Atlantic coast declined 70 percent, going from 2016 to 2015. The total annual landings have declined 90.7 percent since 2004, 2004 to 2016. The commercial landings in 2016 represent the lowest annual landings for spot commercially in the entire time series. That goes back to 1950.

It's only about 10.9 percent of the long-term-mean landings in the data series. For the recreational harvest, spot declined just under 67 percent in 2016. The annual harvest in the recreational fishery has been below the long-term mean since 2009, and was still below that threshold in 2016; with a red proportion increasing to 62.6 percent.

Although it wasn't the second year in a row above 30, so you just get that big jump from 2016. The recreational index actually would not have tripped, whereas the commercial one did. For the composite index, the composite characteristics showed a general decline in landings; which is primarily in recent years it has been since 2008, with increasing proportions of red annually. The composite characteristic did trip in 2016 at the 30 percent level, its second consecutive year at 30 percent or greater.

The increase in the recreational proportion is driven more by the decline in the commercial landings relative to the recreational landings. However, in 2016 they were both fairly high, and the continued declining trend in the spot fishery landings seems to be driven more by declines in the Mid-Atlantic region, which accounts for most of the commercial and recreational harvest versus the southeast coast for the whole coastwide landings.

For the adult abundance indices, the NMFS Index had a slight increase in 2016 from 2015. It was only 1.3 percent. It was still below the long-term mean, so you're still getting a little bit of red in that index; but this index wouldn't have triggered since 2003 was the last time you had two consecutive years over that 30 percent threshold.

Then the SEAMAP Index declined just about 7 percent in 2016, and remained above that long-term mean. The SEAMAP Index did not trigger either, and that one wouldn't have triggered since 2007. Both of these, while showing some slight declines in recent years from the peaks that occurred in 2011, '12, '13, have been trending upward.

For the composite index the traffic light for adults showed very little change from 2015 to 2016. That slight increase in catch levels in the NMFS Index was offset by the slight decrease in SEAMAP, so you're basically seeing them stay about the same. That composite would not have triggered in 2016.

Then for the juvenile fish with the Maryland Survey, you see those large fluctuations in catch-per-unit effort that alternating red and green, again typical of young-of-the-year fish, with variable recruitment in year class strength versus what is going on with the population. However, the index did trip at the 30 percent level; it's actually tripped at the 30 percent level in 2013-14, and at the 60 percent level in 2015 and '16. This continues that where we're seeing more of the declining trend that's occurring in the Chesapeake and in the Mid-Atlantic, versus what we've seen in some of the South Atlantic indices. In the age-partitioned traffic light, which I'll be showing after we get through this, it shows some examples from the ChesMMAP Survey, which also shows similar decline. To summarize for spot, the traffic light composite indices tripped for the juvenile spot index, but not for the adult composite characteristic.

The harvest composite characteristic also triggered in 2016; mostly due to the decline of what we've seen in commercial landings. Then with declines in the harvest metric as well as juvenile abundance metric that appears to be going on. There is some concern, because even though it didn't necessarily trigger under what's required under the Omnibus Amendment.

We're still seeing declining trend in multiple indices. Now that we've finished the stock assessment that is why we've continued to try and refine the traffic light for spot; in considering additional metrics, and surveys, and some abundance indices. Since we're going into that next, I think I'll leave it at that and let's go with questions for the traffic light, and then we can talk about the modification that we've been doing.

CHAIRMAN ESTES: Okay, do you want to dispense with the croaker questions, traffic light analysis? Is that all right?

MR. McDONOUGH: Yes.

CHAIRMAN ESTES: Are there questions? Yes, Pat.

MR. PAT GEER: It appears that your harvest indices are relatively, they're going down. But your abundance indices are generally going up, generally. But is there any thought about trying to examine harvest using effort? Because we've already said that effort is going down. The shrimp effort in my state alone is down about 70 percent in the last 20 years.

If you tried to apply some kind of effort to that harvest, you may see a totally different picture. Whether it be pounds per trip or pounds per license even, or pounds per vessel. But certainly we should be able to get pounds per trip, and examine it as a catch-per-unit effort; so that we're bringing that declining effort into that evaluation.

MR. McDONOUGH: That is just a very good point, because we had discussed that and we had difficulty in the assessment process trying to get some reliable effort estimates. It was basically at the trip level for a lot of it, and that's what we were using in some cases with the shrimp trawl estimates.

But depending on the gear types and everything else, you know effort and even at trip levels. A trip could be a day, a trip could be a week; and so it was too much uncertainty. But it certainly would be something we should continue to look at. But yes that is a really good point.

CHAIRAMN ESTES: Any more questions; yes, Roy?

MR. MILLER: Chris, again in the speculative realm, if I may head in that direction a little bit. With regard to croaker, croaker are an extremely important species in the northern part of the normal range of the croaker; particularly Maryland, Delaware, and New Jersey. They make up a very large component of the summer recreational fishery. In recent years my perception is that fishing has been poor for croaker. The few croaker that have been available have been very small, generally less than the minimum size. That sort of flies in the face of the popular perception of climate change, assuming you ascribe to the philosophy that climate change is real and not fake news.

I would have expected croaker to be expanding the range to the northern part of the range, due to climate change. But I'm wondering if perhaps the croaker are instead, the larger croaker are moving offshore, hence they're being vulnerable to the NMFS Trawl Surveys, which of course samples the deeper water component than the recreational fishing sector is accustomed to fishing on. I just wondered if instead the croaker are heading offshore, and not heading north.

MR. McDONOUGH: We've actually discussed that and tried teasing that out in the NMFS Trawl Survey data. Since NEMAP has taken over king of the inner strata that the NMFS Trawl Survey used to do, up to 2009. When they switched to the Bigelow and they couldn't go in as shallow, the earlier time series you would see, actually higher abundances in the shallower water; when they were still using the Albatross.

But the deeper strata further out, which is what we use for the NMFS Index; so we can get the full use of that time series. It goes back to 1972. You do see some changes; but there was more variability deeper out, and you don't see consistent changes with like temperature. There has been some work done by John Hare and Ken Able, looking at actually attributed low overwintering temperatures for Atlantic croaker specifically; causing higher mortality or lowering general recruitment in the spring in Mid-Atlantic estuaries.

That has been the only; I think there might be one other one. I think Ken had another study also looking at that. But there just hasn't been much work done on whether or not they're moving out. Then even the NMFS survey only samples, let's see they do sample deeper than the 60 meters, which is that outer strait it goes to.

They do sample deeper than that. But the intercept for croaker at those deeper stations is pretty low; which is why we don't use them. We have gone back and looked, I think two years ago, pulled some of that deeper water data again; to see if there were any changes in croaker coming in. We really didn't see. Your positive intercepts were say 5 to 10 percent or less for the deeper water. They might move out, and there are certainly years where there are more of them out there. But it's probably something that needs more looking at.

CHAIRMAN ESTES: Yes sir, Chris.

MR. BATSAVAGE: Back in the early 2000s, I think it was 2003, 2004 in the Chesapeake Bay, and there may have been a few other places. There was a die-off of large croaker in the summertime. There were reports of the outgoing tide, dead croaker going out through the Chesapeake Bay, the lower bay.

I actually saw it myself up there fishing during that time period. I'm trying to think back. I believe we saw a truncation in some of the ages, and definitely in the sizes of croaker. I was thinking about the commercial fishery in North Carolina, they haven't seen that larger croaker since then. Has the TC talked about that event and how that has kind of impacted some of the trends we've seen? Because just looking at the traffic light analysis for the commercial landings, things look the best in the late '90s to about the early mid-2000s, and then you start to see red creeping in around 2006. I didn't know if the TC talked about that possibly playing a role in some of the things that we've seen in the traffic light analysis.

MR. McDONOUGH: We did discuss things like the low dissolved oxygen die-offs and things, particularly in the Chesapeake. In the last stock assessment, the 2010 stock assessment, the data we were using in that timeframe, we actually started seeing an expansion of both the age and the size frequency distributions for croaker.

Then for this assessment going up to 2014, it seemed like it started to decrease; and then we started looking at when we incorporated, adding in 2015 and 2016, which of course wasn't part of the stock assessment. We've actually seen a further contraction of the size and age range going back down again; which would certainly support some of that.

But we tried to see if there were any incidents with like the VIMS Index and the other Chesapeake Juvenile Indices in low DO events and that type of thing. There wasn't really a way, at least in the traffic light, we certainly discussed it, but we haven't figured out a way to incorporate it.

CHAIRMAN ESTES: Anything else on croaker? Because both of the triggers, the composite indices, they did not trip, no management action is required. I would suggest, unless there is any objection that the TC does look into incorporating ages and possibly looking at different indices to try to improve the traffic light. Unless there is a big appetite to make changes in light of this, we'll go on to spot. I don't see anybody with a big – we just had lunch. Are there questions about the spot traffic light analysis? Yes, Joe.

MR. CIMINO: I'll start by thanking everyone. I know a lot of work and very thorough. Thanks, Chris, I appreciate this whole presentation. It is eerily, at least for spot eerily like weakfish, and I was in your position when the management board was told something very similar; just look at trends, ignore the assessment for now. I know Jim Gilmore remembers that well too; since we were sitting up there together. I think this is going to be a tough situation for us.

I've got I guess three things, one, I hope that we will continue to see as much information as possible, including ChesMMAP and NEMAP; even if they're not necessarily incorporated in the TOAs. Two and you guys may need a crystal ball for this, I'm wondering about the TOR of including shrimp trawl into a TOA and what that would look like, what you think it might look like.

Three, since this is a short-lived species and we are seeing this troubling trend in the juvenile index, is it worth updating sooner than five years? I mean would it be something that we should be considering in two to three years; just to see what's going on? That would be the modified assessment.

MR. McDONOUGH: Well, actually your first two points are both directly addressed in the next; I'm talking about the age-partitioning stuff, as far as incorporating. Right now we're looking at incorporating ChesMMAP right now, not necessarily NEMAP. Then the Shrimp Fishery Index, well we're going to get into it, but basically we're not necessarily recommending that be one of the traffic light triggers in and of itself, but that it be used each year as an advisory index to see, because it's going to gauge a relative impact of removals. In the case of the way the index is calculated with the shrimp fishery.

Typically the abundance and the harvest, higher numbers are considered good, low numbers are considered bad. In the Shrimp Fishery Index it is actually reversed, high numbers of bycatch is really the red proportion and low numbers of bycatch is the green proportion. I'm sorry, what was the third point; the assessment schedule?

MR. CIMINO: Right.

MR. McDONOUGH: I would say at this point that going through the management trigger exercise, if things continue to decline and it's perceived next year, the year after or whatever, and things continue to get worse. Then the Board can certainly initiate an assessment sooner than the five-year timeframe. They always have that at their disposal. I would say we have to see how some of this other stuff goes, but yes we could always do it sooner.

CHAIRMAN ESTES: Any other questions? I would suggest, unless there are objections that we do incorporate those extra information to the traffic light analysis, if the Board is okay directing the TC to investigate that. Okay, I don't see any objections. Now we're at the point where we need to talk about Acceptance of the Spot Stock Assessment and Peer Review. I would be quite happy to listen to a motion. Toni.

MS. KERNS: Jim, since the Peer Review did not recommend using the advice coming out of the assessment for management use, we generally don't actually accept it then; unless the Board has a different opinion, and then you can consider that.

CHAIRMAN ESTES: Okay. It's up to the Board. Then we could just leave it silent, is that what we would do? Is everyone all right with that? I assume because of that there is probably not an appetite here for a management action either; beings how we didn't trip the triggers. Seeing nothing; I guess we're done with that. Is there any other business to go before the Board? Oh, I'm sorry. Chris is still up. Sorry about that Chris.

MR. McDONOUGH: This is the last one, and you all don't have to listen to me talk anymore. Okay just to cover real quick the age partitioned, kind of looking at this traffic light in a different way. Again, the main issue being the decline in the commercial recreational landings versus what we're seeing in the abundance indices.

Most likely reason being differing size in age classes of fish captured in the different surveys, as well as what is seen in the fishery. We did this looking at using annual-age-length keys applied to the total-length-frequency-distribution data from each dataset, to get expanded numbers at age annually.

Now I'm doing this example I'm showing you is just for croaker. We're doing the same thing for spot, but with the reduced ages. We have age availability; we have a spot we're still kind of teasing that one out. But for croaker the ages were split between the pre-recruits, which is the Ages 0-1, and the recruits, which would be fully recruited to the fishery, which would be Ages 2 plus. Part of the reason for doing this was because it was an overlap, particularly in the fall surveys where you would be catching Age-0s and they would be similar in size range to the Age-1s, and they would kind of confound each other. By combining the 0s and the 1s, it provides for a little better separation in the indices.

We're using the same four fishery independent datasets; NMFS, SEAMAP, as well as North Carolina and VIMS in the commercial and recreational harvest, and then we were also examining the two other datasets, the ChesMMAP Survey as well as running the traffic light with the Shrimp Trawl Fishery Bycatch Estimates.

However, we didn't have size data for the shrimp fishery discards, so that was just run with total landings; since we had no way to separate that out within the age. This is the first time that the shrimp fishery stuff has been run through the traffic light. For our harvest composite with the traffic light, the top one there which is the Age 0-1, showed an increase in recruitment levels observed in the early 1990s and kind of steadily increasing proportions of red, which is that declining harvest of fish in that age range; likely due to a declining recruitment.

Then the bottom figure, the composite traffic light for the Age 2 plus that very closely resembles the general trends seen in the overall landings. That appears that Age 2 plus is really what is driving the harvest component for the traffic light. High landings seen from '96 through 2006, where you get that green in the Age 0-1 pre-recruits, which shows up from 1990-'99.

The persistence of those throughout the fishery could be accounting for those proportions of your green you're seeing in the Age 2 plus from the mid '90s to the early 2000s, as they kind of work their way through the fishery over about eight or ten years. For the fishery independent surveys, and these are mostly broken up, you'll have the non-partitioned one showing you and then the partitioned ones on top with the partitioned ones below it.

That non-partitioned traffic light shows a general increase in the recent years. The Age 0-1 was similar to that non-partitioned traffic light, indicating the overall trend in the catch effort was driven more by Ages 0-1 in that particular index. Then for Ages 2 plus it shows a little bit more of a decline in that older age group that was apparent in recent years; even though you do get a couple of years in the green in 2014 and '15.

The decline that you're seeing, you're seeing a declining trend a little bit in that Age 2 plus, which is kind of what we're seeing in the commercial and recreational. For the SEAMAP Survey, you still see the non-partitioned traffic light matched the higher degree of annual variability seen in the Age 0-1 traffic light; as well as the increase in the trend when you look just at the Ages 0-1 in the traffic light, that center one.

You see much higher proportions of green than you do in the non-partitioned one. Then the magnitude of change in the Ages 2 plus was less than the Age 0-1 traffic light, but it still shows some of those increases in recent years. One difference that is notable in the SEAMAP data compared to the other datasets was it had a younger maximum age of 8 versus 15, 16 in some of the Mid-Atlantic surveys.

It tended to have a narrower annual size range that was consistent across the whole time period; whereas you saw increasing size range in the mid-2000s, and then it declined again in later years in the Mid-Atlantic. SEAMAP just didn't see the larger/older fish that you see in some of the other surveys. Okay ChesMMAP, one thing with ChesMMAP is you see there is the catch-per-unit effort, which is the figure on the left, was much more pronounced for Ages 2 plus, particularly you get peak values from 2004 through 2007.

But then the overall trends in the traffic light show the decline for croaker in both Ages 0-1 as well as Age 2, and the catch levels were much higher in ChesMMAP in the first five years of the survey; whereas since 2008, the catch levels have been extremely low. The traffic light for Ages 0-1 reflected the higher recruitment levels that we're seeing in 2005 to 2007, after which that red proportion was pretty much over 50 percent.

Then the traffic light for Ages 2 plus also showed those peak years early in the survey from 2004 to 2007, and that subsequent decline beginning in 2008 and even basically red proportion levels at 70 percent or greater. That decline, particularly in ChesMMAP, matches up pretty well with what is happening with the commercial and recreational landings.

For the Juvenile Composite Index, the Age 0-1 traffic light, if you're just looking at NMFS and SEAMAP, which is that center one, because of the increases seen in that index for those younger ages, you see an even greater proportion of green for those years. Then the combination on that bottom one, using all four of them, reinforced those increases that have occurred since 2011; with higher proportions of green, particularly that SEAMAP and NEMAP kind of bringing those up in those younger fish.

The fishery independent composite characteristic really showed the varying trends, depending on the age group and which indexes were included, and which years were covered; which actually just kind of adds a bit, but we're still working on it but it does add a bit of confusion to it. If we incorporate ChesMMAP into that; now we're only using 2002 to 2016, because that is the time period for that survey.

You see that the ChesMMAP data, because of the high proportion of red, particularly in later years, is introduced into the traffic light; and so it offsets a bit of that increase we were seeing in just the larger scale surveys, NMFS, SEAMAP, as well as the local ones in North Carolina and VIMS.

For the Age 2 plus datasets, you see red proportions pretty high throughout the 1990s and early 2000s, and then that increasing trend even a little bit with the green showing up in that top one. Then with the addition of ChesMMAP, you see those higher red proportions in all years after 2008 that more closely match; again, what we're seeing in those declines in the commercial and recreational traffic light.

The addition of ChesMMAP brought those red proportions above 30 percent for most years from 2008-2016, except for two years, 2014 and '15, where they were just below 30 percent. While there was a slight declining trend in the red proportions after 2008, the higher proportions of red from the addition of ChesMMAP, again ties in better with what we're seeing in the harvest metric.

Then the shrimp fishery discards, as I said there is no length frequency data, so we ran it on the entire survey, just the discard estimates. The discards showed a high peak early in the time series, in the early '90s. The peak was 3.3 billion fish in 1991, and then values have pretty much stayed under 900 million fish per year since then. But the traffic light for using the '96-2008 reference period showed high proportions of red in the beginning of the time series when bycatch levels were fairly high. This also coincides with the timeframe when bycatch-reduction devices were not required, pre 1995-96. Then there were only two years later in the time series that had red proportions greater than 30 percent, which was 2013 and '14.

I mentioned this before answering Joe's question, while the shrimp fishery traffic light gives a good estimate of general removals, it is probably better utilized as an advisory index;

looked at every year as part of the trigger management exercise, but not necessarily used in and of itself as one of the actual indexes to decide whether or not management action is warranted, and that goes back to reliability of the estimates for the shrimp fishery estimates.

To sum everything up here, the declines in commercial recreational harvest over the last five, six years have not been necessarily mirrored in the fishery independent abundance indices. The use of the age-partitioned indexes did give us a little better clarification of the trends among the different indices; particularly with the harvest and abundance indices, where you see more declines in those older fish, which is more reflective of what's happening in the commercial and recreational fisheries.

It also helped show us what groups are necessarily maybe driving those traffic light indices as well. The Age 2 plus, what we're seeing is more of the decline in some of them, whereas the Age 0-1 traffic light is behaving more like the abundance surveys.

Further refinement of the traffic light through age partitioning of the annual index catch-per-unit-effort values, as well as the harvest estimates, could definitely provide better synchrony or agreement between the different traffic light metrics, and hopefully help account for some of the discrepancies that we're seeing between them.

Then as far as the other surveys go, the ChesMMAP Survey would be a more appropriate addition for the traffic light at this time, because it has a longer time series starting in 2002, and has a great deal of overlap already with the current reference time period; although that would be reevaluated as well.
The NEMAP Survey, while it does provide valuable data on abundance across a wide geographic range, still is a relatively short timeframe; beginning in 2007 it does not cover a complete generation time for croaker, which is 15 years. Then since the Atlantic croaker do make up such a large proportion of the shrimp trawl fishery bycatch, the use of that as an advisory index with the TOA would be useful also. That is something that we will continue to look at, because again this is really preliminary. With that any questions?

CHAIRMAN ESTES: Questions. Chris, thank you for all the work, it looks like you guys were on your computer a god bit, it looks like for the last few months.

ADJOURNMENT

Thank you very much. Is there any other business before the Board? Seeing none; we are adjourned.

(Whereupon the meeting was adjourned at 2:23 o'clock p.m. on August 1, 2017.)

Atlantic States Marine Fisheries Commission

Draft Interstate Fishery Management Plan for Atlantic Migratory Group Cobia for Public Comment

ASMFC Vision:
Sustainably Managing Atlantic Coastal Fisheries

August 2017

Draft Interstate Fishery Management Plan for Atlantic Migratory Group Cobia

Prepared by
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Cobia Plan Development Team

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This Plan was prepared under the guidance of the Atlantic States Marine Fisheries Commission's South Atlantic State/Federal Fisheries Management Board, Chaired by Jim Estes of Florida and Advisory assistance was provided by the South Atlantic Species Advisory Panel Chaired by Tom Powers of Virginia.

This is a report of the Atlantic States Marine Fisheries Commission pursuant to U.S. Department of Commerce, National Oceanic and Atmospheric Administration Award No. NA15NMF4740069.

The Atlantic States Marine Fisheries Commission seeks your input on Draft Interstate Fishery Management Plan for Atlantic Migratory Group Cobia.

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 October 6, 2017.** Regardless of when they were sent, comments received after that time will not be included in the official record. The South Atlantic State/Federal Fisheries Management Board will consider public comment on this document before finalizing the Interstate FMP.

You may submit public comment by attending a public hearing held in your state or jurisdiction or mailing, faxing, or emailing written comments to the address below. Comments can also be referred to your state's members on the South Atlantic State/Federal Fisheries Management Board or South Atlantic Advisory Panel; however, only comments received at a public hearing or written comments submitted to the Commission will become part of the public comment record.

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1. INTRODUCTION

1.1. BACKGROUND INFORMATION

At the August 2016 meeting of the Interstate Fishery Management Program (ISFMP) Policy Board, Commissioners expressed an interest in developing an Interstate Fishery Management Plan (FMP) complementary to the South Atlantic Fishery Management Council (SAFMC) Coastal Migratory Pelagics (CMP) FMP for cobia (*Rachycentron canadum*). Concerns were raised because the Annual Catch Limits (ACL) established by the SAFMC were being exceeded and fishery closures were resulting in disproportionate impacts to member states. A concern with future stock status due to ACL overages and the need for state specific involvement in management precipitated the development of an interstate FMP. Based on current genetic data, the management unit for this FMP are the Atlantic Migratory Group cobia that range from Georgia through New York. After a review of the available information developed by staff, the South Atlantic State/Federal Fisheries Management Board recommended initiation of an FMP. Upon review of the report, the ISFMP Policy Board voted to initiate the FMP and assigned its development and administration to the South Atlantic State/Federal Management Board (Management Board), which administers the FMPs for Atlantic croaker, black drum, red drum, Spanish mackerel, spot, and spotted seatrout.

The Management Board initiated development of an FMP for Atlantic Migratory Group (Atlantic) cobia in August 2016 and approved the Public Information Document for public comment in November 2016. Public comment was received and hearings held in December 2016, and the Management Board tasked the Plan Development Team (PDT) with developing a Draft FMP for Atlantic cobia in February 2017. A progress report was provided to the Management Board in May 2017. The Management Board discussed future management options and approved a letter to the SAFMC and GMFMC requesting a full transfer of management authority to the ASMFC. At their June, 2017, meeting in Ponte Vedra, FL, the SAFMC voted to begin developing an amendment to the CMP FMP to consider the transfer. At the same meeting, an emergency action to restore the Atlantic cobia stock boundary to include the east coast of Florida was not approved, leaving the current stock boundary from Georgia through New York.

1.1.1. Statement of the Problem

Cobia management has historically been considered precautionary through the CMP FMP. Both sectors of the fishery have been managed with a 2 fish possession limit and 33” fork length (FL) minimum size since formal management began with the federal CMP FMP in 1982, with Gulf and Atlantic cobia managed as one stock. CMP Amendment 5 (GMFMC/SAFMC 1990) provided a metric for designating a stock as overfished (spawning stock biomass), and the specified that overfishing would be designating when the rate of harvest would prevent rebuilding (if overfished), or would lead to overfished status. Through CMP Amendment 8 (GMFMC/SAFMC 1996) and Amendment 11 (GMFMC/SAFMC 1998), the GMFMC and SAFMC refined the overfishing definition, so that overfishing is occurring when fishing mortality (F) exceeds the maximum fishing mortality threshold (MFMT), which is based on 30% Static Spawning Potential Ratio (SPR). This overfishing definition is maintained in the CMP FMP and is determined only through a stock assessment.

Amendment 8 (GMFMC/SAFMC 1996) extended cobia management into the Mid-Atlantic region, but Gulf and Atlantic cobia were managed as one stock until Amendment 18 (GMFMC/SAFMC 2012). This amendment set the stock boundary at the boundary between the GMFMC and SAFMC, and also established the ACLs and Accountability Measures. Additionally, Amendment 18 specified that because there was no Overfishing Level (OFL) recommendation available at that time, overfishing would be defined as landings exceeding the ACL. The Councils specified that OFL would be revisited after the stock assessment (SEDAR 28) was complete.

The 2013 stock assessment conducted through the Southeast Data Assessment and Review (SEDAR) process indicated overfishing was not occurring (i.e., F<MFMT) and that the stock was not overfished, although biomass has been trending steadily downward over the previous two decades. Following completion of the assessment, the SAFMC's Scientific and Statistical Committee (SSC) recommended the OFL and the acceptable biological catch (ABC) for Atlantic cobia.

The stock assessment used a new stock boundary (Georgia through New York), which was implemented into the FMP along with the updated ACLs in Amendment 20B (GMFMC/SAFMC 2014). The current ACL is a precautionary approach to prevent the stock from reaching an overfished status. The recent overages of the ACL in 2015 and 2016 significantly exceeded the ACL as well as the OFL recommended by the SAFMC's SSC. Further quota overages could result in overfishing and lead to the stock becoming overfished.

Most recently, the SAFMC implemented revised harvest limits for Atlantic cobia in federal waters through CMP Framework Amendment 4 (SAFMC 2016), and these will become effective on September 5, 2017. The new recreational limits are 1/person or 6/vessel, whichever is more restrictive, with a minimum size limit of 36" FL. Commercial limits are 2/person or 6/vessel, whichever is more restrictive, but the commercial minimum size limit does not change from 33" FL. The SAFMC also modified the recreational accountability measures so that if landings exceed the ACL, first there will be a reduced vessel limit for the following fishing season. If this does not mitigate the overage, then the following fishing season will be shortened.

Efforts to more closely monitor state specific harvest to ensure that the federal ACL is not exceeded and avoid overfishing 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 measures to maintain a healthy resource while minimizing the socio-economic impacts of seasonal closures.

1.1.2. Benefits of Implementation

1.1.2.1. Social and Economic Benefits

Sustainable management practices and policies for a moderately-lived species such as cobia can increase economic benefits and provide social stability in the fishing community while ensuring a fishery for future generations. Greater cooperation and uniform management measures among the states ensure that the conservation efforts of one state or group will not be undermined or that one state is not disadvantaged over another.

Historically, the commercial market has been a bycatch fishery due to low possession limits of 2 fish per person. Directed harvest, even at these low limits, appears to be increasing. Cobia are primarily caught as bycatch in nearshore to offshore trolling and hook and line commercial fisheries that target snapper/grouper and king mackerel. Cobia are considered excellent table fare and command a high price for the fishermen and fish houses when they are seasonally available.

The recreational fishing season primarily occurs from May through August, but may begin as early as April and typically extends into September in the Mid-Atlantic region. Atlantic cobia support a significant for-hire fishery and lure manufacturing businesses.

The recreational fishery and landings far exceed the commercial fishery and management has deemed the recreational fishery as the primary goal in management.

1.1.2.2. Ecological Benefits

Consistent management goals across jurisdictions can provide greater protections to a migratory stock. Cobia are moderately lived and can have multiple opportunities to contribute to the population if allowed to reach older ages, which can be afforded by regulatory protections across the range of the population and age classes.

Concern that the peak fishery occurs during the spawning season has resulted in at least one state (South Carolina) implementing a closure during that time.

1.2. DESCRIPTION OF THE RESOURCE

1.2.1. Species Life History

Cobia are a member of the family Rachycentridae and has historically been managed in the federal CMP FMP because of its migratory behavior. Cobia are distributed worldwide in tropical, subtropical and warm-temperate waters. In the western Atlantic it occurs from Nova Scotia, Canada, south to Argentina, including the Caribbean Sea. They are abundant in warm waters off the coast of the U.S. from the Chesapeake Bay south and throughout the Gulf of Mexico (Gulf). Cobia prefer water temperatures between 68-86°F. As a pelagic fish, cobia are found over the continental shelf as well as around offshore natural and artificial reefs. Cobia frequently reside near any structure that interrupts the open water such as pilings, buoys, platforms, anchored boats, and flotsam, and are often seen under or accompanying rays, large coastal sharks, and sea turtles. Cobia are also found inshore inhabiting bays, inlets, and mangroves.

Cobia form large aggregations, spawning during daylight hours between June and August in the Atlantic Ocean near the Chesapeake Bay and off North Carolina in May and June, and in the Gulf during April through September. Spawning frequency is once every 9-12 days, spawning 15-20 times during the season. During spawning, cobia undergo changes in body coloration from brown to a light horizontal-striped pattern, releasing eggs and sperm into offshore open water. Cobia have also been observed spawning in estuaries and shallow bays with the young heading offshore soon after hatching. Cobia eggs are spherical, averaging 1.24 mm in diameter. Larvae are released approximately 24-36 hours after fertilization.

Newly hatched larvae are 2.5 mm (1 inch) long and lack pigmentation. Five days after hatching, the mouth and eyes develop, allowing for active feeding. A pale yellow streak is visible, extending the length of the body. By day 30, juveniles take on the appearance of adult cobia with two color bands running from the head to the posterior end.

Weighing up to a record 61 kg (135 pounds whole weight [lbs ww]), cobia are more common at weights of up to 23 kg (50 lbs ww). They reach lengths of 50-120 cm (20-47 inches), with a maximum of 200 cm (79 inches). Cobia grow quickly and have a moderately long life span. Maximum ages observed for cobia in the Gulf were 9 and 11 years for males and females, respectively, while off North Carolina maximum ages were 14 and 13 years, respectively. Females reach sexual maturity at 3 years of age and males at 2 years in the Chesapeake Bay region. During autumn and winter months, cobia presumably migrate south and offshore to warmer waters. In early spring, migration occurs northward along the Atlantic coast. Significant efforts are currently underway using various tagging methods to better understand the migratory behavior of cobia.

1.2.2. Stock Assessment Summary

1.2.2.1. Stock Identification and Management Unit

Microsatellite-based analyses demonstrated that tissue samples collected from North Carolina, South Carolina, east coast Florida (near St. Lucie), Mississippi, and Texas showed disparate allele frequency distributions, and subsequent analysis of molecular variance showed population structuring occurring between the states (Darden et al. 2014). Results showed that the Gulf of Mexico stock appeared to be genetically homogeneous and that a segment of the population continued around the Florida peninsula to St. Lucie, FL, with a genetic break somewhere between St. Lucie, FL, and Port Royal Sound, SC. However, no samples were available from Cape Canaveral, FL, to Hilton Head Island, SC. Tag-recapture data using conventional dart tags also suggested two stocks of fish that overlap at Brevard County, FL, corroborating the genetic findings.

The Atlantic and Gulf stocks were separated at the Florida-Georgia line during SEDAR 28 because genetic data suggested that the split is north of the Brevard/Indian River County line and tagging data did not dispute this split. The FL-GA line was selected as the stock boundary based on recommendations from the commercial and recreational work groups and comments that this boundary would allow easier management and did not conflict with the life history information available. However, there was not enough resolution in the genetic or tagging data to suggest that a biological stock boundary exists specifically at the FL-GA line, only that a mixing zone occurs around Brevard County, FL, and potentially to the north. The Atlantic stock was determined to extend northward, as far as New York.

Several ongoing research projects are expanding sample collection throughout coastal Georgia and northern Florida, which may help provide better resolution for where the genetic break (or mixing zone) between the Gulf of Mexico population and the Atlantic population occurs. In addition, a few hundred cobia have been tagged with acoustic tags in South Carolina, Georgia, and the east coast of Florida to evaluate movement patterns along the South Atlantic (FL-NC) coast of the United States. This may also help determine where the stock boundary/mixing zone occurs.

1.2.2.2. SEDAR 28

The Gulf and Atlantic migratory groups of cobia were assessed by SEDAR 28 in 2013. The SEDAR 28 stock assessment for Atlantic migratory group cobia (Atlantic cobia) determined that the stock is not overfished or experiencing overfishing. The Gulf of Mexico Fishery Management Council (GMFMC) Scientific and Statistical Committee's (SSC) review of the SEDAR 28 stock assessment of Gulf migratory group cobia (Gulf cobia) determined that the stock was not overfished or experiencing overfishing.

1.2.3. Abundance and Present Condition

No coastwide index of abundance is available for cobia and no reliable regional indices of abundance can be generated due to lack of targeted monitoring programs and low incidental catch of cobia in most existing surveys. In particular, few surveys consistently encounter and sample adult fish due to their size and gear avoidance in primary survey methods such as trawls.

1.3. DESCRIPTION OF THE FISHERY

1.3.1. Commercial Fishery

Prior to 2015, the SAFMC's management area for Atlantic cobia extended from the east coast of Florida through New York. As implemented through Amendment 20B (GMFMC/SAFMC 2014) and effective in 2015, the harvests of cobia off the east coast of Florida have been considered part of the Gulf migratory group, thus the current management area for Atlantic cobia extends from Georgia through New York. The tables presented below include cobia landings and revenues from Georgia through New York, and thus exclude those from Florida. In this way, reported landings and revenues for 2010 through 2014 are consistent with those for 2015 under the new geographic designation of Atlantic cobia.

Three important issues should be recognized regarding the commercial landings data for Atlantic cobia presented in Tables 1 and 2. First, Table 1 shows 2015 landings in landed weight, while Table 2 shows 2010-2015 landings in whole weight. The Atlantic cobia ACL is specified and monitored in terms of landed weight ("as reported"), which is generally a combination of gutted and whole weight. This means landings in gutted weight are not converted to whole weight, or vice-versa, but landings in whole or gutted weight are simply added together to track landings against the ACL. The Atlantic Coastal Cooperative Statistics Program (ACCSP), which is a major data source for cobia (and other Atlantic species) landings, reports commercial landings in whole weight but may be converted to gutted weight using a conversion factor. However, the ACCSP is not currently able to provide landed weight. Second, the 2015 data shown in the tables is preliminary, but a more recent update has been made by the Southeast Fisheries Science Center (SEFSC). The updated 2015 Atlantic cobia commercial landings were 71,790 lbs landed weight (Table 1). This number is lower than that shown in the tables and is also in landed weight, not whole weight. Third, landings prior to 2015 cannot be directly converted to landed weight. However, the commercial ACL (quota) prior to 2015 was monitored in terms of whole weight. Also, commercial quotas were not instituted until 2011.

Table 1. Updated 2015 commercial landings (pounds landed weight [lw]) and revenues (2014 $).

States				
	GA/SC	**NC**	**VA**	**Total**
Pounds (lw)	3,219	42,338	26,233	71,790
Revenues (2014 $)	$28,755	$113,052	$75,394	$217,200

Source: D. Gloeckner (pers. comm., 2016) for 2015 data.

From 2010 through 2015, annual commercial landings of Atlantic cobia ranged from approximately 33,000 to 83,000 lbs ww (Table 2). Dockside revenues from those landings ranged from approximately $79,000 to $233,000 (2014 $) (Table 2). The average dockside price for those six years was $2.43 per lb ww (2014 $). The highest landings and revenues occurred in 2015, whereas the lowest for both landings and revenues occurred in 2011. When the Florida east coast zone was still part of the management area for Atlantic cobia, commercial harvest reached the sector's quota of 125,712 lbs ww in 2014 and closed on December 11, 2014. Under the modified management area, excluding the Florida east coast zone, the quota for Atlantic cobia was revised to 60,000 lbs landed weight (lw) in 2015 and 50,000 lbs lw in 2016 and thereafter. Although landings exceeded the 2015 quota, no quota closure was imposed. Preliminary commercial landings for 2016 are 48,690 lbs lw (SEFSC Quota Monitoring Program; July, 2017). The federal commercial fishery closed on December 6, 2016.

Commercial landings of Atlantic cobia have predominantly come from North Carolina, followed by Virginia and South Carolina/Georgia (Table 2). Georgia and South Carolina landings are combined for confidentiality purposes because of the relatively small amount of cobia landings in Georgia. Cobia landings north of Virginia are relatively rare and sporadic, thus, Virginia is considered the northernmost major contributor to the commercial Atlantic cobia fishery. One notable feature for Virginia is the surge in landings in 2014 and 2015, although they were still lower than landings in North Carolina.

Table 2. Commercial Atlantic cobia landings (lbs ww) and revenues (2014 $) by state/area, 2010-2015 (preliminary). GA landings are very small, so they are combined with those of SC.

	GA/SC	NC	VA	Total
	Pounds (ww)			
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	83,148
Average	3,867	37,559	14,732	56,158
	Dockside Revenues (2014 $)			
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

Source: SEFSC Commercial ACL Dataset (December 2015) for 2010-2014 data; D. Gloeckner (pers. comm., 2016) for 2015 data.

Commercial fishermen harvest cobia using various gear types. Table 3 shows commercial Atlantic cobia landings and revenues by gear type. In Table 3, “Hook and Line” includes handline, longline, power-assisted line, and troll line while “Others” includes traps, other net gear, dredges/gigs/spears, and unclassified gear. Handline has been the foremost gear type used in harvesting cobia for most years (Table 3), followed closely by gillnets. Within the “Others” category, the largest landings were assigned to “unclassified gear.” Although not shown in the table, handline accounted for the biggest share of the hook and line landings. Longline has been a minor gear type in the commercial harvest of cobia.

Table 3. Commercial Atlantic cobia landings (lb ww) and revenues (2014$) by gear, 2010-2015 (preliminary).

	Hook and Line	Gillnets	Others	Total
	Pounds (ww)			
2010	26,758	23,495	6,022	56,275
2011	18,322	9,177	6,294	33,793
2012	12,962	21,091	7,906	41,959
2013	28,356	13,343	10,933	52,632
2014	37,082	23,540	8,517	69,139
2015	37,702	36,417	9,030	83,148
Average	26,864	21,177	8,117	56,158
	Dockside Revenues (2014 $)			
2010	$49,095	$38,605	$14,030	$101,730
2011	$39,265	$18,242	$21,717	$79,224
2012	$29,677	$43,875	$23,486	$97,038
2013	$69,433	$30,206	$31,189	$130,828
2014	$99,959	$55,275	$21,520	$176,754
2015	$108,165	$100,130	$25,377	$233,672
Average	$65,932	$47,722	$22,886	$136,541

Source: SEFSC Commercial ACL Dataset (December 2015) for 2010-2014 data; D. Gloeckner (pers. comm., 2016) for 2015 data.

1.3.1.1. State-specific Commercial Fishery

Georgia

There is no directed commercial fishery for cobia in Georgia. Commercial landings may occur but they are typically the result of bycatch in other targeted fisheries. Some illegal sale of recreationally-caught cobia may occur; however, the total amount and value is relatively small. The greatest recorded landings in Georgia (since annual landings became available in 1979) occurred in 1993 when 2,730 pounds of cobia were landed resulting in a market value of $4,728.

South Carolina

There is a limited commercial fishery for cobia in South Carolina. Cobia are a state-designated Gamefish, and as such, cobia landed in state waters may not be sold commercially. However, cobia landed in Federal waters can be sold commercially under current regulations. Commercial cobia landings have ranged from 2,000-4,300 lbs per year with an annual mean of 3,207 lbs per year for 2005-2016 and dollar values ranging from $4,731-$17,795 annually.

North Carolina:

Commercial landings of cobia in North Carolina are available from 1950 to the present. However, monthly landings are not available until 1974. North Carolina instituted mandatory reporting of commercial landings through their Trip Ticket Program, starting in 1994. Landings information collected since 1994 are considered the most reliable. The primary fisheries associated with cobia in North Carolina are the snapper-grouper, coastal pelagic troll, and the large mesh estuarine gill net fisheries. Cobia landings from 1950 – 2016 have ranged from a low of 600 pounds (1951; 1955) to a high of 52,684 pounds (2015) with average landings of 16,611 pounds over the 66-year time series (Table 3). Recently, landings have ranged from 19,004 pounds (2007) to 52,684 pounds (2015), averaging 34,674 pounds over the last ten years.

The primary commercial gear used to harvest cobia has changed over time. This is most likely due to changing fisheries and the fact that it is mostly considered a marketable bycatch fishery, especially after North Carolina adopted the CMP FMP measures of 33-inches minimum FL and two-per person possession limit in 1991. From 1950 to the late 1970s, cobia were mostly landed out of the haul seine fishery. Most landings that occurred during the 1980s came from the pelagic troll and hand line fishery with modest landings from the haul seine and anchored gill net fishery. From 1994-2016, the majority of landings have occurred from the anchored gill net and pelagic troll and hand line fishery with gill nets being the top gear during most of those years.

Virginia

Similar to the situation for the recreational sector, commercial hook-and-line fishermen have come to depend more on cobia as the quality of other fisheries in Virginia has deteriorated. In fact, it has become an actively targeted species for many such commercial fishermen, even though cobia has often been considered a bycatch species in other states and for other gears.

Virginia has had variable commercial landings of cobia since the Virginia Marine Resources Commission instituted mandatory reporting in 1993, with landings being high in the mid-1990s, lower in the mid-2000s, and peaking in the past three years (2014-2016; Appendix II, Table VA1). There is a small, but directed hook-and-line fishery, with mainly bycatch landings from gillnets and pound nets, although these landings can be sizable (Appendix II, Table VA2). The “Other” category is predominantly gillnet landings, but they were combined with other gears for confidentiality purposes. Hook-and-line landings have been the largest, by gear, since 2007.

1.3.2. Recreational Fishery

The recreational sector is comprised of a private component and a for-hire component. The private component includes anglers fishing from shore (including all land-based structures) and private/rental boats. The for-hire component is composed of charter boats and headboats (also called partyboats). Although charter boats tend to be smaller, on average, than headboats, the key distinction between the two types of operations is how the fee is typically determined. On a charter boat trip, the fee charged is for the entire vessel, regardless of how many passengers are carried, whereas the fee charged for a headboat trip is paid per individual angler.

1.3.2.1. Permits

A federal charter/headboat (for-hire) vessel permit is required for harvesting CMP species, including cobia, when fishing on for-hire vessels in the south Atlantic and mid-Atlantic waters. The federal for-hire permit is an open access system. As of May 16, 2016, there were 1,494 valid (non-expired) or renewable Atlantic charter/headboat CMP permits. A renewable permit is an expired permit that may not be actively fished, but is renewable for up to one year after expiration. Although the for-hire permit application collects information on the primary method of operation, the resultant permit itself does not identify the permitted vessel as either a headboat or a charter boat and does not restrict operation as either a headboat or charter boat, thus, vessels may operate in both capacities. However, only selected headboats are required to submit harvest and effort information to the National Marine Fisheries Service (NMFS) Southeast Region Headboat Survey (SRHS). Participation in the SRHS is based on determination by the SEFSC that the vessel primarily operates as a headboat. There were 73 South Atlantic vessels registered in the SRHS as of February 22, 2016 (K. Fitzpatrick, NMFS SEFSC, pers. comm.).

Information on South Atlantic charter boat and headboat operating characteristics, including average fees and net operating revenues, as reported in Holland et al. (2012), and financial and economic impact information on Southeast (FL-NC) for-hire vessels, as reported in Steinback and Brinson (2013), is incorporated herein by reference.

There are no specific federal permitting requirements for recreational anglers to fish for or harvest cobia. Instead, anglers are required to possess either a state recreational fishing permit that authorizes saltwater fishing in general, or be registered in the federal National Saltwater Angler Registry system, subject to appropriate exemptions. As a result, it is not possible to identify with available data how many individual anglers would be expected to be affected by this proposed FMP.

Recently, the states of North Carolina and Virginia have developed programs to survey recreational cobia fishermen. These programs may provide information in the future that would help characterize the cobia fisheries in these states.

1.3.2.2. Harvest

On average, from 2010 through 2015, the recreational sector landed approximately 793,000 lbs ww of Atlantic cobia (Table 4). North Carolina has been the dominant state in recreational landings of cobia, followed by Virginia, South Carolina, and Georgia. Cobia landings north of Virginia are relatively rare and sporadic, thus, Virginia is considered the northernmost major contributor to the recreational Atlantic cobia fishery. Noticeable in the table is the surge in the recreational landings of cobia for all states in 2015, resulting in 2015 landings that were more than double the recreational ACL. Preliminary landings (1,289,993 lbs ww, GA-VA; Pers. com. National Marine Fisheries Service [NMFS] [July 21, 2017]) indicate that a similar circumstance occurred in 2016.

The private/rental mode has been the most dominant fishing mode for harvesting cobia (Table 5). Headboats have provided the lowest contribution to recreational landings of cobia. Information reported in Table 5 indicates that the 2015 surge in recreational landings can be attributed to substantial landings increases by the charter and private/rental fishing modes. Charter boat landings more than doubled while private/rental mode landings more than tripled in 2015. In the particular case of the South Carolina charter boat sector, increasing landings of cobia caught from offshore waters (greater than 3 miles) partly compensated for the declining landings from estuarine and nearshore waters (0-3 miles) that have occurred since about 2007 (South Carolina Cobia Management Needs PowerPoint Presentation, SC DNR, 2016).

Table 4. Annual recreational landings (lbs ww) of Atlantic cobia, by state, 2010-2015 (preliminary).

	Georgia	**South Carolina**	**North Carolina**	**Virginia**	**Total**
2010	77,064	63,678	559,476	237,528	937,746
2011	88,049	1,554	119,678	137,931	347,213
2012	102,996	222,353	66,645	103,995	495,989
2013	28,427	19,159	492,998	354,463	895,048
2014	19,768	32,010	277,846	214,426	544,050
2015	67,250	124,057	631,024	718,647	1,540,978
Average	63,926	77,135	357,945	294,498	793,504

Source: SEFSC MRIPACLspec_rec81_15wv6_17Mar16.

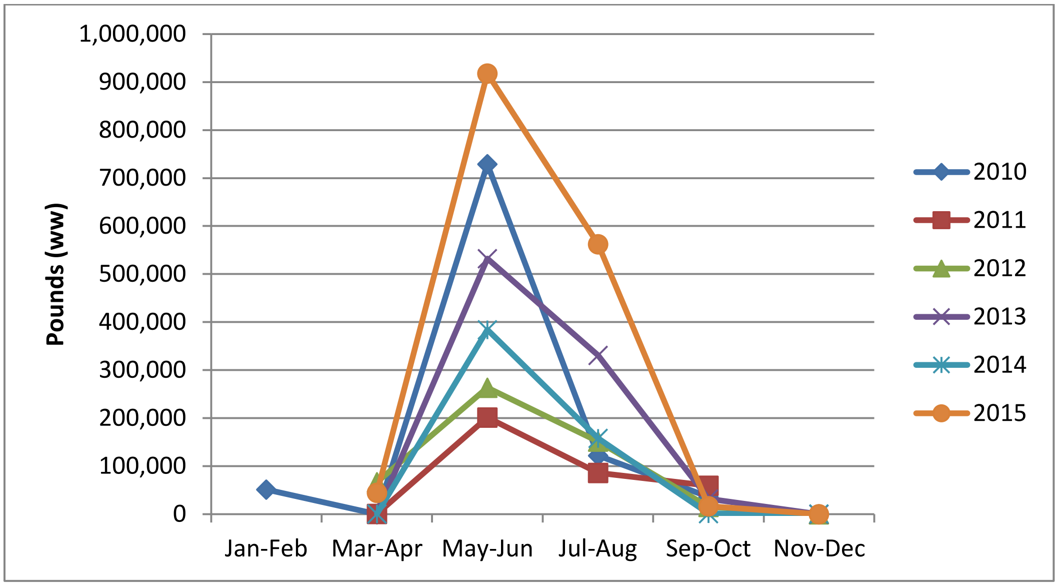
Table 5. Annual recreational landings (lbs ww) of Atlantic cobia, by fishing mode, 2010-2015 (preliminary).

	Charter	**Headboat**	**Private/Rental**	**Shore**	**Total**
2010	133,110	2,747	789,996	11,893	937,746
2011	23,608	1,886	282,728	38,990	347,213
2012	39,729	1,671	385,777	68,811	495,989
2013	73,623	5,485	815,940	0	895,048
2014	46,528	5,701	453,871	37,950	544,050
2015	102,941	1,741	1,400,338	35,957	1,540,978
Average	69,923	3,205	688,108	32,267	793,504

Source: SEFSC MRIPACLspec_rec81_15wv6_17Mar16.

Peak recreational landings of cobia occurred in the May-June wave each year from 2010 through 2015 (Figure 1). Recreational landings steeply increased from the March-April wave to their peak and also steeply declined after the peak wave. Landings are concentrated around the May-June and July-August waves.

Figure 1. Distribution of Atlantic cobia recreational harvest, by wave, 2010-2015 (preliminary).



Source: SEFSC MRIPACLspec_rec81_15wv6_17Mar16.

1.3.2.3. Effort

Recreational effort derived from the Marine Recreational Statistics Survey/Marine Recreational Information Program (Marine Recreational Fisheries Statistical Survey [MRFSS]/Marine Recreational Information Program [MRIP]) database can be characterized in terms of the number of trips as follows:

Target effort - The number of individual angler trips, regardless of duration, where the intercepted angler indicated that the species or a species in the species group was targeted as either the first or second primary target for the trip. The species did not have to be caught.

Catch effort - The number of individual angler trips, regardless of duration and target intent, where the individual species or a species in the species group was caught. The fish did not have to be kept.

Total recreational trips - The total estimated number of recreational trips in the Atlantic, regardless of target intent or catch success.

Other measures of effort are possible, such as the number of harvest trips (the number of individual angler trips that harvest a particular species regardless of target intent), and directed trips (the number of individual angler trips that either targeted or caught a particular species), but the three measures of effort listed above are used in this assessment.

Estimates of annual Atlantic cobia effort (in terms of individual angler trips) for 2010-2015 are provided in Table 6 for target trips and Table 7 for catch trips. Target and catch trips are shown by fishing mode (charter, private/rental, shore) for Georgia, South Carolina, North Carolina, and Virginia. These are trips for cobia in state or federal waters off of these states. Estimates of cobia target and catch trips for additional years, and other measures of directed effort, are available at http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/queries/index.

Cobia is one of the few species where target trips generally exceed catch trips. The 2010-2015 average target trips were 4,519 for the charter mode, 130,360 for the private/rental mode, and 28,293 for the shore mode (Table 6). In contrast, the average catch trips were 3,114 for the charter mode, 33,329 for the private/rental mode, and 6,840 for the shore mode (Table 7). This is suggestive of a relatively strong interest in fishing for cobia among recreational anglers across all fishing modes. For each state, the private/rental mode has been the most dominant fishing mode both in target and catch effort.

Table 6. Target trips for Atlantic cobia, by fishing mode and state, 2010-2015 (preliminary).

Year	Charter				
	Georgia	S. Carolina	N. Carolina	Virginia	Total
2010	0	3,349	3,029	358	6,736
2011	22	2,940	1,416	525	4,903
2012	0	1,025	345	156	1,526
2013	160	0	2,446	24	2,630
2014	0	1,452	1,703	295	3,450
2015	792	1,290	2,765	3,022	7,869
Average	162	1,676	1,951	730	4,519
	Private/Rental				
2010	5,453	14,228	49,358	67,730	136,769
2011	4,030	24,554	26,400	49,180	104,164
2012	2,495	57,543	23,320	37,706	121,064
2013	12,235	22,373	50,883	53,981	139,472
2014	1,322	23,365	50,112	49,075	123,874
2015	12,236	9,684	58,658	76,241	156,819
Average	6,295	25,291	43,122	55,652	130,360
	Shore				
2010	0	2,030	14,950	9,838	26,818
2011	0	0	10,090	2,366	12,456
2012	0	914	12,444	14,939	28,297
2013	0	627	15,977	5,693	22,297
2014	0	2,395	17,085	18,565	38,045
2015	0	363	21,925	19,554	41,842
Average	0	1,055	15,412	11,826	28,293

Source: http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/queries/index.

Table 7. Catch trips for Atlantic cobia, by fishing mode and state, 2010-2015 (preliminary).

Year	Charter				
	Georgia	South Car.	North Car.	Virginia	Total
2010	97	1,301	4,398	237	6,033
2011	400	0	1,655	135	2,190
2012	140	372	472	156	1,140
2013	160	48	2,798	24	3,030
2014	55	110	1,559	72	1,796
2015	0	879	2,652	963	4,494
Average	142	452	2,256	265	3,114
	Private/Rental				
2010	3,320	2,939	18,433	13,600	38,292
2011	4,145	606	8,156	9,291	22,198
2012	3,296	5,134	4,869	6,658	19,957
2013	1,157	3,699	21,047	14,256	40,159
2014	1,436	2,957	10,561	14,803	29,757
2015	2,351	4,396	18,740	24,121	49,608
Average	2,618	3,289	13,634	13,788	33,329
	Shore				
2010	0	0	6,192	0	6,192
2011	0	0	6,528	0	6,528
2012	0	0	7,983	2,055	10,038
2013	0	0	2,673	0	2,673
2014	0	3,268	6,128	0	9,396
2015	0	2,697	3,514	0	6,211
Average	0	994	5,503	343	6,840

Source: http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/queries/index.

Headboat data in the Southeast do not support the estimation of target or catch effort because target intent is not collected and the harvest data (the data reflects only harvest information and not total catch) are collected on a vessel basis and not by individual angler. **Table 8** contains estimates of the number of headboat angler days for the South Atlantic states for 2010-2015. Georgia and South Carolina data are combined for confidentiality purposes. Virginia information was not available because only South Atlantic headboats are included in the SRHS.

Table 8. South Atlantic headboat angler days, by state, 2010-2015.

Year	GA/SC	NC	TOTAL
2010	46,908	21,071	67,979
2011	46,210	18,457	64,667
2012	42,064	20,766	62,830
2013	42,853	20,547	63,400
2014	44,092	22,691	66,783
2015	41,479	22,716	64,195
Average	43,934	21,041	64,976

Source: NMFS Southeast Region Headboat Survey (SRHS).

1.3.2.4. State Specific Recreational Fisheries

Georgia

A large recreational fishery exists for cobia in Georgia. The majority of this fishery occurs in nearshore waters around natural and artificial reefs. While there are some instances of cobia being caught inshore and on beach front piers in Georgia, most landings come from outside state waters. Anglers begin targeting cobia in late April-early May with the peak of the season typically occurring in June. Late season catches often occur on nearshore reefs through October depending on water temperatures. However, these fall runs of fish are sporadic and are often missed by anglers.

South Carolina

The recreational fishery accounts for the majority of cobia landings in South Carolina. The fishery occurs in both nearshore waters and around natural and artificial reefs offshore. Historically, the majority of cobia landings have occurred in state waters in and around spawning aggregations from April through May. However, due to intense fishing pressure in the inshore zone, annual landings of cobia have fallen drastically since 2009, such that the majority of recreationally caught cobia in South Carolina now come from offshore (federal) waters. Anglers begin targeting cobia in late April-early May with the peak of the season typically occurring May into early June. Late season catches can occur on nearshore reefs through October depending on water temperatures. However, these fall catches are sporadic. South

Carolina has accounted for an average of 1.3% of total landings in state jurisdictional waters along the Atlantic coast for 2010-2016.

North Carolina

Historically, recreational fisherman targeted cobia from a vessel by anchoring and fishing with dead, live, or a mixture of both bait types near inlets and deep water sloughs inshore (Manooch 1984). Fish were also harvested from shore or off of piers using dead or live bait, most commonly menhaden. In the early 2000s, fisherman began outfitting their vessels with towers to gain a higher vantage point to spot and target free swimming cobia along tidelines and around bait aggregations. This method of fishing actively targets cobia in the nearshore coastal zone and has become the primary mode of fishing in most parts of the state.

Recreational harvests of cobia in North Carolina from 1981-2016 have ranged from a low of 0 pounds (1983) to a high of 631,024 pounds (2015). Landings during the 1980s and 1990s remained relatively constant from year to year. Landings began to increase and become more variable beginning in the mid-2000s. From 2010-2015, recreational cobia landings in North Carolina ranged from 66,645 to 631,024 pounds (avg. = 357,945 pounds). Seasonally, cobia are landed mostly in the spring and summer months corresponding with their spring spawning migration (Smith 1995). Peak landings occur during the latter part of May into June and quickly diminish thereafter. However, recreational landings of cobia can occur through the month of October. By fishing mode, the majority of recreational landings of cobia in North Carolina occur form private vessels (73 %) with charter vessels (14 %) and shore based modes (13 %) accounting for the rest.

Virginia

According to the MRFSS/MRIP, Virginia's estimated recreational landings of cobia have been highly variable since 2000, with the lowest estimate being 26,537 pounds in 2012 and 898,542 pounds in 2006 (Appendix II, Table VA3). Although still preliminary, the estimate for 2016 is 919,992 pounds. It is believed the recreational fishery has grown in recent years, both in the number of participants, and the effectiveness of fishing due to the advent of sight-casting—especially when aided by "cobia towers." Traditionally, cobia had been targeted using live-bait bottom-fishing, but these new techniques are causing a shift in preference among anglers. However, the extent of this change is not clear for Virginia's recreational fishery.

In addition to a large private recreational industry, there is a small, dedicated group of for-hire participants. Many of these captains/fishing guides utilize cobia towers and prefer sight-casting, although some still chum and fish using live bait.

1.3.3. Subsistence Fishery

There is no known subsistence fishery for cobia.

1.3.4. Non-Consumptive Factors

No non-consumptive factors were identified that were of significance to the cobia resource.

1.3.5. Interactions with Other Fisheries, Species, or Users

The recreational cobia fishery tends to be a targeted fishery. Various small and large coastal sharks and various ray species are the most common bycatch. Cobia are encountered as bycatch in the troll and live bait fisheries for king and Spanish mackerel, dolphin, and other pelagic species. Additionally, cobia are taken incidental to offshore bottom fishing activities for snapper/grouper species.

The commercial cobia fishery is primarily bycatch in the same troll fisheries and taken incidental to snapper/grouper fisheries. Some directed harvest does occur; however, low limits preclude a large scale fishery.

1.4. HABITAT CONSIDERATIONS

1.4.1. Habitat Important to the Stocks

1.4.1.1. Description of the Habitat

1.4.1.1.1. Spawning Habitat

The SAFMC has management jurisdiction of the federal waters (3-200 nautical miles) offshore of North Carolina, South Carolina, Georgia, and Florida. Under the CMP FMP, the SAFMC manages Atlantic cobia through the Mid-Atlantic region (VA-NY).

Cobia spawn in nearshore waters along the South Atlantic coast from April through June. Nearby states (South Carolina) have documented the presence of inshore spawning aggregations of cobia (Lefebvre and Denson, 2012). However, there have been no such aggregations identified in Georgia. Eggs and larvae are typically found in nearshore waters and juveniles most often occur inshore or in protected nearshore waters.

Cobia enter nearshore waters along the south Atlantic Coast when water temperatures reach 20-21 °C, usually late April and aggregate to spawn through June. Histological evaluation of gonads from these nearshore collections suggest cobia are mature and spawning in inshore waters of high salinity estuaries (Callibogue, Port Royal Sound and St. Helena Sound in SC)(Lefebvre and Denson, 2012). The inshore spawning aggregations in South Carolina have been determined to be genetically distinct from the Atlantic stock of cobia (Darden et al. 2014). These findings are corroborated by conventional tag-recapture information and show estuarine fidelity for spawning fish and natal homing annually into estuaries. Eggs and larvae are typically found in nearshore waters where there is significant retention time of estuarine waters; however, juveniles (< 2yrs of age) are only occasionally caught inshore or in protected nearshore waters making it unclear what habitat the majority of this life stage utilizes until they mature and join spawning aggregations (Lefebvre and Denson, 2012).

1.4.1.1.2. Larval Habitat

Little is known about the larval stages of cobia. Larvae have been collected in pelagic waters of the Gulf of Mexico (65-134 m isobaths), within a meter of the water column (Ditty and Shaw 1992).

1.4.1.1.3. Juvenile Habitat

Juveniles, like larvae, have also been found in pelagic waters of the Gulf of Mexico, and are believed to utilize floating *Sargassum* as habitat in such areas (Ditty and Shaw 1992). Early juveniles then move to high-salinity, inshore areas along beaches, river mouths, barrier islands, and bays/inlets (Benson 1982, Hoese and Moore 1977, McClane 1974, Swingle 1971).

1.4.1.1.4. Adult Habitat

Adults enter estuaries on a seasonal basis but otherwise inhabit coastal waters and the continental shelf (Benson 1982, Collette 1978, Robins and Ray 1986). Although generally considered pelagic, adult cobia are found at various depths throughout the water column (Freeman and Walford 1976). They do not appear to be substratum-specific, but extensive tagging research is currently being conducted by various states along the U.S. Atlantic coast to better determine movement and habitat usage.

1.4.1.1.4.1. South Atlantic Region

The continental shelf off the southeastern U.S., extending from the Dry Tortugas, FL, to Cape Hatteras, NC, encompasses an area in excess of 100,000 square km (Menzel 1993). Based on physical oceanography and geomorphology, this environment can be divided into two regions: Dry Tortugas, FL, to Cape Canaveral, FL, and Cape Canaveral, FL, to Cape Hatteras, NC. The continental shelf from the Dry Tortugas, FL, to Miami, FL, is approximately 25 km wide and narrows to approximately 5 km off Palm Beach, FL. The shelf then broadens to approximately 120 km off Georgia and South Carolina before narrowing to 30 km off Cape Hatteras, NC. The Florida Current/Gulf Stream flows along the shelf edge throughout the region. In the southern region, this boundary current dominates the physics of the entire shelf (Lee et al. 1994).

In the northern region, additional physical processes are important and the shelf environment can be subdivided into three oceanographic zones (Atkinson et al. 1985, Menzel 1993), the outer shelf, mid-shelf, and inner shelf. The outer shelf (40-75 meters (m)) is influenced primarily by the Gulf Stream and secondarily by winds and tides. On the mid-shelf (20-40 m), the water column is almost equally affected by the Gulf Stream, winds, and tides. Inner shelf waters (0-20 m) are influenced by freshwater runoff, winds, tides, and bottom friction. Water masses present from the Dry Tortugas, FL, to Cape Canaveral, FL, include Florida Current water, waters originating in Florida Bay, and shelf water.

Spatial and temporal variation in the position of the western boundary current has dramatic effects on water column habitats. Variation in the path of the Florida Current near the

Dry Tortugas induces formation of the Tortugas Gyre (Lee et al. 1992, 1994). This cyclonic eddy has horizontal dimensions of approximately 100 km and may persist near the Florida Keys for several months. The Pourtales Gyre, which has been found to the east, is formed when the Tortugas Gyres moves eastward along the shelf. Upwelling occurs in the center of these gyres, thereby adding nutrients to the near surface (<100 m) water column. Wind and input of Florida Bay water also influence the water column structure on the shelf off the Florida Keys (Smith 1994, Wang et al. 1994). Further downstream, the Gulf Stream encounters the "Charleston Bump", a topographic rise on the upper Blake Ridge where the current is often deflected offshore resulting in the formation of a cold, quasi-permanent cyclonic gyre and associated upwelling (Brooks and Bane 1978). On the continental shelf, offshore projecting shoals at Cape Fear, Cape Lookout, and Cape Hatteras, NC, affect longshore coastal currents and interact with Gulf Stream intrusions to produce local upwelling (Blanton et al. 1981, Janowitz and Pietrafesa 1982). Shoreward of the Gulf Stream, seasonal horizontal temperature and salinity gradients define the mid-shelf and inner-shelf fronts. In coastal waters, river discharge and estuarine tidal plumes contribute to the water column structure.

The water column from Dry Tortugas, FL, to Cape Hatteras, NC, serves as habitat for many marine fish and shellfish. Most marine fish and shellfish release pelagic eggs when spawning and thus, most species utilize the water column during some portion of their early life history (Leis 1991, Yeung and McGowan 1991). Many fish inhabit the water column as adults. Pelagic fishes include numerous clupeoids, flying fish, jacks, cobia, bluefish, dolphin, barracuda, and the mackerels (Schwartz 1989). Some pelagic species are associated with particular benthic habitats, while other species are truly pelagic.

1.4.1.1.4.2. Mid-Atlantic Region

Information about the physical environment of the Mid-Atlantic region was provided by the Mid-Atlantic Fishery Management Council (MAFMC) and adapted from the 2016 Mackerel, Squid, and Butterfish Specifications Environmental Assessment, available at: http://www.greateratlantic.fisheries.noaa.gov/regs/2016/January/16msb2016specspr.html.

Climate, physiographic, and hydrographic differences separate the Atlantic Ocean from Maine to Florida into the New England-Middle Atlantic Area and the South Atlantic Area (division/mixing at Cape Hatteras, NC). The inshore New England-Middle Atlantic area is fairly uniform physically and is influenced by many large coastal rivers and estuarine areas. The continental shelf (characterized by water less than 650 ft. in depth) extends seaward approximately 120 miles off Cape Cod, narrows gradually to 70 miles off New Jersey, and is 20 miles wide at Cape Hatteras. Surface circulation is generally southwesterly on the continental shelf during all seasons of the year, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. Water temperatures range from less than 33^{o}F from the New York Bight north in the winter to over 80^{o}F off Cape Hatteras in summer.

Within the New England-Middle Atlantic Area, the Northeast U.S. Continental Shelf Large Marine Ecosystem includes the area from the Gulf of Maine to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream. The Northeast U.S. Continental Shelf Large Marine Ecosystem is a dynamic, highly productive, and intensively studied system providing a broad spectrum of ecosystem goods and services. This region, encompassing the continental shelf area between Cape Hatteras and the Gulf of Maine, spans approximately 250,000 km^2 and supports some of the highest revenue fisheries in the U.S. The system historically underwent profound changes due to very heavy exploitation by distant-water and domestic fishing fleets. Further, the region is experiencing changes in climate and physical forcing that have contributed to large-scale alteration in ecosystem structure and function. Projections indicate continued future climate change related to both short and medium-term cyclic trends as well as non-cyclic climate change.

A number of distinct subsystems comprise the region. The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and fast-moving currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, NC. Detailed information on the affected physical and biological environments inhabited by the managed resources is available in Stevenson et al. (2006).

1.4.2. Identification and Distribution of Habitat and Habitat Areas of Particular Concern

Habitat information for Atlantic cobia is sparse. Few, if any, fishery independent surveys consistently interact with cobia in numbers adequate to develop any trends or conclusions. Much of the habitat data presented is generic for the coastal migratory pelagic fishes that include king and Spanish mackerel. Species-specific habitat information is a data and research need.

A description of the Habitat Areas of Particular Concern (HAPC) for CMP species is provided in Amendment 18 to the CMP FMP (GMFMC/ SAFMC 2011), and is incorporated herein by reference. Areas which meet the criteria for HAPCs include sandy shoals of Cape Lookout, Cape Fear, and Cape Hatteras from shore to the ends of the respective shoals, but shoreward of the Gulf stream; The Point, The Ten- Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump and Hurl Rocks (South Carolina); The Point off Jupiter Inlet (Florida); *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; nearshore hard bottom south of Cape Canaveral; The Hump off Islamorada (Florida); The Marathon Hump off Marathon (Florida); The “Wall” off of the Florida Keys; Pelagic *Sargassum*; and Atlantic coast estuaries with high numbers of Spanish mackerel and cobia based on abundance data from the Estuarine Living Marine Resources Program. Estuaries meeting this criteria for Spanish mackerel include Bogue Sound and New River (North Carolina), for cobia, Broad River (South Carolina).

1.4.2.1. Essential Fish Habitat for Coastal Migratory Pelagics

A description of the Essential Fish Habitat (EFH) for CMP species is provided in Amendment 18 to the CMP FMP (GMFMC and SAFMC 2011), and is incorporated herein by reference. EFH for

CMPs include coastal estuaries from the U.S./Mexico border to the boundary between the areas covered by the GMFMC and SAFMC from estuarine waters out to depths of 100 fathoms (GMFMC 2004). In the South Atlantic, EFH for coastal migratory pelagic species includes 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*. In addition, all coastal inlets, all state-designated nursery habitats of particular importance to coastal migratory pelagics (for example, in North Carolina this would include all primary nursery areas and all secondary nursery areas).

For cobia, EFH also includes high salinity bays, estuaries, and seagrass habitat. In addition, the Gulf Stream is an EFH because it provides a mechanism to disperse CMP larvae. For king and Spanish mackerel and cobia, EFH occurs in the South Atlantic and Mid-Atlantic Bights.

1.4.3. Present Condition of Habitats and Habitat Areas of Particular Concern

1.4.3.1. 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 cobia.

One threat to the spawning habitat for cobia 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 cobia spawning habitat.

Besides creating the need for dredging operations that directly and indirectly affect spawning habitat for cobia, 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 southeastern U.S. Studies have implicated jetty construction to alterations in hydrodynamic regimes, thus, affecting the transport of estuarine-dependent organisms' larvae through inlets (Miller *et al*. 1984, Miller 1988).

1.4.3.2. Estuarine Nursery, Juvenile and Subadult Habitat: Condition and threats

Coastal wetlands and their adjacent estuarine waters likely constitute primary nursery, juvenile, and sub-adult habitat for cobia 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, pers. comm.).

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. 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 cobia's similar dependence on estuarine habitats throughout its early life history, these same threats are likely to impact cobia as well.

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 cobia 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 upon which cobia depend. 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). Cobia may be similarly susceptible to such changes in the physical regime of their environment.

1.4.3.3. Adult Habitat: Condition and Threats

Threats to the cobia's adult habitat are not as numerous as those faced by postlarvae, juveniles, and subadults in the estuary and coastal waters. Current threats to the nearshore and offshore habitats that adult cobia 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 cobia habitat in the future. Currently, no mineral mining activities are taking place in the South Atlantic. However, various proposals to open 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 cobia habitat throughout different life stages in the future (ASMFC 2012). Currently, no offshore wind farms are established in the United States. However, the Atlantic coast is a potential candidate for future wind farm sites.

1.5. IMPACTS OF THE FISHERY MANAGEMENT

1.5.1. Biological and Environmental Impacts

Significant recreational fishery overages of the ACL in 2015 and 2016 raise concerns over the future status of the stock and potential of the stock becoming overfished. Adoption of coastwide management measures can provide flexibility to states while maintaining harvest within the ACL and protecting a portion of the spawning stock. Limits on catch can provide additional protection throughout cobia's geographic range to support a sustained population and fishery.

1.5.2. Social Impacts

Information on fishermen, fishing-dependent businesses, or communities that depend on the cobia fisheries Is available in CMP Amendment Framework 4 (SAFMC 2016). In order to understand the impact that any new rules and regulations may have on participants in any fishery, in-depth community profiles need to be developed that will aid in the description of communities involved, both present and historical. Limited social science research has been conducted in communities in the U.S. South Atlantic, and adequate descriptions of the potential effects on communities are not available at this time.

While not an in-depth ethnographic study, a project employing rapid assessment was completed to document the location, type, and history of fishing communities in the South Atlantic region. SAFMC staff worked collaboratively with the University of Florida to describe fishing communities in a broad manner (for example, whether the community is characterized mostly by commercial fishing, for-hire, recreational or some combination of all sectors), and link on-the-ground fieldwork with the collection of as much secondary data as possible. The secondary data included U.S. Census records, landings, permits, and state information. All of this information is used to form a baseline dataset to assist in the measurement of social and economic impacts (Jepson et al. 2006).

1.5.2.1. Recreational Fishery

The recreational sector of the cobia fishery is much larger than the commercial sector, and cobia is an important species for recreational anglers and the for-hire sector. Landings estimates indicate that the private recreational sector is the dominant component of the cobia recreational fishery (Table 5), and most landings are associated with Virginia and North Carolina (Table 4).

Implementation of the cobia FMP is expected to impact the recreational sector. Specifically it is likely that social impacts would be most significant for recreational fishermen and for-hire businesses in Virginia and North Carolina. However, the FMP will also allow management to maintain stock health and recreational participation, in addition to consistency in regulations among states.

1.5.2.2. Commercial Fishery

The commercial sector has operated primarily as a bycatch fishery for decades. The current ACL for the commercial fishery is 50,000 pounds from Georgia-New York. Current measures and those proposed in this document essentially maintain status quo for the commercial fishery. In accordance with federal policy, should the coastwide ACL be met, a closure would occur. Depending on the timing of any closure, social impacts would vary.

1.5.3. Other Resource Management Efforts

1.5.3.1. Artificial Reef Development/Management

Approximately 120,000 acres (155 nm^2) of ocean and estuarine bottom along the south Atlantic coast have been permitted for the development of artificial reefs (ASMFC 2002). The Georgia Department of Natural Resources is responsible for the development and maintenance of a network of man-made reefs both in estuarine waters and in the open Atlantic Ocean. Funding for the artificial reef program is provided by Federal Aid in Sport Fish Restoration, fishing license revenues, and private contributions. To date, there are 15 reefs within the estuary proper, which are constructed of a variety of materials including concrete rubble, metal cages, and manufactured reef units. These provide habitat for juvenile cobia and other species of recreationally important fishes. In 2001, three "beach" reefs were constructed in locations within Georgia's territorial waters just off the barrier island beaches. These are experimental in nature, but should provide some habitat for juvenile and adult cobia. There are 19 man-made reefs in the U.S. Exclusive Economic Zone (EEZ) ranging from depths of 40 to 130 feet. These reefs are constructed of a variety of materials including surplus vessels, concrete rubble, barges, bridge spans, and manufactured reef units. Both juvenile and adult cobia are known to use these reefs.

The Florida Fish and Wildlife Conservation Commission's (FWC) Division of Marine Fisheries Management administers a state artificial reef program that provides financial and technical assistance to coastal local governments, nonprofit corporations and state universities to develop artificial reefs and to monitor and evaluate these reefs. To date, there are 919 artificial reefs located in the Atlantic off Florida with 38 of these reefs being located within estuarine waters. The estuarine reefs are located in two Florida counties one being Dade County which has 32 and Palm Beach County which has six. Artificial habitats off Florida range in depth from six feet to 420 feet of water and consist of a variety of materials, i.e., concrete culverts, bridge spans, barges, and decommissioned military ships such as the ex-U.S.S. Hoyt Vandenberg which has become a very popular dive destination. Oyster shells are also used to create artificial habitat in Florida waters, but the FWC does not keep track of these reefs. These artificial habitats should provide habitat for juvenile and adult cobia off Florida's Atlantic coast.

New Jersey has also developed and invested in an artificial reef program, with the state agency involved since 1984. Similarly, Delaware has invested in an artificial reef program, with 14 reef sites within Delaware Bay. Artificial reef construction is especially important in the Mid-Atlantic region, where near shore bottom is usually featureless sand or mud.

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.

1.5.3.2. Bycatch

Cobia are uncommon bycatch components in most U.S. South and Mid-Atlantic fisheries. Mortalities resulting from cobia released from varying depths in the hook and line fisheries and regulatory discards from the large mesh gill fisheries in North Carolina and Virginia are unknown.

1.6. LOCATION OF TECHNICAL DOCUMENTATION FOR FMP

1.6.1. Review of Resource Life History and Biological Relationships

The PDT has compiled available life history data on cobia, much of which is contained in this document. Readers may review the documents developed for the Coastal Migratory Pelagics FMP by the SAFMC for historical perspective (SAFMC 2016).

1.6.2. Stock Assessment Document

The most recent cobia stock assessment (SEDAR 28) was completed in 2013. The stock assessment utilized the Beaufort Assessment Model with data through 2011 (SEDAR 2013). An updated stock assessment and review of stock structure information from genetic and tagging studies is scheduled for completion in 2019.

1.6.3. Economic Assessment Document

No economic assessment has been performed.

1.6.4. Law Enforcement Assessment Document

ASMFC's Law Enforcement Committee has prepared a document titled "Guidelines for Resource Managers on the Enforceability of Fishery Management Measures' (July 2009), which can be used to evaluate the effectiveness of future measures.

2. GOALS AND OBJECTIVES

2.1. HISTORY AND PURPOSE OF THE PLAN

2.1.1. History of Prior Management Actions

No interstate fisheries management program currently exists for Atlantic cobia. At present, four states have implemented harvest regulations for cobia (Table 9).

Table 9. 2017 State Recreational Regulations for Atlantic Cobia.

State	Size Limit	Bag Limit	Vessel Limit	Season	Notes
Georgia					
South Carolina	33" FL	1	3 south of Jeremy Inlet, 2 all other areas	See notes	May closure south of Jeremy Inlet
North Carolina	36" FL	1	4	May 1 – September 1	
Virginia	40" TL	1	3	June 1 – September 15	1 fish > 50" TL, No gaffing
Maryland	none	none	none	none	
Delaware	none	none	none	none	Implement federal regulations
New Jersey	37" TL	2	none	none	
New York	37" TL	2	none	none	

Commercial regulations are consistent throughout the management unit with a 33 inch FL minimum size limit (Virginia employs a 37 inch TL size limit) and 2 fish per license holder, with up to 6 fish allowed per trip, whichever is more restrictive. The one exception is Virginia, which allows 6 fish per trip regardless of the number of license holders on board.

2.1.2. Purpose and Need for Action

Currently there is no interstate management for cobia, but four main reasons have been identified as to why/how interstate management would benefit the fishery:

1) A majority of the coastwide catch occurs in state waters;
2) Need to maintain catches within the federal ACL;
3) Lack of consistent regulations and goals;
4) An Interstate FMP establishes a framework to provide greater flexibility to states and address future concerns or changes in the fishery or population.

2.2. GOAL

The goal of the Cobia FMP shall be to provide for an efficient management structure to implement coastwide management measures in a timely manner.

2.3. OBJECTIVES

1) Provide a flexible management system to address future changes in resource abundance, scientific information, and fishing patterns among user groups or area.
2) Promote cooperative collection of biological, economic, and social data required to effectively monitor and assess the status of the cobia resource and evaluate management efforts.
3) Manage the cobia fishery to protect both young individuals and established breeding stock.
4) Develop research priorities that will further refine the cobia management program to maximize the biological, social, and economic benefits derived from the cobia population.

2.4. SPECIFICATION OF MANAGEMENT UNIT

The proposed management unit is defined as the cobia (*Rachycentron canadum*) resource from Georgia through New York within U.S. waters of the northwest Atlantic Ocean, from the U.S. Atlantic coastal estuaries eastward to the offshore boundaries of the EEZ. The selection of this management unit is based on genetic analysis and tag-recapture data described in this document.

2.4.1. Management Areas

The proposed management area is the Atlantic coast distribution of the resource from Georgia through New York.

2.5. DEFINITION OF OVERFISHING

The federal The CMP FMP, as amended, specifies that overfishing is occurring when fishing mortality (F) exceeds the maximum fishing mortality threshold (MFMT), which is based on 30% Static Spawning Potential Ratio (SPR). This is determined only through a stock assessment.

Amendment 18 (GMFMC/SAFMC 2014) specified that because there was no Overfishing Level (OFL) recommendation available at that time, overfishing would be defined as landings exceeding the ACL. The Councils specified that OFL would be revisited after the stock assessment (SEDAR 28) was complete. Following completion of SEDAR 28, the SAFMC's SSC recommended an OFL based on the stock assessment.

2.6. STOCK REBUILDING PROGRAM

The NMFS lists the status of the cobia population as not overfished and that overfishing is not occurring; therefore, a stock rebuilding program is not required.

3. MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

Upon approval of the FMP, the South Atlantic Species Advisory Panel (AP) would meet as necessary to review stock assessments for cobia (when available) and all other relevant data pertaining to stock status. Based on this information, the AP would prepare and submit a report of recommendations to the Management Board.

The Cobia Technical Committee (TC) would meet annually, or as necessary, to review state management program changes, developments in the fishery, or other changes or challenges in the fishery.

The Cobia Stock Assessment Subcommittee (SAS), in cooperation with the SAFMC SSC, would generally meet every five years to review and update or perform a benchmark stock assessment on Atlantic cobia. This schedule may be modified as needed to incorporate new information and consideration of the Atlantic cobia stock. A new cobia stock assessment through the SEDAR process is scheduled for completion in 2019.

The Cobia Plan Review Team (PRT) would annually review implementation of the management plan and any subsequent adjustments (addenda), and report to the Management Board on any compliance issues that may arise. The PRT would also prepare the annual Cobia FMP Review and coordinate the annual update and prioritization of research needs (see Section 6.2).

3.1. ASSESSMENT OF ANNUAL RECRUITMENT

No programs currently collect data necessary to assess annual recruitment of cobia.

The FMP recommends examination of possible surveys from which Atlantic cobia abundance indices could be developed. These indices would be valuable for informing future stock assessments.

3.2. ASSESSMENT OF SPAWNING STOCK BIOMASS

SEDAR 28 (2013) provides the most current information on spawning stock biomass. While the stock is not currently considered overfished, the 2013 stock assessment does indicate declines in biomass over the last few years of the assessment (terminal year: 2010). New information should be revealed by the stock assessment scheduled for completion in 2019.

3.3. ASSESSMENT OF FISHING MORTALITY TARGET AND MEASUREMENT

SEDAR 28 (2013) provides the most current information on fishing mortality. The stock is not currently considered to be undergoing overfishing. While no definition currently exists for overfishing the cobia resource, recent overages of the ACL raises concerns. New information should be revealed by the stock assessment scheduled for completion in 2019.

3.4. SUMMARY OF MONITORING PROGRAMS

The proposed FMP includes no requirements regarding fishery-dependent monitoring programs, but all state fishery management agencies are encouraged to pursue full implementation of the standards of the Atlantic Coastal Cooperative Statistics Program (ACCSP). Upon approval of the FMP, the Management Board would recommend a transitional or phased-in approach be adopted to allow for full implementation of the ACCSP standards. Until the ACCSP standards are implemented, the Management Board would encourage state fishery management agencies to initiate implementation of specific ACCSP modules and/or pursue pilot and evaluation studies to assist in development of reporting programs to meet the ACCSP standards. The ACCSP partners are the 15 Atlantic coast states from Maine through Florida, the District of Columbia, the Potomac River Fisheries Commission, NOAA Fisheries, the U.S. Fish and Wildlife Service, the three federal Fishery Management Councils, and the Atlantic States Marine Fisheries Commission. Participation by program partners in the ACCSP would not relieve states from their responsibilities in collating and submitting harvest/monitoring reports to the Commission as required under the proposed FMP.

3.4.1. Catch, Landings, and Effort Information

3.4.1.1. Commercial Catch and Effort Data

The ACCSP's standard for commercial catch and effort statistics is mandatory, trip-level reporting of all commercially harvested marine species, with fishermen and/or dealers required to report standardized data elements for each trip by the tenth of the following month. Refer to the ACCSP Program Design document for more details on standardized data elements.

3.4.1.2. Recreational Catch and Effort Data

The ACCSP has selected the MRIP as the base program for recreational fishing data collection for shore and private boat fishing. The MRIP provides statistics for finfish, but does not cover shellfish fisheries, which will require development of new surveys. The MRIP combines data from two independent surveys to produce estimates of fishing effort, catch, and participation.

3.4.1.2.1. Household Telephone Survey for Effort Data

For private/rental boats and shore, fishing effort data is collected through a random digit-dialed telephone survey of recreational marine fishing license holders. A “wave” is a two-month sampling period, such as January through February (Wave 1) or March through April (Wave 2). The random-digit dialing survey for effort data is conducted in two-week periods that begin the last week of each wave and continue through the first week of the next wave.

3.4.1.2.2. Intercept Survey for Catch Data

Catch data for private/rental boats and shore fishing is collected through an access-site intercept survey. State partners are encouraged to increase their involvement in conducting the intercept survey. The ACCSP is addressing transition of conduct of the intercept survey for catch from a contractor to a cooperative agreement involving states at varying levels.

3.4.1.2.3. For-Hire Catch and Effort Data

The ACCSP has selected the NOAA Fisheries For-Hire Survey as the preferred methodology for collecting data from charterboats and headboats (partyboats), also called the “for-hire” sector. The For-Hire Survey is similar to the MRIP with two major improvements; it uses: 1) a telephone survey to collect fishing effort data from vessel representatives and 2) a validation process for the self-reported data. Catch data are collected in conjunction with the MRIP with the addition of on-board samplers for headboats.

The independent survey components of the For-Hire Survey include: 1) a vessel effort survey; 2) an effort validation survey; 3) an access-site intercept survey for catch data; and 4) at-sea samplers on headboats for catch data. Using the data collected through these surveys, NOAA Fisheries generates catch and effort estimates for for-hire fisheries.

Catch and effort for federally permitted headboats operating in the South Atlantic (North Carolina – Georgia) is monitored through the Southeast Region Headboat Survey conducted by the Southeast Fisheries Science Center. Vessel operators are required to file weekly electronic reports for all trips to report catch and effort. Dockside samplers collect biological samples from the catches, and at-sea observers as mentioned above also sample South Atlantic headboats.

3.4.1.2.4. Vessel Telephone Survey for Effort Data

The vessel effort survey is a mandatory survey for for-hire vessels that uses a coastwide directory of such vessels as the sampling frame for for-hire fishing effort. The directory is continually updated as intercept and telephone interviewers identify changes in the fleet. Optimal sampling levels will be determined following evaluation of the Atlantic coast For-Hire Survey results from the first three years. Until the optimal sampling level is determined, a minimum of 10% of for-hire vessels or three charterboats and three headboats (whichever is greater), will be randomly sampled each week in each state. A vessel representative, usually the captain, is called and asked to provide information on the fishing effort associated with that vessel during the previous week. Vessel representatives are notified in advance that they have been selected for sampling and an example form is provided. To be included in the sample frame for particular wave, a vessel record must include: 1) at least one vessel representative's telephone number; 2) the name of the vessel or a vessel registration number issued by a state or the U.S. Coast Guard; 3) the county the boat operates from during that wave, and 4) designation as either a charter or guide boat (both called "charter") or headboat.

3.4.1.2.5. Validation Survey for Effort Data

To validate the self-reported effort data collected through the vessel telephone survey, field samplers periodically check access sites used by for-hire vessels to observe vessel effort. Interviewers record the presence or absence of a for-hire vessel from its dock or slip, and if the vessel is absent, they try to ascertain the purpose of the trip. Those observations are compared to telephone data for accuracy and to make any necessary corrections.

3.4.1.2.6. Catch Data

Vessels that meet the ACCSP definition of a charterboat, "typically hired on a per trip basis," are sampled for catch data through an intercept site survey of anglers at access points, similar to the MRIP. The intercept survey has been in progress since 1981.

Some Partners collect for-hire effort data using Vessel Trip Reports (VTR), which are mandatory for some vessels and contain all minimum data elements collected by the For-Hire Survey. In areas where the survey runs concurrently with VTR programs, captains selected for the weekly telephone survey are permitted to fax their VTRs in lieu to being interviewed by phone.

3.4.1.2.7. At-Sea Sampling of Headboats

At-sea samplers collect catch data aboard headboats, defined by the ACCSP as "any vessel-for-hire engaged in recreational fishing that typically is hired on a per person basis." Samples collected at-sea are supplemented by dockside sampling.

3.4.2. Biological Information

The ACCSP has set standards for how biological data should be collected and managed for commercial, recreational, and for-hire fisheries. Trained field personnel, known as port agents or field samplers, should obtain biological samples. Information should be collected through direct observation or through interviews with fishermen. Detailed fishery statistics and/or biological samples should be collected at docks, unloading sites, and fish houses. Biological sampling includes species identification of fish and shellfish; extraction of hard parts including spines and otoliths; and tissue samples such as gonads, stomachs, and scales.

3.4.3. Social and Economic Information

3.4.3.1. Commercial Fisheries

The ACCSP is testing its sociological and economic data collection standards for commercial harvesters. Standards for these types of data for dealers and fishing communities are in development with the Committee on Economics and Social Sciences. The ACCSP should collect baseline social and economic data on commercial harvesters using the following voluntary surveys:

- An annual fixed cost survey directed at the owner/operator,
- A trip cost survey to evaluate variable costs associated with a particular vessel's most recent commercial fishing trip to be directed at the vessel captain, and
- An annual owner/captain/crew/survey to gather sociological information.

Surveys may also be conducted using permit and registration data and vessel trip reports or sampling frames.

3.4.3.2. Recreational and For-hire Fisheries

The ACCSP's sociological and economic data for recreational and for-hire fisheries should come from periodic add-ons to existing telephone and intercept surveys. The standard is voluntary surveys of finfish fisheries conducted at least every three years.

3.4.4. Observer Programs

No specific observer programs are in place to monitor the cobia fishery. Observer programs already in place, whether state or federal, may observe capture of cobia in other monitored fisheries or specific gear types. A review of these programs should take place.

3.5. STOCKING PROGRAM

The Virginia Institute of Marine Science (VIMS) began an experimental stocking program in the Chesapeake Bay in 2003 to explore stock enhancement and study juvenile movement and habitat utilization (VIMS 2017). Juvenile cobia were tagged and released into the Chesapeake Bay in 2003, 2006, 2007, and 2008, with more than 300 tagged releases occurring in those first two years. Recapture information indicated habitats ranged from 1-4 m in depth and consisting of sandy and grass-bed bottoms. It is unclear whether this program had any effect on the population of cobia in Virginia, although it is assumed to have had minimal impact due to the small number of releases.

South Carolina has an experimental stock enhancement program designed to evaluate the methodology necessary for augmenting wild populations. To date experiments have been designed to determine best size and time of year to stock cobia in coastal rivers focused on augmentation of the distinct population segment of cobia in SC. Locally-caught brood stock have been conditioned to spawn in recirculating seawater systems using temperature and photoperiod conditioning and hormone implantations to facilitate final oocyte maturation. To date multiple years of spawning and growout have occurred, and more than 50,000 (60-350 mm TL) cobia have been stocked in the Colleton and Broad Rivers of Port Royal Sound. All fish are genetically identifiable to broodstock group and can be identified in the catch and distinguished genetically from wild-spawned fish. Cobia tissue samples collected from charterboat captains and from carcasses collected at tournaments and cooperating recreational anglers show that as much as 50% of the catch from the 2007 year-class were from hatchery releases and that these animals have persisted in the catch each year since release. This research has demonstrated the application of stock enhancement as an additional management tool for cobia. In addition to research on production of animals, the SCDNR has developed predictive individual-based genetic models to determine the appropriate number of cobia that should be produced and stocked each year in order to grow the population while minimizing any negative impact on the genetic health of the wild population.

3.6. BYCATCH REDUCTION PROGRAM

Bycatch is defined as “portion of a non-targeted species catch taken in addition to the targeted species. It may include non-directed, threatened, endangered, or protected species, as well as individuals of the target species below a desired or regulatory size” (ASMFC 2009a). Bycatch can be divided into two components: incidental catch and discarded catch. Incidental catch refers to retained or marketable catch of non-targeted species, while discarded catch is the portion of the catch returned to the sea because of regulatory, economic, or personal considerations.

The ACCSP’s bycatch standards include both quantitative and qualitative components. The quantitative components include at-sea sampling programs and collection of bycatch data through fisherman reporting systems. The qualitative components include sea turtle and marine mammal entanglement and stranding networks, beach bird surveys, and add-ons to existing recreational and for-hire intercept and telephone surveys. Specific fisheries priorities will be determined annually by the Bycatch Prioritization Committee.

The recreational cobia fishery is largely a directed fishery with bycatch occurring in fisheries directed towards other species. Mortality associated with regulatory discards of undersized cobia or fish taken after the bag limit is reached is largely unknown but likely varies based on depth caught and methods used to boat the catch.

The commercial cobia fishery tends to be a bycatch fishery in the hook and line and large mesh gill net fisheries. Juvenile cobia have been documented as bycatch in shrimp trawls off the

Atlantic coast, although this is not a frequent occurrence. All shrimp trawlers in the South Atlantic are required to use bycatch reduction devices, as of the 1996 Amendment 2 to the Federal Shrimp Fishery Management Plan.

3.7. HABITAT PROGRAM

Particular attention should be directed toward cobia 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 cobia range from the middle portions of estuaries and coastal rivers 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.

4. MANAGEMENT PROGRAM OPTIONS

intent of the management program would be to complement management actions taken by the SAFMC by maintaining harvest within the ACL (currently set at 670,000 pounds), while providing the states the flexibility to adjust management to suit their specific state needs. To accomplish this, the PDT developed management options that would allocate a coastwide harvest limit set equivalent to and monitored concurrently with the federal ACL, should such a limit exist. In the event that the federal ACL is removed, the coastwide harvest limit and state allocations will remain the same as those in place during the last year that the ACL was in place, unless specified by Board through board action. It should be noted that state-specific allocations developed in this FMP may be revisited through the ASMFC's adaptive management process as more data and updated estimates are obtained.

The current allocation of the coastwide, Atlantic Migratory Group ACL is 620,000 pounds to the recreational fishery and 50,000 pounds to the commercial fishery.

4.1. RECREATIONAL FISHERIES MANAGEMENT OPTIONS

In order to complement the current federal FMP and achieve the goals of the proposed ASMFC FMP, this document proposes that all states would establish regulations consistent with the federal regulations related to size and bag limits.

Several alternatives for state allocations were developed and discussed by the Board and the PDT. As a result of low and variable sample sizes and inconsistencies in the estimation of average weights throughout the management unit, state allocations of the proposed recreational harvest limit are based on historical landings in numbers of fish as opposed to weights. These percentages, based on numbers of fish, would be multiplied by the coastwide recreational harvest limit (equivalent to the federal recreational ACL, currently 620,000 pounds) to calculate annual state allocations in pounds. All landings would continue to be monitored against the federal ACL as weights in pounds.

4.1.1. Size Limit Options

Option 1: Status Quo: No coastwide size limit option**.**

Option 2: Coastwide size limit: All states would be required to establish a minimum size limit of 36 inches FL by April 1, 2018. A total length equivalent may be considered by the TC and Management Board.

4.1.2. Bag Limit Options

Option 1: Status Quo: No coastwide bag limit option.

Option 2: Coastwide bag limit: All states would be required to establish a 1 fish per person bag limit by April 1, 2018.

4.1.3. Vessel Limit Options

Option 1: Status Quo: No coastwide vessel limit option.

Option 2: Coastwide vessel limit: All states would be required to establish a daily vessel limit not to exceed 6 fish per vessel by April 1, 2018.

4.1.4. Season and Allocation Options

Management of the recreational harvest limit may be accomplished by coastwide or state-specific seasons. Options for management of the recreational harvest limit, including state allocation options, are shown below (Options 1-3).

Options 1 and 2 are methods for allocating the coastwide recreational harvest limit to the states as hard quotas or soft targets, based on historical landings during one of several reference time periods between 2006 and 2015 (Tables 10 and 11; Sub-Options a-d). 2015 was chosen as the terminal year for reference period landings due to fishery closures that occurred after 2015. Landings data from states north of Virginia are excluded from calculation of coastwide harvests for state allocations due to the rare and sporadic nature of landings in these states. Using SEFSC data, historical landings in states north of Virginia are:

2005 – Delaware – 1,480 lbs.

2006 and 2012– New Jersey – 27,863 lbs., 69,655 lbs.

2010 and 2016 – Maryland – 1,287 lbs., 1,762 lbs.

Average landings in pounds and corresponding percentages by state vary based on the time series selected and the landings estimate used (SEFSC or MRIP). As a result of concerns raised over the variability in average weights throughout the management unit and the observation that total numbers of fish harvested were consistent between estimation methods, the PDT examined the landings by number of fish to eliminate any bias or concern related to average weights (Table 10).

Option 3 is an option for coastwide management using a combination of coastwide seasons and daily vessel limits (Sub-Options a-f) to restrict harvest to the coastwide recreational harvest limit. For this option, larger changes in season dates correspond to the lower range of potential daily vessel limits because of the lack of high-catch trips in the recreational survey data. Few intercepted anglers reported catching four or more fish in a trip, thus, reductions to higher vessel limits would be projected to minimally reduce harvest. However, a daily vessel limit of one or two fish would be projected to cause a more substantial reduction in harvest.

Other allocation options may be considered in a subsequent amendment that could rely on F-based, rolling annual catch estimates, or other methods.

Option 1: State-defined seasons that adhere to hard state-by-state recreational quota shares of the coastwide recreational harvest limit, based on states' percentages of the coastwide historical landings in numbers of fish during a specified reference period (Sub-Options a-d). Percentage shares of the coastwide recreational harvest limit would only be divided among states that do not qualify for *de minimis* status. States would develop harvest control measures/seasons to limit catches to their assigned quota. Proposed state measures/seasons must be reviewed and approved by the TC and Management Board for initial implementation by April 1, 2018. Overages in one year must be accounted for in the following year's harvest control plan by reducing season length or vessel limits. Under-harvest would not carry over. Allocation of the ACL may be re-evaluated by the Management Board if a *de minimis* state exceeds the *de minimis* threshold.

Historical Landings Reference Period Sub-Options:

a) 3-year average (2013-2015)
b) 5-year average (2011-2015)
c) 10-year average (2006-2015)
d) 50% of 5-year average (2011-2015) + 50% of 10-year average (2006-2015)

Option 2: State-defined seasons that adhere to soft state-by-state recreational quota shares (harvest targets) of the coastwide recreational harvest limit, based on states' percentages of the coastwide historical landings in numbers of fish during a specified reference period (Sub-Options a-d). The coastwide recreational harvest limit would only be divided among states that do not qualify for *de minimis* status. States would develop harvest control measures to limit catches to their assigned soft harvest target. Proposed state measures must be reviewed and approved by the TC and Management Board for initial implementation by April 1, 2018. Measures approved by the Management Board would remain in place for a specified amount of time, ranging from 2-3 years (Sub-Options e-f).

After each specified time period (Sub-Options e-f), if a state's average annual landings for that time period (Sub-Options e-f) are greater than their annual soft harvest target, that state will adjust their season length or vessel limits for the following specified time period (Sub-Options e-f) as necessary to prevent exceeding their share in the future. States reporting an under-harvest over the previous specified time period (Sub-Options e-f) may present a plan to extend seasons or increase vessel limits, if desired. Changes to management measures for states with overages or states that wish to liberalize management measures must be reviewed and approved by the TC and Management Board prior to implementation. Determination of state-by-state soft targets may be re-evaluated by the Management Board if a *de minimis* state exceeds the *de minimis* threshold.

Historical Landings Reference Period Sub-Options (a-d):

a) 3-year average (2013-2015)
b) 5-year average (2011-2015)
c) 10-year average (2006-2015)
d) 50% of 5-year average (2011-2015) + 50% of 10-year average (2006-2015)

Average Landings Monitoring Timeframe Sub-Options (e-f):

e) 2 years
f) 3 years

The information used to calculate state specific harvest quotas for Options 1 and 2 are contained in Tables 10 and 11.

Table 10. Average AMG Cobia recreational landings in numbers (n) and percentages of recreational landings from Georgia through Virginia for establishing hard recreational quotas for Options 1 and soft recreational harvest targets for Option 2. Averages are calculated by state for 3-year (2013-2015; Sub-option a), 5-year (2011-2015; Sub-Option b), and 10-year (2006-2015; Sub-Option c) time periods, as well as an average of the 5-year and 10-year time periods (5-yr/10-yr Average; Sub-Option d).

State	a. 3-yr Average (2013-2015)	b. 5-yr Average (2011-2015)	c. 10-yr Average (2006-2015)	d. 5-yr/10-yr Average
Georgia	n = 1,421 4.5%	n = 2,150 9.0%	n = 2,445 10.0%	n = 2,298 9.5%
South Carolina	n = 1,984 6.3%	n = 2,558 10.8%	n = 3,312 13.6%	n = 2,935 12.2%
North Carolina	n = 15,065 48.2%	n = 10,344 43.5%	n = 8,203 33.6%	n = 9,273 38.5%
Virginia	n = 12,799 40.9%	n = 8,714 36.7%	n = 10,465 42.9%	n = 9,589 39.8%
Total	N = 31,269 100%	N = 23,766 100%	N = 24,425 100%	n = 24,095 100%

Data source: SEFSC w/ headboat.

Table 11. Division of the coastwide recreational harvest limit of 613,800 pounds (equivalent to the federal ACL, which is currently 620,000 pounds, as reduced by a 1% set aside for *de minimis* states) for cobia by state based on percentages derived from Table 10.

State	a. 3-yr Average (2013-2015) (lbs.)	b. 5-yr Average (2011-2015) (lbs.)	c. 10-yr Average (2006-2015) (lbs.)	d. 5-yr/10-yr Average (lbs.)
GA	27,621	55,242	61,380	58,311
SC	38,669	66,290	83,477	74,885
NC	295,852	267,003	206,237	236,313
VA	251,044	225265	263,320	244,292

Data source: SEFSC w/ headboat.

Option 3: Coastwide season and daily vessel limit based on federal CMP Framework 4 analysis (2013-2015), with a 1 fish per person bag limit and 36 inch FL size limit. This option is essentially status quo of the current federal FMP.

Under this option, annual overages in coastwide landings would be paid back through a reduction in the following year's coastwide recreational harvest limit.

Coastwide season and vessel limit Sub-Options (a-f):

a) January 1-August 22 with 1 fish vessel limit
b) January 1-July 28 with 2 fish vessel limit
c) January 1-July 20 with 3 fish vessel limit
d) January 1-July 18 with 4 fish vessel limit
e) January 1-July 17 with 5 fish vessel limit
f) January 1-July 15 with 6 fish vessel limit

4.2. COMMERCIAL FISHERIES MANAGEMENT OPTIONS

This document proposes that commercial fishery management measures for cobia would complement the existing commercial regulations contained in CMP Amendment 20 (50,000 pound ACL). In accordance with federal policy, should the coastwide ACL be met, a closure would occur.

4.2.1. Size Limit Options

Option 1: Status Quo: No coastwide size limit.

Option 2: Coastwide size limit: All states would be required to establish a 33 inch FL minimum size limit for commercial cobia fisheries by April 1, 2018. An equivalent total length may be considered by the TC and Management Board.

4.2.2. Possession Limit Options

Option 1: Status Quo: No coastwide possession limit.

Option 2: Coastwide possession limit: All states would be required to establish a maximum commercial possession limit of 2 cobia per license holder not to exceed 6 cobia per vessel by April 1, 2018.

4.3. HABITAT CONSERVATION AND RESTORATION

4.3.1. Threats to Cobia Habitat

Threats to Cobia habitats include the following: loss of estuarine and marine wetlands, coastal development, nutrient enrichment of estuarine waters, poor water quality, hydrologic modifications, and alteration of freshwater flows into estuarine waters.

4.3.2. Recommendations

1. Where sufficient knowledge is available, states should designate cobia habitat areas of particular concern 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 potential threats to cobia 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, 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 cobia 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, if possible, or at a minimum, adequately mitigated.
5. Each state should establish windows of compatibility for activities known or suspected to adversely affect cobia 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.
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 interruption of 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 cobia tolerance limits.

7. The use of any fishing gear that is determined by management agencies to have a negative impact on cobia 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 conduct research to evaluate the role of submerged aquatic vegetation (SAV) and other submersed structures in the spawning success, survival, growth and abundance of cobia. 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.
9. 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.
10. Water quality criteria for cobia 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.
11. State fishery regulatory agencies, in collaboration with state water quality agencies, should monitor water quality in known habitat for cobia, including turbidity, nutrient levels, and dissolved oxygen.
12. States should work to reduce point-source pollution from wastewater through such methods as improved inspections of wastewater treatment facilities and improved maintenance of collection infrastructure.
13. 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 cobia habitats are protected and water quality needs are met.

4.4. ALTERNATIVE STATE MANAGEMENT REGIMES

Upon approval of the FMP, states would be required to obtain prior approval from the Management Board for any changes to their management program for which a compliance requirement is in effect. Changes to non-compliance measures would be required to be reported to the Management Board but may be implemented without prior Management Board approval. A state would be able to request permission to implement an alternative to any mandatory compliance measure only if that state could show to the Management Board's satisfaction that its alternative proposal would have the same conservation value as the measures contained in this FMP or subsequent amendments or addenda. States submitting alternative proposals would be required to demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans would be required to be submitted in writing to the Management Board either as part of the annual FMP Review process or in the Annual Compliance Reports.

4.4.1. General Procedures

A state would be able to submit a proposal for a change to its regulatory program or any mandatory compliance measure under the Cobia Fishery Management Plan to the Management Board, including a proposal for *de minimis* status. Such changes would be submitted to the Chair of the PRT, who would distribute the proposal to the Management Board, PRT, TC, SAS, and AP.

The PRT would be responsible for gathering the comments of the TC, SAS, and AP and presenting these comments as soon as possible to the Management Board for decision.

The Management Board would decide whether to approve the state proposal for an alternative management program if it determines that it is consistent with the “target fishing mortality rate applicable” and the goals and objectives of this FMP.

4.4.2. Management Program Equivalency

The TC, under the direction of the PRT, would review any alternative state proposals under this section and provide to the Management Board its evaluation of the adequacy of such proposals.

Following the first full year of implementation of an alternate management program, the PRT would have the responsibility of evaluating the effects of the program to determine if the measures were equivalent with the standards of the FMP and subsequent amendments or addenda. The PRT would report to the Management Board on the performance of the alternate program.

4.4.3. *De minimis* Fishery Guidelines

The ASMFC ISFMP Charter defines *de minimis* as “a situation in which, under the existing condition of the stock and scope of the fishery, conservation, and enforcement actions taken by an individual state would be expected to contribute insignificantly to a coastwide conservation program required by a Fishery Management Plan or amendment” (ASMFC 2009b).

States may petition the Management Board at any time for *de minimis* status. Once *de minimis* status is granted, designated states must submit annual reports including commercial and recreational landings to the Management Board, justifying the continuance of *de minimis* status. States must include *de minimis* requests as part of their annual compliance reports.

Option 1: No *de minimis* program

Option 2: Include *de minimis* program for both commercial and recreational fisheries, collectively: To qualify for *de minimis*, a state’s total (recreational and commercial) landings for 2 of the previous 3 years must be less than 1% of the coastwide total landings for the same time period. If a state qualifies for *de minimis*, the state may have the ability to choose to match the management measures implemented by an adjacent non-*de minimis* state (or the nearest non-

de minimis state if none are adjacent) or the state's recreational and commercial fisheries would be limited to 1 fish per vessel per trip (Sub-Options a-b). Minimum size of the 1 fish per vessel per trip may mirror the previously proposed minimum size limits of the commercial and recreational fisheries (33 inches and 36 inches FL, respectively; Sub-Option c) or be the more conservative limit (36 inches FL; Sub-Option d) for both the commercial and recreational sectors. One-percent (1%) of the total, federal ACL (6,700 pounds) will be set aside for de minimis state landings.

***De Minimis*-Qualifying State's Ability to Match Management Measures of Adjacent Non-*De Minimis* State Sub-Options (a-b):**

a) A *de minimis* state may not have the ability to choose to match recreational management measures of an adjacent (or the nearest) non-*de minimis* state. *De minimis* states' recreational fisheries would be subject to a 1 fish per vessel per trip limit with a minimum size limit (Sub-Options c-d).

b) A *de minimis* state may have the ability to choose to match management measures of an adjacent (or the nearest) non-*de minimis* state. Should a *de minimis* state choose to match an adjacent (or the nearest) non-*de minimis* state, the *de minimis* state would be subject to all cobia regulations, including bag, possession, size, vessel, and season restrictions, of their adjacent (or nearest) non-*de minimis* state. *De minimis* states would also have an alternative management option of a 1 fish per vessel per trip limit with a minimum size limit (Sub-Options c-d). For example, a state north of Virgina (e.g. Delaware) could choose to implement the Board approved measures of Virginia, the nearest non-*de minimis* state, or implement a 1 fish per vessel per trip limit with a minimum size limit (Sub-Options c-d) to comply with *de minimis* requirements.

Minimum Size Limits for *De Minimis*-Qualifying States Sub-Options (c-d):

c) Minimum size limits of 33 inches FL for the commercial fishery and 36 inches FL for the recreational fishery
d) Minimum size limit of 36 inches FL for both the commercial and recreational fisheries

Option 3: Include *de minimis* program for recreational fisheries only: To qualify for *de minimis*, a state's recreational landings for 2 of the previous 3 years must be less than 1% of the coastwide recreational landings for the same time period. If a state qualifies for *de minimis*, the state may have the ability to choose to match the recreational management measures implemented by an adjacent non-*de minimis* state (or the nearest non-*de minimis* state if none are adjacent) or the state's recreational fishery would be limited to 1 fish per vessel per trip (Sub-Options a-b). Minimum size of the 1 fish per vessel per trip may mirror the previously proposed coastwide minimum size limit of the recreational fishery (36 inches FL; Sub-Option c) or be less conservative (FL at 50% female maturity according to SEDAR 28; 29 inches FL) based on observations that cobia at the northern edge of their range tend to be smaller (Sub-Option d). One-percent (1%) of the recreational, federal ACL (6,200 pounds) will be set aside for de minimis state landings.

***De Minimis*-Qualifying State's Ability to Match Management Measures of Adjacent Non-*De Minimis* State Sub-Options (a-b):**

a) A *de minimis* state may not have the ability to choose to match recreational management measures of an adjacent (or the nearest) non-*de minimis* state. *De minimis* states' recreational fisheries would be subject to a 1 fish per vessel per trip limit with a minimum size limit (Sub-Options c-d).

b) A *de minimis* state may have the ability to choose to match recreational management measures of an adjacent (or the nearest) non-*de minimis* state. Should a *de minimis* state choose to match an adjacent (or the nearest) non-*de minimis* state, the *de minimis* state would be subject to all recreational cobia regulations, including bag, size, vessel, and season restrictions, of their adjacent (or nearest) non-*de minimis* state. *De minimis* states would also have an alternative recreational management option of a 1 fish per vessel per trip limit with a minimum size limit (Sub-Options c-d). For example, a state north of Virgina (e.g. Delaware) could choose to implement the Board approved measures of Virginia, the nearest non-*de minimis* state, or implement a recreational 1 fish per vessel per trip limit with a minimum size limit (Sub-Options c-d) to comply with *de minimis* requirements.

Minimum Size Limits for *De Minimis*-Qualifying States Sub-Options (c-d):

c) Minimum size limit of 36 inches FL for the recreational fishery
d) Minimum size limit of 29 inches FL for the recreational fishery

4.5. ADAPTIVE MANAGEMENT

The Management Board would be able to vary the requirements specified in this FMP as a part of adaptive management in order to conserve the cobia resource. Specifically, the Management Board would be able to change target fishing mortality rates, harvest specifications, or other measures designed to prevent overfishing of the stock complex or any spawning component. Such changes would be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Management Board.

4.5.1. General Procedures

The PRT would monitor the status of the fisheries and the resources and report on that status to the Management Board annually or when directed to do so by the Management Board. The PRT would consult with the TC, SAS, and AP in making such review and report. The report will contain recommendations concerning proposed adaptive management revisions to the management program.

The Management Board would review the report of the PRT, and may consult further with the TC, SAS, or AP. The Management Board would be able to, based on the PRT Report or on its own discretion, direct the PRT to prepare an addendum to make any changes it deems necessary. The addendum would contain a schedule for the states to implement its provisions.

The PRT would prepare a draft addendum, as directed by the Management Board, and distribute to the board for approval for public comment. The document would be released for public comment for a minimum of 30 days. A public hearing would be held in any state that requests one. After the comment period, the PRT would summarize the comments and present them to the Board along with the recommendations of the TC, SAS,LEC and AP, when applicable. The Management Board would choose a management program and approve a final document.

Upon adoption of an addendum implementing adaptive management by the Management Board, states would prepare plans to carry out the addendum and submit them to the Management Board for approval, according to the schedule contained in the addendum.

4.5.2. Measures Subject to Change

The following measures would be subject to change under adaptive management upon approval by the Management Board:

(1) Fishing year and/or seasons;
(2) Area closures;
(3) Overfishing definition, MSY and OY;
(4) Rebuilding targets and schedules;
(5) Fishery Specifications
(6) Catch controls, including bag and size limits;
(7) Effort controls;
(8) Bycatch allowance
(9) Reporting requirements;
(10) Gear limitations;
(11) Measures to reduce or monitor bycatch;
(12) Observer requirements;
(13) Management areas;
(14) Recommendations to the Secretaries for complementary actions in federal jurisdictions;
(15) Research or monitoring requirements;
(16) Frequency of stock assessments;
(17) *De minimis* specifications;
(18) Management unit;
(19) Maintenance of stock structure;

(20) Catch allocation; and
(21) Any other management measures currently included in the FMP.

4.6. EMERGENCY PROCEDURES

Emergency procedures would be able to be used by the Management Board to require any emergency action that is not covered by or is an exception or change to any provision in the FMP. Procedures for implementation are addressed in the ASMFC ISFMP Program Charter, Section Six (c) (11) (ASMFC 2009b).

4.7. MANAGEMENT INSTITUTIONS

The management institution for cobia would be subject to the provisions of the ISFMP Charter (ASMFC 2009b). The following would not be intended to replace any or all of the provisions of the ISFMP Charter. All committee roles and responsibilities are included in detail in the ISFMP Charter and are only summarized here.

4.7.1. ASMFC and the ISFMP Policy Board

The ASMFC and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans and amendments, and must make all final determinations concerning state compliance or non-compliance. The ISFMP Policy Board reviews any non-compliance recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.7.2. South Atlantic State/Federal Fisheries Management Board

The South Atlantic State/Federal Fisheries Management Board (Management Board) was established under the provisions of the Commission's ISFMP Charter (Section Four; ASMFC 2009b) and would be generally responsible for carrying out all activities under this FMP.

The Management Board establishes and oversees the activities of the Cobia FMP's PDT, PRT, TC, and SAS, as well as the South Atlantic Species AP. Among other things, the Management Board makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under Sections 4.4 and 4.5. The Management Board reviews the status of state compliance with the management program, at least annually, and if it determines that a state is out of compliance, reports that determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.7.3. Cobia Plan Development Team / Plan Review Team

The Cobia Plan Development Team (PDT) and Cobia Plan Review Team (PRT) would be composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the Management Board. An ASMFC FMP Coordinator chairs the PDT and PRT. The PDT and PRT would be directly responsible to the Management Board for providing information and documentation concerning the implementation, review, monitoring and enforcement of the species management plan. The PDT and PRT would be comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of the relevant species. The Cobia PDT is responsible for preparing all documentation necessary for the development of the FMP, using the best scientific information available and the most current stock assessment information. The PDT will either disband or assume inactive status upon completion of the FMP. Alternatively, the Board may elect to retain PDT members as members of the species-specific PRT or appoint new members. The PRT would provide annual advice concerning the implementation, review, monitoring, and enforcement of the FMP once it has been adopted by the Commission.

4.7.4. Technical Committee

The Cobia Technical Committee (TC) would consist of representatives from state and/or federal agencies, Regional Fishery Management Councils, Commission, university or other specialized personnel with scientific and technical expertise and knowledge of the relevant species. The Management Board would appoint the members of a TC and may authorize additional seats as it sees fit. Its role is to act as a liaison to the individual state and federal agencies, provide information to the management process, and review and develop options concerning the management program. The TC would provide scientific and technical advice to the Management Board, PDT, and PRT in the development and monitoring of a fishery management plan or amendment.

4.7.5. Stock Assessment Subcommittee

The Cobia Stock Assessment Subcommittee (SAS) would be appointed and approved by the Management Board, with consultation from the TC, and will consist of scientists with expertise in the assessment of the relevant population. Its role is to assess the species population and provide scientific advice concerning the implications of proposed or potential management alternatives, or to respond to other scientific questions from the Management Board, TC, PDT or PRT. The SAS would report to the TC and work closely with the Southeast Fishery Science Center and SAFMC SSC in developing upcoming stock assessments.

4.7.6. Advisory Panel

The South Atlantic Species Advisory Panel (AP) was established according to the Commission's Advisory Committee Charter. Members of the AP are citizens who represent a cross-section of commercial and recreational fishing interests and others who are concerned about the conservation and management of cobia, as well as Spanish mackerel, spot, black drum, red drum, and spotted seatrout, and Atlantic croaker. The AP provides the Management Board with advice directly concerning the Commission's management program for these six species.

4.7.7. Federal Agencies

4.7.7.1. Management in the Exclusive Economic Zone (EEZ)

Management of cobia in the EEZ is within the jurisdiction of the SAFMC under the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. 1801 et seq.). In the absence of a Council Fishery Management Plan for cobia, management of this species is the responsibility of the NOAA National Marine Fisheries Service (NOAA Fisheries) as mandated by the Atlantic Coastal Fisheries Cooperative Management Act (16 U.S.C. 5105 et seq.).

4.7.7.2. Federal Agency Participation in the Management Process

The Commission has accorded the United States Fish and Wildlife Service (USFWS) and NMFS NOAA Fisheries voting status on the ISFMP Policy Board and the South Atlantic State/Federal Fisheries Management Board in accordance with the Commission's ISFMP Charter. NOAA Fisheries and the USFWS may also participate on the Management Board's supporting committees described in *Sections 4.7.3-4.7.6*.

4.7.7.3. Consultation with Fishery Management Councils

In carrying out the provisions of this FMP, the states, as members of the South Atlantic State/Federal Fisheries Management Board, would closely coordinate with the SAFMC to cooperatively manage the Atlantic Migratory Group of cobia. In accordance with the Commission's ISFMP Charter, a representative of the SAFMC shall be invited to participate as a full member of the Management Board.

4.8. RECOMMENDATIONS TO THE SECRETARIES FOR COMPLEMENTARY ACTIONS IN FEDERAL JURISDICTIONS

The SAFMC manages cobia in the EEZ through bag, size limits, trip limits and seasons. It is in the interest of the Interstate FMP to achieve consistency in management efforts in state waters and the EEZ. At present, NOAA fisheries has closed the EEZ to cobia harvest in the recreational fishery to maintain harvest within the prescribed ACL. Because reliance on the EEZ for cobia harvest varies by state, closure impacts vary from south to north. The majority of the recreational harvest off Georgia occurs in the EEZ, while little harvest occurs in the EEZ off Virginia. A primary consideration for the Interstate cobia FMP may be to recommend consistent measures in state and federal waters to avoid in season closures.

4.9. COOPERATION WITH OTHER MANAGEMENT INSTITUTIONS

At this time, no other management institutions have been identified that would be involved with management of cobia on the Atlantic coast. Nothing in the FMP precludes the coordination of future management collaborations with other management institutions, should the need arise.

5. COMPLIANCE

Full implementation of the provisions of this FMP would be necessary for the management program to be equitable, efficient, and effective. States would be expected to implement these measures faithfully under state laws. Although the ASMFC does not have authority to directly compel state implementation of these measures, it would continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. This section sets forth the specific elements states would be required to implement in order to be in compliance with this FMP, and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC ISFMP Charter (ASMFC 2009b).

5.1. MANDATORY COMPLIANCE ELEMENTS FOR STATES

A state would be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- Its regulatory and management programs to implement *Section 4* have not been approved by the Management Board; or
- It fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under Adaptive Management (*Section 4.5*); or
- It has failed to implement a change to its program when determined necessary by the South Atlantic State-Federal Fisheries Management Board; or
- It makes a change to its regulations required under *Section 4* or any addendum prepared under Adaptive Management (*Section 4.5*), without prior approval of the Management Board.

5.1.1. Mandatory Elements of State Programs

To be considered in compliance with this FMP, all state programs would include harvest controls on cobia fisheries consistent with the requirements of *Sections 4.1, 4.2, 4.3*; except that a state may propose an alternative management program under *Section 4.5*, which, if approved by the Management Board, may be implemented as an alternative regulatory requirement for compliance.

5.1.1.1. Regulatory Requirements

Each state would be required to submit its cobia regulatory program to the Commission through the ASMFC staff for approval by the Management Board. During the period from submission until the Board makes a decision on a state’s program, a state may not adopt a less protective management program than contained in this amendment or contained in current state law. The following lists the specific compliance criteria that a state/jurisdiction would be required to implement in order to be in compliance with this FMP:

1. All states would establish a maximum possession limit of 1 fish per person and a minimum size limit of 36 inches FL, or an equivalent measure in TL, for their recreational fisheries by April 1, 2018.

2. All states would establish a maximum vessel limit not to exceed 6 fish for all recreational and commercial fisheries by April 1, 2018.

3. States would establish a recreational fishing season to correspond with specific harvest goals for the individual state by April 1, 2018.

4. States would be able to apply for *de minimis* status if for the preceding three years for which data are available, their averaged combined commercial and recreational landings (by weight) constitute less than 1% of the average coastwide combined, commercial and recreational landings for the same period.

Once approved by the Management Board, states would be required to obtain prior approval from the Board for any changes to their management program for which a compliance requirement is in effect. Other measures would be required to be reported to the Board but may be implemented without prior Board approval. A state would be able to request permission to implement an alternative to any mandatory compliance measure only if that state could show to the Board's satisfaction that its alternative proposal would have the same conservation value as the measure contained in this FMP or any subsequent amendments or addenda. States submitting alternative proposals would be required to demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans would need to be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance reports.

5.1.1.2. Monitoring Requirements

There are currently no requirements for additional monitoring. Monitoring may be implemented in the future through the Commission's addendum process.

5.1.1.3. Research Requirements

The PDT has prioritized the research needs for cobia (*Section 6.2*). Appropriate programs for meeting these needs may be implemented under Adaptive Management (*Section 4.5*) in the future.

5.1.1.4. Law Enforcement Requirements

All state programs would be required to include law enforcement capabilities adequate for successfully implementing that state's cobia regulations. The adequacy of a state's enforcement activity would be monitored annually by reports of the ASMFC Law Enforcement Committee to the PRT. The first reporting period would cover the period from January 1, 2018 to December 31, 2018.

5.1.1.5. Habitat Requirements

There are no mandatory habitat requirements in the FMP, although requirements may be added under Adaptive Management (*Section 4.5*). See *Section 4.3* for Habitat Recommendations.

5.1.2. Compliance Schedule

States would be required to implement the FMP according to the following schedule:

January 1, 2018:	States must submit programs to implement the FMP for approval by the South Atlantic State-Federal Fisheries Management Board. Programs must be implemented upon approval by the Management Board.
April 1, 2018:	States with approved management programs must implement FMP requirements. States may begin implementing management programs prior to this deadline, if approved by the Management Board.

Reports on compliance would be submitted to the Commission by each jurisdiction annually, no later than July 1st, beginning in 2019.

5.1.3. Compliance Reporting Content

Each state would be required to submit an annual report concerning its cobia fisheries and management program for the previous calendar year on July 1. A standard compliance report format has been prepared and adopted by the ISFMP Policy Board. States should follow this format in completing the annual compliance report.

5.2. PROCEDURES FOR DETERMING COMPLIANCE

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section Seven (ASMFC 2009b). Future revisions to the ISFMP Charter may take precedence over the language contained in this FMP, specifically in regards to the roles and responsibilities of the various groups contained in this section. The following summary is not meant in any way to replace the language found in the ISFMP Charter.

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the FMP (or subsequent amendments and/or addenda) must be submitted annually by each state with a declared interest. Compliance with the FMP will be reviewed at least annually. The Management Board, ISFMP Policy Board or the Commission, may request that the PRT conduct a review of plan implementation and compliance at any time.

The Management Board will review the written findings of the PRT within 60 days of receipt of a state's compliance report. Should the Management Board recommend to the Policy Board that a state be determined to be out of compliance, a rationale for the recommended non-compliance finding will be included addressing specifically the required measures of the FMP that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes cobia conservation, and the actions a state must take in order to comply with the FMP requirements.

The ISFMP Policy Board shall, within thirty days of receiving a recommendation of non-compliance from the Management Board, review that recommendation of non-compliance. If it concurs in the recommendation, it shall recommend to the Commission that a state be found out of compliance.

The Commission shall consider any FMP non-compliance recommendation from the Policy Board within 30 days. Any state which is the subject of a recommendation for a non-compliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with the FMP, and specify the actions the state must take to come into compliance.

Any state that has been determined to be out of compliance may request that the Commission rescind its non-compliance findings, provided the state has revised its cobia conservation measures or shown to the Management Board and/or Commission's satisfaction that actions taken by the state provide for conservation equivalency.

5.3. RECOMMENDED (NON-MANDATORY) MANAGEMENT MEASURES

The Management Board through this FMP would request that those states outside the management unit (New York through Maine, and Pennsylvania) implement complementary regulations to protect the cobia spawning stock.

5.4. ANALYSIS OF ENFORCEABILITY OF PROPOSED MEASURES

The ASMFC Law Enforcement Committee would, during the implementation of this FMP, analyze the enforceability of new conservation and management measures as they are proposed.

6. MANAGEMENT AND RESEARCH NEEDS

Characterized as High (H), Medium (M), or Low (L) priority, these management and research needs would be reviewed annually as part of the Commission's FMP Review process. The annual Cobia FMP Review would contain an updated list for future reference.

6.1. STOCK ASSESSMENT AND POPULATION DYNAMICS

An updated stock assessment for the Atlantic Migratory Group cobia has been scheduled for completion in 2019, led by SEFSC Beaufort Lab. The assessment will provide updated status information since the terminal year of the last assessment (2012). Anticipated results will include updated stock status and reference points and contribute to recommendations for additional management needs, if any.

6.2. RESEARCH AND DATA NEEDS

6.2.1. Biological

- Conduct studies to estimate catch and release mortality estimates.
- Obtain better estimates of harvest from the cobia recreational fishery (especially in the for hire sector).
- Increase spatial and temporal coverage of age samples collected regularly in fishery dependent and independent sources. Prioritize collection of age data from fishery dependent and independent sources in all states.
- Collect genetic material to continue to assess the stock identification and any Distinct Population Segments that may exist within the management unit.
- Conduct a high reward tagging program to obtain improved return rate estimates. Continue and expand current tagging programs to obtain mortality and growth information and movement at size data.
- Continue to collect and analyze current life history data from fishery independent and dependent programs, including full size, age, maturity, histology workups and information on spawning season timing and duration. Any additional data that can be collected on any life stages of cobia would be highly beneficial.
- Conduct studies to estimate fecundity-at-age coastwide and to estimate batch fecundity.
- Obtain better estimates of bycatch and mortality of cobia in other fisheries, especially juvenile fish in South Atlantic states.
- Obtain estimates of selectivity-at-age for cobia through observer programs or tagging studies.
- Define, develop, and monitor adult abundance estimates

6.2.2. Social

- Obtain better coverage of shore and nighttime anglers.

6.2.3. Economic

- Obtain better data on the economic impacts of recreational and commercial cobia fishing on coastal communities.

6.2.4. Habitat

- If possible, expand existing fishery independent surveys in time and space to better define and cover cobia habitats.

- Conduct otolith microchemistry studies to identify regional recruitment contributions.

- Conduct new and expand existing satellite tagging programs to help identify spawning and juvenile habitat use and regional recruitment sources.

6.2.5. State-specific

Georgia

Little is known regarding cobia stocks off Georgia. It is unclear if Georgia has a unique sub-population of East-West migration cobia as seen in other nearby states (South Carolina). Furthermore, the range of habitat types (inshore vs. nearshore) utilized by cobia in Georgia remains unknown. It would be beneficial to better explain the range of habitat utilized by cobia in Georgia as well as identify overwintering locations for Georgia cobia. This could be easily done through a simple acoustic telemetry study. Identifying these basic life history characteristics for cobia in Georgia will aid in the management of the species both at a state and a regional level. Additionally, better socio-economic estimates of the impact of cobia fishing in Georgia would aid in understanding how regulatory changes may impact the economic benefit cobia fishing has throughout Georgia.

7. PROTECTED SPECIES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) began discussing ways to improve implementation of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. Historically, these policies have been minimally enforced in state waters (0-3 miles). In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved amendment of its ISFMP Charter (Section Six (b)(2)) so that interactions between ASMFC-managed fisheries and species protected under the MMPA, ESA, and other legislation, including the Migratory Bird Treaty Act be addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed "protected species"), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation which guides protection of marine mammals, sea turtles, and marine birds; (2) the protected species with potential fishery interactions; (3) the specific type(s) of fishery interactions; (4) population status of the affected protected species; and (5) potential impacts to Atlantic coastal state and interstate fisheries.

7.1. Marine Mammal Protection Act (MMPA) Requirements

Since its passage in 1972, one of the primary goals of the MMPA has been to reduce the incidental mortality and serious injury of marine mammals permitted in the course of commercial fishing operations to insignificant levels approaching a zero mortality and serious injury rate. Under the 1994 Amendments, the MMPA requires the NMFS to develop and implement a take reduction plan to assist in the recovery or prevent the depletion of each strategic stock that interacts with a Category I or II fishery. Specifically, a strategic stock is defined as a stock: (1) for which the level of direct human caused mortality exceeds the potential biological removal (PBR) level; (2) which is declining and is likely to be listed under the Endangered Species Act (ESA) in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. Category I and II fisheries are those that have frequent or occasional incidental mortality and serious injury of marine mammals, respectively, whereas Category III fisheries have a remote likelihood of incidental mortality and serious injury of marine mammals. Each year, NMFS publishes an annual List of Fisheries which classifies commercial fisheries into one of these three categories.

Under the 1994 mandates, the MMPA also requires fishermen participating in Category I and II fisheries to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA for non-ESA listed marine mammals. All fishermen, regardless of the category of fishery they participate in, must report all incidental injuries and mortalities caused by commercial fishing operations within 48 hours.

Section 101(a)(5)(E) of the MMPA allows for the authorization of the incidental taking of individuals from marine mammal stocks listed as threatened or endangered under the ESA in the course of commercial fishing operations if it is determined that: (1) incidental mortality and serious injury will have a negligible impact on the affected species or stock; (2) a recovery plan has been developed or is being developed for such species or stock under the ESA; and (3) where required under Section 118 of the MMPA, a monitoring program has been established, vessels engaged in such fisheries are registered in accordance with Section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock. Permits are not required for Category III fisheries; however, any mortality or serious injury of a marine mammal must be reported.

7.2. Endangered Species Act (ESA) Requirements

The taking of endangered sea turtles and marine mammals is prohibited and considered unlawful under Section 9(a)(1) of the ESA. In addition, NMFS or the USFWS may issue Section 4(d) protective regulations necessary and advisable to provide for the conservation of threatened species. There are several mechanisms established in the ESA to allow exceptions to the take prohibition in Section 9(a)(1). Section 10(a)(1)(A) of the ESA authorizes NMFS to allow the taking of listed species through the issuance of research permits for scientific purposes or to enhance the propagation or survival of the species. Section 10(a)(1)(B) authorizes NMFS to permit, under prescribed terms and conditions, any taking otherwise prohibited by Section

9(a)(1)(B) of the ESA, if the taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Finally, Section 7(a)(2) requires federal agencies to consult with NMFS to ensure that any action that is authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species. If, following completion of consultation, an action is found to jeopardize the continued existence of any listed species or cause adverse modification to critical habitat of such species, reasonable and prudent alternatives will be identified so that jeopardy or adverse modification to the species is removed and Section 7(a)(2) is met (see Section 7(b)(3)(A)). Alternatively, if, following completion of consultation, an action is not found to jeopardize the continued existence of any listed species or cause adverse modification to critical habitat of such species, reasonable and prudent measures will be identified that minimize the take of listed species or adverse modification of critical habitat of such species (see Section 7(b)(4)). Section (7)(o) provides the actual exemption from the take prohibitions established in Section 9(a)(1), which includes Incidental Take Statements that are provided at the end of consultation via the ESA Section 7 Biological Opinions.

7.3. Migratory Bird Treaty Act (MBTA) Requirements

Under the Migratory Bird Treaty Act it is unlawful "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation (16 USC. 703). Section 50 CFR 21.11 prohibits the take of migratory birds except under a valid permit or as permitted in the regulations. Many migratory waterbirds occur within the boundaries of cobia fisheries. USFWS Policy on Waterbird Bycatch (October 2000) states: "It is the policy of the U.S. Fish and Wildlife Service that the Migratory Bird Treaty Act of 1918, as amended, legally mandates the protection and conservation of migratory birds. The USFWS seeks to actively expand partnerships with regional, national, and international organizations, States, tribes, industry, and environmental groups to address seabird bycatch in fisheries, by promoting public awareness of waterbird bycatch issues, and facilitating the collection of scientific information to develop and provide guidelines for management, regulation, and compliance."

Birds of Management Concern are a subset of MBTA-protected species which pose special management challenges because of a variety of factors (e.g., too few, too many, conflicts with human interests, societal demands). These species are of concern because of: documented or apparent population declines; small or restricted populations; dependence on restricted or vulnerable habitats; or overabundant to the point of causing ecological and economic damage.

7.4. Protected Species with Potential Fishery Interactions

The management unit of the cobia Atlantic Migratory Group extends from the Georgia/Florida line through New York. There are numerous protected species that inhabit the range of the cobia management unit covered under this FMP. Listed below are ESA and MMPA protected species found in coastal and offshore waters of the Atlantic Ocean within the range of cobia fisheries. USFWS species of management concern that have the potential to interact with cobia fisheries are also listed. Species of management concern are protected under the MBTA, but lack the protections mandated by the ESA.

ESA – Endangered[1]

- Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)*, NY Bight, Chesapeake Bay, Carolina, and South Atlantic Distinct Population Segments (DPSs)[2]
- Shorthnose sturgeon (*Acipenser brevirostrum*)
- Smalltooth sawfish (*Pristis pectinata*)
- Blue whale (Balaenoptera musculus)
- Fin whale (Balaenoptera physalus)
- Humpback whale (Megaptera novaeangliae)
- North Atlantic right whale (*Eubalaena glacialis)*
- Sei whale (Balaenoptera borealis)
- Sperm whale (Physeter microcephalus)
- Hawksbill sea turtle (Eretmochelys imbricata)
- Kemp's ridley sea turtle *(Lepidochelys kempii)*
- Leatherback sea turtle (*Dermochelys coriacea)*
- Bermuda petrel (*Pterodroma cahow*)
- Roseate tern *(Sterna dougallii dougallii*)*,* northeastern U.S. and Nova Scotia breeding population

ESA – Threatened[3]

- Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), Gulf of Maine DPS
- Nassau grouper (Epinephelus striatus)
- Green sea turtle (*Chelonia mydas),* North Atlantic and South Atlantic DPSs
- Loggerhead sea turtle *(Caretta caretta)*, Northwest Atlantic Ocean DPS
- Roseate tern *(Sterna dougallii dougallii*)*,* Southeastern U.S. and Caribbean breeding population (FL, GA, NC, SC, Puerto Rico, Virgin Islands)
- Piping plover (Charadrius melodus)

MMPA – Protected[4]

Includes all marine mammals above in addition to:

- Atlantic spotted dolphin *(Stenella frontalis)*

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1 http://www.nmfs.noaa.gov/pr/species/esa/listed.htm
2 A distinct population segment (DPS) is a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The ESA provides for listing species, subspecies, or DPS of vertebrate species.
3 http://www.nmfs.noaa.gov/pr/species/esa/listed.htm
4 http://www.nmfs.noaa.gov/pr/species/mammals

- Bottlenose dolphin (Tursiops truncatus)
- Atlantic white-sided dolphin *(Lagenorhynchus acutus)*
- Clymene dolphin (Stenella clymene)
- Pantropical spotted dolphin *(Stenella attenuata)*
- Risso's dolphin (Grampus griseus)
- Rough-toothed dolphin (Steno bredanensis)
- Short-beaked common dolphin *(Delphinus delphis)*
- Spinner dolphin (Stenella longirostris)
- Striped dolphin (Stenella coeruleoalba)
- Gray seal (Halichoerus grypus)
- Harbor porpoise (Phocoena phocoena)
- Harbor seal (Phoca vitulina)
- Minke whale (Balaenoptera acutorostrata)
- Cuvier's beaked whale (Ziphius cavirostris)
- Gervais' beaked whale (Mesoplodon europaeus)
- True's beaked whale *(Mesoplodon mirus)*
- Bryde's whale (Balaenoptera edeni)
- Dwarf sperm whale *(Kogia sima)*
- False killer whale (Pseudorca crassidens)
- Killer whale (Orcinus orca)
- Long-finned pilot whale *(Globicephala melas)*
- Melon-headed whale (Peponocephala electra)
- Pygmy killer whale (Feresa attenuate)
- Pygmy sperm whale (Kogia breviceps)
- Short-finned pilot whale (Globicephala macrorhynchus)

ESA – Species of Concern[5]

- Alewife (Alosa pseudoharengus)
- Blueback herring (Alosa aestivalis)
- Dusky shark (Carcharhinus obscures)
- Porbeagle shark *(Lamna nasus)*
- Rainbow smelt (Osmerus mordax)
- Sand tiger shark (Carcharias taurus)
- Speckled hind (Epinephelus drummondhayi)
- Striped croaker (Bairdiella sanctaeluciae)
- Warsaw grouper (Epinephelus nigritus)

MBTA—USFWS Species of Management Concern

5 http://www.nmfs.noaa.gov/pr/species/concern/

- Canvasback (Aythya valisineria)
- Redhead (Aythya americana)
- Greater scaup (*Aythya marila*)
- Lesser scaup (*Aythya affinis*)
- Surf scoter (Melanitta perspicillata)
- White-winged scoter (*Melanitta fusca*)
- Black scoter (Melanitta americana)
- Long-tailed duck (*Clangula hyemalis*)
- Common goldeneye (*Bucephala clangula*)
- Red-throated loon (*Gavia stellata)*
- Black-capped petrel (Pterodroma hasitata)
- Greater shearwater (*Puffinus gravis*)
- Audubon's shearwater (*Puffinus lherminieri*)
- Band-rumped storm-petrel (*Oceanodroma castro*)
- Masked booby (*Sula dactylaria*)
- Brown booby (Sula leucogaster)
- Pied-billed grebe (*Podilymbus podiceps*)
- Horned grebe (Podiceps auritus)
- Magnificent frigatebird (*Fregata magnificens*)
- Least tern (*Sternula antillarum*), non-listed Atlantic coast subspecies
- Gull-billed tern (Gelochelidon nilotica)

7.5. Protected Species Interactions with Existing Fisheries

7.5.1. Brief overview of the Cobia fishery and gears used

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. 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. The average recreational cobia landings in Atlantic states north of Florida from 2010-2015 was almost 800,000lb.[6]

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. According to the 2015 biological opinion conducted for the Coastal Migratory Pelagic (CMP) resources in the Atlantic and Gulf of Mexico (GOM), in 2013, the predominant gear types used to capture cobia commercially were hook-and-line (78.2%), followed by diving (i.e., spearfishing; 10.4%), longline (7.5%), and gill net (2.5%); all other gears each accounted for less than 0.5% of the total catch (NMFS, 2015). The average commercial cobia landings in Atlantic states north of Florida from 2010-2015 was 56,158 lbs (ASMFC, 2016). In 2015, the predominant gear types that were used to capture cobia in the Atlantic north of Florida were hook-and-line (46%), gill net (44%), pound net (9%), and unknown gear type (1%)[7].

7.5.2. Marine Mammals

NMFS completed a biological opinion on June 18, 2015, evaluating the impacts of the CMP fishery on ESA-listed species. In the biological opinion, NMFS determined that the proposed continued authorization of the CMP Fishery, is not likely to adversely affect any listed whales (i.e., blue, sei, sperm, fin, humpback, or North Atlantic right whales). NMFS also determined that the CMP fishery will have no effect on designated critical habitat for North Atlantic right whale (NMFS, 2015).

The Gulf and South Atlantic CMP hook-and-line fishery (which includes fisheries that capture cobia) is classified in the 2017 MMPA List of Fisheries as a Category III fishery (82 FR 3655; January 12, 2017). This means the annual mortality and serious injury of a marine mammal resulting from the fishery is less than or equal to 1% of PBR, the maximum number of animals, not including natural moralities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. In other words, there is a remote likelihood of or no known incidental mortality and serious injury of marine mammals resulting from these fisheries.

The Gulf and South Atlantic CMP gillnet fishery is classified as Category II fishery in the 2017 MMPA List of Fisheries. This classification indicates an occasional incidental mortality or serious injury of a marine mammal stock resulting from the fishery (1-50% annually of PBR). The fishery has no documented interaction with marine mammals; NMFS classifies this fishery as Category II based on analogy (i.e., similar risk to marine mammals) with other gillnet fisheries.

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6 SEFSC, recreational ACL dataset

7 http://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/landings-by-gear/index

7.5.3. Sea Turtles

7.5.3.1. Overview

As mentioned above, the NMFS completed a biological opinion on June 18, 2015, evaluating the impacts of the CMP fishery (including King mackerel, Spanish mackerel, and cobia) on ESA-listed species (NMFS, 2015). According to the biological opinion, green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all likely to be adversely affected by the CMP fishery. Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory, travel widely throughout the GOM and South Atlantic, and are known to occur in area of the fishery. The biological opinion evaluated the potential for the following gears to interact with protected species: hook-and-line gear, cast net gear, and gill net gear. The biological opinion found that gill net gear is the only gear used in the CMP fisheries that may adversely affect sea turtles. Gill net gear is used to target both Spanish and king mackerel, but not cobia.

7.5.3.2. Hook-and-line fishing

The 2015 biological opinion for CMP resources concluded that sea turtles (as well as smalltooth sawfish and Atlantic sturgeon) are not likely to be adversely affected by CMP hook-and-line fishing. The 2015 biological opinion stated: "*The hook-and-line gear used by both commercial and recreational fishers to target CMP species is limited to trolled or, to a much lesser degree (e.g., historically ~2% by landings for king mackerel), jigged handline, bandit, and rod-and-reel gear. Sea turtles, Atlantic sturgeon, and smalltooth sawfish are both vulnerable to capture on hook-and-line gear, but the techniques commonly used to target CMP species makes effects on these listed species extremely unlikely and, therefore, discountable. Sea turtles are unlikely to be caught during hook-and-line trolling because of the speed (4-10 kt) at which the lure is pulled through the water. As cedar plugs and spoons are generally used when trolling, it is unlikely that a sea turtle of any size would actively pursue the gear and get hooked. Likewise, we also believe sea turtles would be unlikely to be snagged by jigged gear as it is deployed at or near the surface and constantly reeled and jigged back to the boat. It is possible that a sea turtle could be incidentally snagged if it comes in contact with a trolled or jigged hook, but the chances of this occurring are extremely low… We believe that CMP species caught on bandit gear or standard rod-and-reel gear (i.e., baited and deployed as passive, vertical gear) are largely bycatch when targeting other species closer to the bottom (e.g., snapper and grouper); use of the gear in this method (i.e., mid-water placement) is not effective at catching mackerel based on available information (e.g., landings data). In summary, we believe effects from these gear types on Atlantic sturgeon, smalltooth sawfish, and sea turtles are extremely unlikely to occur, and are therefore discountable*" (NMFS, 2015).

There is limited information about protected species interactions within recreational fisheries. In 2015, The North Carolina Division of Marine Fisheries conducted a project funded under the ACCSP to examine potential protected species interactions and finfish discards and releases in the recreational cobia hook-and-line fishery. Observations were made via an alternative observer platform, where recreational fishing activity was monitored at close proximity from individuals on state owned vessels. From April 27, 2015, through October 29, 2015, 552 recreational hook-and-line observations (observed fishing trips) were completed over 138 observed fishing days with 16.2% of fishing trips targeting cobia. Observations occurred in inshore (estuarine) and near-shore waters (≤ 3 miles) of Carteret County. No protected species interactions were observed (Boyd 2016).

7.5.3.3. Gill net

Cobia are generally considered a bycatch species within gill net fisheries. The 2015 biological opinion for CMP resources concluded that gill net gear used in the federal CMP fisheries of the Atlantic and GOM have adversely affected sea turtles, smalltooth sawfish, and Atlantic sturgeon in the past via entanglement and, in the case of sea turtles, via forced submergence (NMFS, 2015).

7.5.3.4. Targeting of large animals

One known method used to prosecute cobia in offshore waters is to target large rays, large sharks, sea turtles, or floating debris around which cobia congregate. Not much is known about this method or its impacts on protected species.

7.5.4. Sturgeon, smalltooth sawfish, Nassau grouper

The 2015 biological opinion for CMP resources concluded that gill net gear used in the federal CMP fisheries of the Atlantic and GOM have adversely affected smalltooth sawfish[8] and Atlantic sturgeon in the past via entanglement.

The biological opinion also concluded that smalltooth sawfish and Atlantic sturgeon are not likely to be adversely affected by CMP hook-and-line fishing. Fishers who capture smalltooth sawfish most commonly report that they were fishing for snook, redfish, or sharks (Simpfendorfer and Wiley 2004), not CMP species. Additionally, Atlantic sturgeon and smalltooth sawfish are largely bottom-dwelling species, whereas CMP lures and baits are typically fished near the surface of the water. This also greatly reduces the likelihood of Atlantic sturgeon and smalltooth sawfish interactions with trolling gear (NMFS, 2015).

On June 29, 2016, NMFS published a final rule listing Nassau grouper as threatened under the ESA. Reinitiation of Section 7 consultation on the CMP FMP is needed to address newly listed species. NMFS is currently prioritizing completion of the consultation along with other consultations required after recent listings.

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8 Although smalltooth sawfish are typically found in the peninsula of Florida, there have been recent interactions as far north as North Carolina.

7.5.5. Seabirds

The roseate tern, Bermuda petrel, and piping plover are the only ESA listed bird species within the mid-and south-Atlantic maritime regions. The roseate tern and Bermuda petrel are uncommon in inshore and coastal waters of the mid- and south-Atlantic and thus, have relatively low likelihoods of interacting with cobia fisheries. Nevertheless, exceptional efforts to avoid deleterious interactions with these species are warranted as they are rare and highly vulnerable to even minimal levels of mortality. The piping plover could be impacted by shore-based fishing activity if individuals were disturbed or killed by vehicles related to fishing efforts. However, during the nesting season, when plovers are highly vulnerable to beach disturbance, sensitive areas are posted and beach access is often restricted.

Bermuda petrels are occasionally seen in the waters of the Gulf Stream off the coasts of North Carolina and South Carolina during the summer. Sightings are considered rare and only occurring in low numbers (Alsop 2001). Roseate terns occur widely along the Atlantic coast during the summer but in the southeast region, they are found mainly off the Florida Keys (unpublished USFWS data). Interaction with fisheries has not been reported as a concern for either of these species. Although, the Bermuda petrel and roseate tern occur within the action area, these species are not commonly found and neither has been described as associating with vessels or having had interactions with the CMP fishery. Framework Amendment 4 to the FMP for CMP resources in the Gulf of Mexico and Atlantic Region concluded that the CMP fishery is not likely to negatively affect the Bermuda petrel and the roseate tern.

7.6. Population Status Review of Relevant Protected Species

7.6.1. Marine Mammals

The status review of marine mammal populations inhabiting the Southwest Atlantic are discussed in detail in U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. The most recent assessment was published in 2016 (Waring et al. 2016). The report presents information on stock definition, geographic range, population size, productivity rates, PBR, fishery specific mortality estimates, and compares the PBR to estimated human-caused mortality and serious injury for each stock.

7.6.2. Sea Turtles

All sea turtles that occur in U.S. waters are listed as either endangered or threatened under the ESA. The Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) are listed as endangered. The Northwest Atlantic Ocean DPS of loggerhead turtles (*Caretta caretta*) and the North Atlantic and South Atlantic DPSs of green turtle (*Chelonia mydas*) are listed as threatened. All five of these species inhabit the waters of the U.S. Atlantic and Gulf of Mexico.

Atlantic coastal waters provide important developmental, migration, and feeding habitat for sea turtles. The distribution and abundance of sea turtles along the Atlantic coast is related to geographic location, reproductive cycles, food availability, and seasonal variations in water temperatures. Water temperatures dictate how early northward migration begins each year and are a useful factor for assessing when turtles will be found in certain areas. Sea turtles can occur in offshore as well as inshore waters, including sounds and embayments. More information about sea turtles can be found here: http://www.nmfs.noaa.gov/pr/species/turtles/index.html.

7.6.3. Sturgeon, smalltooth sawfish, and Nassau grouper

No estimate of the historical population size of shortnose sturgeon is available. While the shortnose sturgeon was rarely the target of a commercial fishery, it often was taken incidentally in the commercial fishery for Atlantic sturgeon. In the 1950s, sturgeon fisheries declined on the east coast, which resulted in a lack of records of shortnose sturgeon. Shortnose sturgeon has been listed as endangered since 1967. A status assessement of shortnose sturgeon was last published in 2010 (SSSRT, 2010).[9]

In 2012, NOAA Fisheries listed four DPSs of Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)* as endangered (NY Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs) and one as threatened (Gulf of Maine). More information about Atlantic sturgeon can be found here: http://www.fisheries.noaa.gov/pr/species/fish/atlantic-sturgeon.html#documents.

The U.S. DPS of smalltooth sawfish was listed as endangered in 2003. No accurate estimates of abundance trends over time are available, but available data, including museum records and anecdotal observations from fishers, indicate that the population has declined dramatically by about 95%. Smallooth sawfish were once common throughout their historic range, but they have declined dramatically in U.S. waters over the last century. Still, there are few reliable data available, and no robust estimates of population size exist.[10]

In 2016, NOA Fisheries listed Nassau grouper as threatened under the ESA (81 FR 42268; June 29, 2016). While the species still occupies its historical range, overutilization through historical harvest has reduced the number of individuals which in turn has reduced the number and size of spawning aggregations. Although harvest of Nassau grouper has diminished due to management measures, the reduced number and size of spawning aggregations and the inadequacy of law enforcement continue to present extinction risk to Nassau grouper. The Nassau grouper's confirmed distribution currently includes Bermuda and Florida (U.S.A.), throughout the Bahamas and Caribbean Sea. Many earlier reports of Nassau grouper up the Atlantic coast to North Carolina have not been confirmed.

7.6.4. Seabirds

The overall population status of the Bermuda Petrel is unknown. The Bermuda Petrel is a pelagic seabird, and its range and distribution at sea make it very difficult to survey. It is known

9 http://www.fisheries.noaa.gov/pr/species/fish/shortnose-sturgeon.html
10 http://www.fisheries.noaa.gov/pr/species/fish/smalltooth-sawfish.html

to nest only on five small islets in Bermuda. Surveys are limited to the breeding grounds. The total population of the Bermuda Petrel is estimated as 101 breeding pairs (USFWS, 2013).

The roseate tern is a federally protected and endangered seabird that is mainly found in the Northern Hemisphere on the northeastern coast of North America, extending from Nova Scotia to the southern tip of Florida, as well as several islands in the Caribbean Sea. Populations in the northeastern U.S. greatly declined in the late 19th century due to hunting for the millinery, or hat trade. In the 1930s, protected under the MBTA, the population reached a high of about 8,500, but since then, population numbers have declined and stayed in the low range of 2,500 to 3,300. The species was listed in 1987 as endangered in the northeastern U.S. Populations in Florida, Georgia, North Carolina, Puerto Rico, South Carolina and the Virgin Islands are listed as threatened.[11]

The piping plover breeds on coastal beaches from Newfoundland and southeastern Quebec to North Carolina. These birds winter primarily on the Atlantic Coast from North Carolina to Florida, although some migrate to the Bahamas and West Indies. Piping plovers were common along the Atlantic Coast during much of the 19th century, but nearly disappeared due to excessive hunting for the millinery trade. The current population decline is attributed to increased development and recreational use of beaches. The most recent surveys place the Atlantic population at less than 2000 pairs.[12]

7.7. Existing and Proposed Federal Regulations/Actions Pertaining to Relevant Protected Species

7.7.1. Marine Mammals

Species of large whales protected by the ESA that occur throughout the Atlantic Ocean include the blue whale, humpback whale, fin whale, North Atlantic right whale, sei whale, and the sperm whale. Additionally, the West Indian manatee also occurs in both the Gulf of Mexico and the Atlantic Ocean. These species are also considered depleted under the Marine Mammal Protection Act (MMPA). Depleted and endangered designations afford special protections from captures, and further measures to restore populations to recovery or the optimum sustainable population are identified through required recovery (ESA species) or conservation plans (MMPA depleted species). Numerous other species of marine mammals listed under the MMPA occur throughout the Atlantic Ocean.

The MMPA mandates NOAA's NMFS to develop and implement Take Reduction Plans for preventing the depletion and assisting in the recovery of certain marine mammal stocks that are seriously injured or killed in commercial fisheries. In the Atlantic, the following Take Reduction Plans have been developed, which address in part, gears that have been used to capture cobia (gillnet):

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11 https://www.fws.gov/northeast/pdf/Roseatetern0511.pdf
12 https://www.fws.gov/northeast/pipingplover/overview.html

- The Atlantic Large Whale Take Reduction Plan is designed to reduce the risk of mortality and serious injury of large whales (right, fin, humpback) incindental to U.S. commercial trap/pot and gillnet fisheries, including Southeast Atlantic gillnet.

- The Bottlenose Dolphin Take Reduction Plan is designed to reduce the incidental mortality and serious injury of the western North Atlantic coastal bottlenose dolphin stock in several coastal fisheries, including the Southeast Atlantic gillnet fishery.

7.7.2. Sea turtles

Under the ESA, and its implementing regulations, taking sea turtles – even incidentally – is prohibited, with exceptions identified in 50 CFR 223.206. The incidental take of endangered species may only legally be authorized by an incidental take statement or an incidental take permit issued pursuant to Section 7 or 10 of the ESA, respectively. According to the 2015 biological opinion on CMP fisheries, green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all likely to be adversely affected by the CMP fishery (NMFS, 2015). Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory, travel widely throughout the GOM and South Atlantic, and are known to occur in the area of the fishery. The 2015 biological opinion for CMP established an incidental take statement with reasonable and prudent measures and terms and conditions for incidental take coverage in the federal CMP fisheries for sea turtles takes throughout the action area.

On April 6, 2016, NMFS published a final rule (81 FR 20058) listing 11 distinct population segments (DPSs) for green sea turtles. The listing of the DPSs of green turtles triggers reinitiation of consultation under Section 7 of the ESA because the previous opinion did not consider what effects the CMP fishery is likely to have on this species, therefore NMFS must analyze the impacts of these potential interactions. NMFS is also in the process of identifying critical habitat, which will be proposed in a future rulemaking.

In 2013, the North Carolina Division of Marine Fisheries was issued a permit for the incidental take of listed sea turtles associated with the otherwise lawful large and small mesh gill net fishing in specified inshore estuarine areas. This permit requires North Carolina to close designated areas to avoid approaching the take limit.

Existing NMFS regulations specify procedures that NMFS may use to determine that unauthorized takings of sea turtles occur during fishing activities, and to impose additional restrictions to conserve sea turtles and to prevent unauthorized takings (50 CFR 223.206(d)(4)). Restrictions may be effective for a period of up to 30 days and may be renewed for additional periods of up to 30 days each. In 2007, NMFS issued a regulation (50 CFR 222.402) to establish procedures through which each year NMFS will identify, pursuant to specified criteria and after notice and opportunity for comment, those fisheries in which the agency intends to place observers (72 FR 43176, August 3, 2007). NMFS issues a notice or regulation each year maintaining or updating the fisheries listed on the annual determination. The most recent determination was in December 2016 (81 FR 90330, December 14, 2016). NMFS may place observers on U.S. fishing vessels, either recreational or commercial, operating in U.S. territorial waters, the U.S. exclusive economic zone (EEZ), or on the high seas, or on vessels that are otherwise subject to the jurisdiction of the U.S. Failure to comply with the requirements under this rule may result in civil or criminal penalties under the ESA.

7.7.3. Sturgeon, smalltooth sawfish, and Nassau grouper

Shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*A. oxyrinchus*) were listed under the ESA in 1967 and 2012, respectively. The Commission and federal government implemented a coastwide moratorium on sturgeon harvest in late 1997 and early 1998. Bycatch remains an important issue in the recovery of Atlantic sturgeon populations throughout their range (ASMFC 2007). The National Marine Fisheries Service established a recovery plan for shortnose sturgeon in 1998.[13]

In 2013, the Georgia Department of Natural Resources was issued a permit for the incidental take of shortnose and Atlantic sturgeon associated with the otherwise lawful commercial shad fishery in Georgia. In 2014, the North Carolina Division of Marine Fisheries was issued a permit for the incidental take of Atlantic sturgeon DPSs associated with the otherwise lawful commercial inshore gillnet fishery in North Carolina.

The 2015 biological opinion for the Federal CMP fisheries established an incidental take statement with reasonable and prudent measures and terms and conditions for incidental take of Atlantic sturgeon (as well as sea turtles and smalltooth sawfish) throughout the action area (NMFS, 2015). In June 2016, NOAA Fisheries published proposed rules to designate critical habitat for Atlantic sturgeon (81 FR 36077; 6/3/2016 and 81 FR 35701; 6/3/2016).

The U.S. DPS of smalltooth sawfish was listed as endangered in 2003. Critical habitat was designated for it in 2009 (74 FR 45353; 9/2/2009) and a recovery plan was finalized in 2009 as well.[14]

Harvest and possession of Nassau grouper is prohibited in the United States, Puerto Rico, and the U.S. Virgin Islands. NMFS is evaluating potential management actions, such as critical habitat or application of the 4(d) rule in the ESA. When NMFS listed Nassau grouper as threatened, it solicited information from the public that may be relevant to the designation of critical habitat for Nassau grouper. A 4(d) rule provides regulations necessary for the conservation of any threatened species

7.7.4. Seabirds

Under the ESA and its regulations, take of Bermuda petrels, roseate terns, and piping plovers, even incidentally, is prohibited. The incidental take of an ESA listed species may only be legally authorized by an incidental take statement or incidental take permit issued pursuant to Section

13 http://www.nmfs.noaa.gov/pr/pdfs/recovery/sturgeon_shortnose.pdf
14 http://www.nmfs.noaa.gov/pr/pdfs/recovery/smalltoothsawfish.pdf

7 or 10 of the ESA. No incidental takes of ESA listed bird species is currently authorized for cobia fisheries.

Section 316(c) of the Magnuson-Stevens Fishery Conservation and Management Act authorizes the Interior and Commerce Departments to undertake projects, in cooperation with industry, to improve information and technology to reduce seabird-fisheries interactions. USFWS seeks to partner with State, regional, and Federal agencies; industry; tribes; and NGOs to facilitate outreach and improve information and technology to reduce seabird bycatch in fisheries within state and Federal waters. A Memorandum of Understanding between NMFS and the USFWS (July 2012) describes additional collaborative efforts recommended to better understand and reduce bird bycatch in fisheries.[15]

Most actions to understand and reduce marine bird bycatch in the U.S. have occurred in Pacific waters. However, in 2011, the USFWS issued a business plan for addressing and reducing marine bird bycatch in U.S. Atlantic fisheries. The plan identified priority goals and actions to target the following marine bird-fisheries interactions: greater shearwaters in the New England groundfish fishery, and red-throated loons in the mid-Atlantic gillnet fisheries.[16]

7.8. Potential Impacts to Atlantic Coastal State and Interstate Fisheries

Regulations under the take reduction plans for Atlantic large whales and bottlenose dolphins have the potential to impact gill net fisheries that capture cobia as bycatch.

7.9. Identification of Current Data Gaps and Research Needs

7.9.1. General Bycatch Related Research Needs

The following activities would improve our understanding of bycatch of fish and protected species in the Southeast Region. These activities were identified within NMFS' Southeast Regional Office's FY16-20 Strategic Plan[17]:

- In coordination with the Marine Recreational Information Program (MRIP), test and validate the use of on-board recording systems (e.g., electronic logbooks) for capturing information on discarded fishes and bycatch of protected species in the commercial and recreational fisheries including species, length, depth, location, and disposition; priority fisheries include shrimp (including assessing TED compliance), South Atlantic snapper-grouper, other Southeast Region recreational hook-and-line fisheries, and fisheries under take reduction teams.
- Enhance existing tools (e.g., observers, logbook requirements, electronic technologies) to collect bycatch data that inform agency bycatch priorities; priority fisheries include

15 https://www.fws.gov/migratorybirds/pdf/management/mounmfs.pdf
16 https://www.fws.gov/migratorybirds/pdf/management/focal-species/GreaterShearwater.pdf
17http://sero.nmfs.noaa.gov/news_room/press_releases/2016/pdfs/noaa_fisheries_southeast_regional_office_science_needs_12052016.pdf

shrimp (including assessing TED compliance), South Atlantic snapper-grouper, other Southeast Region recreational hook-and-line fisheries, and fisheries under take reduction teams.
- Invest in new, innovative fishery monitoring techniques, such as electronic fishing logbooks and video monitoring, to provide a cost effective means of producing more information to effectively quantify bycatch; priority fisheries include shrimp (including assessing TED compliance), South Atlantic snapper-grouper, other Southeast Region recreational hook-and-line fisheries, and fisheries under take reduction teams.
- Improve the discard estimates needed for informing snapper-grouper, reef fish, dolphin wahoo, and coastal migratory pelagic SEDAR assessments in the next 3-5 years.

7.9.2. Marine Mammals

The following bycatch related research needs were identified within NMFS' Southeast Regional Office's FY16-20 Strategic Plan[18]:

- Characterize frequency, scope, and scale of bottlenose dolphin interactions with recreational rod/reel fishing gear.
- Enhance and increase observer coverage for gillnet fisheries under the bottlenose dolphin take reduction plans by focusing observer coverage in specific geographic areas and fisheries, improving observer data collection and quality, and measures of fishing effort, as well as coordinating with state observer programs.
- Experimentally investigate possible attractants/deterrents for pilot whale/Risso's dolphins to pelagic longline gear and gear modifications to decrease the likelihood of hooking and/or entanglement.

7.9.3. Sea Turtles

Observer coverage of recreational fisheries has been relatively limited (Boyd, 2016). Expansion of observer programs to recreational hook-and-line fisheries would help determine the level of protected species interactions in those fisheries.

The following bycatch related research needs were identified within NMFS' Southeast Regional Office's FY16-20 Strategic Plan[19]:

- Improved methods/models/techniques for estimating sea turtle bycatch in commercial fisheries including accounting for life stage and recovery unit (where applicable) impacts.

18http://sero.nmfs.noaa.gov/news_room/press_releases/2016/pdfs/noaa_fisheries_southeast_regional_office_science_needs_12052016.pdf
19http://sero.nmfs.noaa.gov/news_room/press_releases/2016/pdfs/noaa_fisheries_southeast_regional_office_science_needs_12052016.pdf

- Produce annual bycatch estimates for the shrimp trawl fisheries, pelagic longline, Gulf and South Atlantic reef fish, and Gulf and South Atlantic shark gillnet and bottom longline fisheries.
- Implement monitoring program to assess bycatch of sea turtles in recreational fisheries, including piers, jetties, head boats and FMP covered recreational fisheries.
- Develop tools to reduce recreational fishing bycatch including on piers/jetties.
- Develop and improve analytic methods for sea turtle bycatch estimation and sampling design to optimally allocate observer coverage and identify gaps and recommend improvements/changes to improve sea turtle bycatch information.
- Ensure sea turtle bycatch data collected across fisheries is standardized and contains all necessary elements to assess post interaction mortality and to inform conservation management.
- Conduct gear research and technology transfer to reduce sea turtle interactions and mortalities in both domestic and foreign trawl, longline, and gill net fisheries.
- Develop sea turtle observer programs for commercial fisheries not currently observed but for which data are needed.

7.9.4. Sturgeon

NOAA Fisheries Southeast Regional Office has identified the following research needs for Atlantic sturgeon[20]:

- Identification of spawning and nursery grounds and overwintering areas.
- Long-term population monitoring programs.
- Population genetics.
- Toxic contaminant and biotoxin impacts and thresholds.
- Develop fish passage devices for sturgeon.
- Impacts of dredging.
- Reducing bycatch and bycatch mortality.

Regarding bycatch, very little information is available on current levels of bycatch and bycatch mortality occurring in fisheries in the Southeast. Research is needed to identify the spatial and temporal distribution of bycatch throughout the species range, and to identify measures that can be implemented to reduce bycatch and/or bycatch mortality.

NOAA Fisheries Southeast Regional Office has identified the following research needs for shorthnose sturgeon[21]:

- Genetic assessments.
- Surveys and presence/absence studies.
- Identification of spawning and nursery grounds and overwintering areas.

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20 http://sero.nmfs.noaa.gov/protected_resources/sturgeon/documents/ats_research_priorities.pdf
21 http://sero.nmfs.noaa.gov/protected_resources/sturgeon/documents/sns_research_priorities.pdf

- Develop fish passage devices for sturgeon.
- Contaminant research.
- Impacts of dredging.

7.9.5. Sawfish

The following research needs were identified within NMFS' Southeast Regional Office's FY16-20 Strategic Plan[22]:

- Develop a functional assessment model of juvenile sawfish habitat use within the critical habitat units.
- Determine the post-release mortality of sawfish from various types of fishing gear.
- Investigate movements (short-term and seasonal) of adult sawfish to identify aggregation habitats and habitat use patterns.
- Develop habitat models to identify potential sawfish nursery habitats in areas unsurveyed or outside of the currently known habitat areas.
- Continue current sawfish surveys as these will be the basis of monitoring recovery.
- Conduct juvenile sawfish surveys beyond the boundaries of current surveys (e.g., east coast or north of Charlotte Harbor) to refine a baseline abundance estimates and monitor recovery.
- Conduct adult surveys throughout the range of smalltooth sawfish to determine a relative abundance estimate, the distribution of adults, and to identify sawfish mating and pupping habitats.

7.9.6. Seabirds

- Initiate and expand observer coverage/bycatch monitoring and collection and analysis of bird bycatch data to better understand extent of bird bycatch and identify bycaught bird species within the target fisheries (state waters).
- Collaborate with fishermen to develop and test gear and identify deployment practices that reduce bird bycatch within the target fisheries (state waters).
- Conduct outreach activities to facilitate sharing of bird bycatch information in the target fisheries among agencies, industry and the public.

22http://sero.nmfs.noaa.gov/news_room/press_releases/2016/pdfs/noaa_fisheries_southeast_regional_office_science_needs_12052016.pdf

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9. APPENDICES

Appendix I

Atlantic States Marine Fisheries Commission
Draft Public Information Document for the Cobia FMP

Introduction

The Atlantic States Marine Fisheries Commission (Commission) is developing an Interstate Fishery Management Plan (FMP) for Cobia, under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). Management authority for this species is from zero to three nautical miles offshore, including internal state waters, and lies with the Commission. Regulations are promulgated by the Atlantic coastal states. Responsibility for compatible management action in the exclusive economic zone (EEZ) from 3-200 miles from shore lies with the South Atlantic Fishery Management Council (Council) and NOAA Fisheries under their Coastal Migratory Pelagics Fishery Management Plan (CMP FMP) under the authority of the Magnuson-Stevens Fisheries Conservation and Management Act.

Management Issues

Currently the Council and NOAA Fisheries manage Cobia under the CMP FMP through an Annual 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 Council. The closure had measureable impacts to member states. Concerned by these impacts and recognizing that a significant but variable proportion of reported recreational landings are harvested in state waters, the Council requested that 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 their August 2016 Business Meeting and agreed Commission management of Cobia was prudent. The Commission tasked the development of an FMP to the South Atlantic State/Federal Fishery Management Board, complementary with the Council plan for Cobia (*Rachycentron canadum*).

Council management, based on current genetic information, addresses the management of Atlantic Migratory Group (AMG) 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. Tag recapture data suggested two main stocks of fish that overlap at Brevard County Florida and corroborated the genetic findings. The genetic findings also determined that there were two distinct population segments (DPS) in Port Royal Sound SC and Chesapeake Bay VA. The main South Atlantic and Gulf stocks were separated for management purposes at the FL/GA line because genetic data suggested that the split is north of the Brevard/Indian River County line and there was no tagging data to dispute this split. The FL/GA line was selected as the stock boundary based on recommendations from the commercial and recreational work groups (of the SEDAR 28 Stock Assessment) and comments that for ease of management the FL/GA line would be the preferable stock boundary and did not conflict with the life history information available.

Cobia that occur off the east coast of Florida are part of the Gulf cobia, but the Gulf of Mexico Fishery Management Council allocated a portion of the Gulf cobia ACL to the SAFMC and the SAFMC manages that portion of the Florida East Coast that occurs within its jurisdiction. This 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 could result in better resolution of where the boundary is 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 due to the overage of the 2015 quota. North Carolina and Virginia developed alternate management strategies for harvest in state waters to avoid the June 20, 2016 closure enacted by NOAA Fisheries for 2016. South Carolina has 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 precluded a timely closure. The commercial Cobia ACL is not tracked in either whole or gutted weight, but “as landed.” Whether the fish were landed gutted or whole, the pounds were all added up together and not converted (most were landed gutted).

Purpose of the Public Information Document (PID)

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 Council 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.

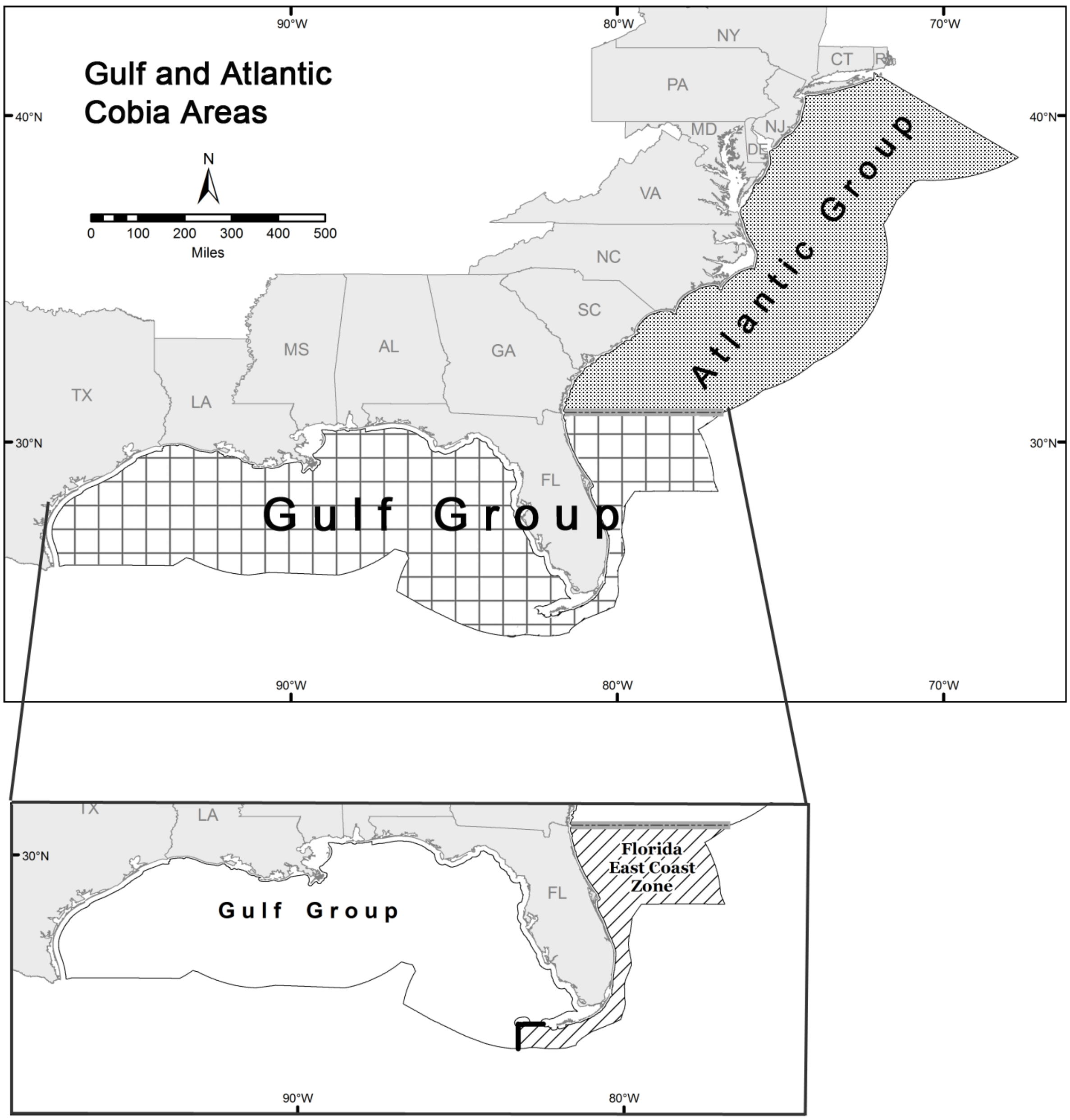

Figure 1. Current jurisdictional boundaries for Atlantic and Gulf of Mexico migratory groups of Cobia.

ASMFC's FMP Process and Timeline

The publication of this document and announcement of the Commission's intent to develop a FMP for Cobia 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.

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.

A tentative schedule for the completion of the FMP is included at the beginning of this document. Please note these dates are subject to change.

Statement of the Problem

Cobia management has historically been considered precautionary through the Gulf of Mexico and Atlantic Coastal Migratory Pelagics FMP. Both sectors of the fishery have been managed with a 2 fish possession limit and 33" fork length (FL) minimum size since formal management began in Amendment 6 to the Coastal Migratory Pelagics FMP in 1990. The ACLs and AMs were established through Amendment 18 (GMFMC/SAFMC 2012). The 2013 stock assessment conducted through the Southeast Data Assessment and Review (SEDAR) process indicated overfishing was not occurring and that the stock was not overfished although trending steadily downward over the previous two decades. Additionally, the stock assessment used a different stock boundary that was implemented into the FMP along with the updated ACLs in Amendment 20B (GMFMC/SAFMC 2014). The current ACL is a precautionary approach to prevent the stock from reaching an overfished status. The recent overage in 2015 exceeded the Council's defined Overfishing Limit, meaning the stock is undergoing overfishing. Further quota overages would continue this 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 measures to maintain a healthy resource while minimizing the socio-economic impacts of seasonal closures.

Description of Management

Council management of Cobia is consistent for the Atlantic Migratory Group in federal waters with a 2 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 restrictions (Table 1). Commercial management remains at 2 fish and 33” FL. **Florida Cobia are not part of the Council's Cobia management unit at this time. At present, Florida Cobia are part of the Gulf stock and the Council establishes the federal regulations for that portion within its jurisdiction.**

Table 1. Recreational measures in 2016 for Cobia in Virginia, North Carolina, South Carolina, Georgia, and Florida.

State	Bag limit (Fish/person/day)	Vessel limit (Fish/vessel/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 Council approved formal review for several changes to cobia management, including recreational harvest limits of 2 fish per person per day or 6 per vessel per day, and a minimum size limit of 36” FL for recreational harvest. Additionally, the Council also proposes a commercial harvest limit of 2 fish per person per day or 6 per vessel, whichever is more restrictive, but no change to the commercial minimum size limit of 33" FL. The Council is also proposing modifications to the recreational accountability measures for Atlantic cobia. These changes are expected to be implemented in spring 2017.

In December 2016, the Council will review and consider formal approval of an amendment to change the recreational fishing year for Atlantic cobia (the fishing year is January 1 – December 31). Currently the preferred alternative would change the fishing year to May 1 – April 30.

The allocation of the Council'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). Beginning in 2016, the ACL is split 92% recreational and 8% commercial. The 2016 ACL for Cobia is 670,000 pounds. The recreational ACL is 620,000 pounds and the commercial ACL is 50,000 pounds. The ACL for 2015 was slightly higher at 690,000 pounds.

Description of the Cobia Resource

Life History and Status of the Stocks

Cobia is a fast growing, moderately lived (14 years old) species that 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. The commercial fishery is primarily a by-catch 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). However, in recent years, it has become a targeted species in Virginia's commercial hook and line fishery.

Cobia grow rapidly in their first 2 years with most mature by age 2. 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 and 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 it appears that a very strong year class occurs once in a decade. Both tag recapture and genetic data show that 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 that the appropriate management unit would separate out Atlantic and Gulf of Mexico stocks at the Florida/Georgia border. 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 2013 stock assessment conducted through the SEDAR process 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 2013 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. In June, the Council proposed Cobia be included in a 2017 Stock ID workshop and the 2019 SEDAR schedule for a research track assessment. The operational assessment that will incorporate the outcomes and recommendations from the Stock ID workshop and 2019 research track assessment is scheduled for 2020. The operational assessment will result in management recommendations.

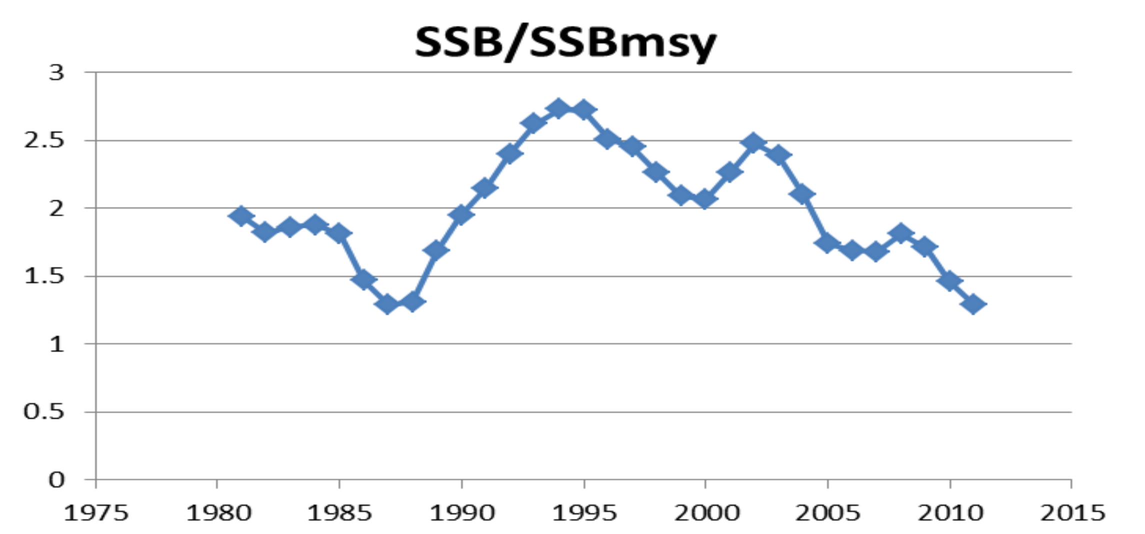

Figure 2. Cobia spawning stock biomass relative to the MSY biomass reference for 1981-2011.

Data collection programs vary by state and will be further described in the upcoming fishery management plan. 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 that conflict 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.

Description of the Fishery

Landings data are generated for the recreational fishery through the Marine Recreational Information Program (MRIP) report landings 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 Cobia 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 the cobia that associate with them. Spearfishing also occurs off North Carolina, along with a popular pier fishery.

Table 2. Percentage of cobia in the recreational fishery harvested in state's 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 without east coast Florida included. All data are final MRIP estimates, which may differ from SEFSC estimates.

	State GA-NY	Federal GA-NY	Percent State
2006	1,005,706	149,537	87
2007	402393	374,051	52
2008	157,793	393,864	29
2009	541,594	134,935	80
2010	679,777	232,073	75
2011	184,514	143,357	56
2012	147,273	289,154	34
2013	590,633	172,290	77
2014	387,364	77,004	83
2015	1,496,442	232,854	85

Table 4. 10-year average percentage of cobia harvested in state waters including the east coast Florida. All data are final MRIP estimates, which may differ from SEFSC estimates.

	State FL-NY	Federal FL-NY	Percent State
2006	1,116,100	532,477	68
2007	456,395	900,681	34
2008	218,154	772,124	22
2009	733,424	304,225	71
2010	1,122,392	534,686	68
2011	436,805	652,506	40
2012	223,755	583,045	28
2013	615,462	421,737	59
2014	486,921	559,870	47
2015	1,559,160	652,092	71

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).

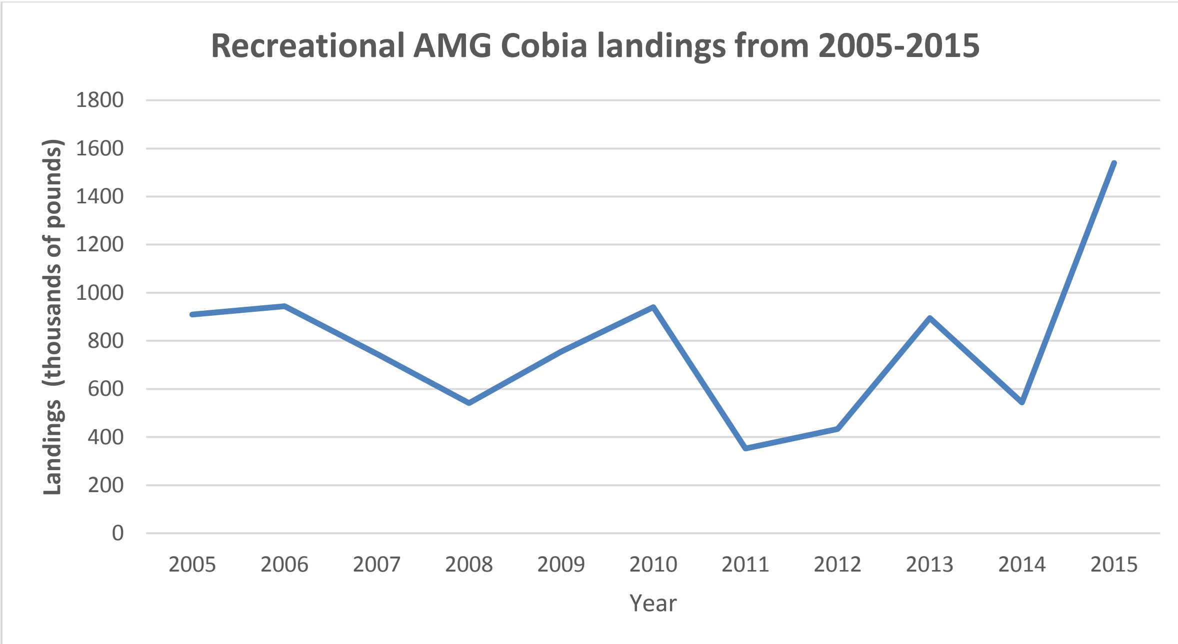

Figure 3. Recreational landings of AMG Cobia (2005-2015)

Commercial harvest of Cobia has traditionally been bycatch in the offshore snapper/grouper and trolling fisheries. 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. The commercial fishery has seen an increasing trend from North Carolina through the mid-Atlantic over the time series. The commercial Cobia fishery closed early in 2014 (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).

State-Specific Landings

Florida

Landings of Cobia in Florida are significant. Continued genetic analysis may result in some adjustments to the current stock boundaries management unit as more data become available. Recreational Cobia landing on the East coast of Florida averaged 488,788 pounds during the 2005-2015 time series (Table 5).

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.

Georgia

Recreational Cobia landings in Georgia ranged from 3,358 to 257,690 pounds (avg. = 58,111 pounds) during the 2005-2015 time series (Table 5).

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 (Table 6).

South Carolina

Recreational Cobia landings in South Carolina averaged 76,954 pounds during the 2005-2015 time series (Table 5). Cobia were designated as gamefish in South Carolina but properly permitted for-hire vessels may sell Cobia.

North Carolina

Recreational Cobia landings in North Carolina averaged 259,883 pounds from 2005-2015 (Table 5).

Commercial landings in North Carolina ranged from 19,950 to 52,315 pounds from 2010-2015, averaging 37,559 pounds over the time series. The landings of 52,684 pounds in 2015 accounted for nearly the entire AMG Cobia commercial quota and would have exceeded the 2016 quota (Table 6).

Virginia

Recreational Cobia landings in Virginia averaged 368,059 pounds during the 2005-2015 time series (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.

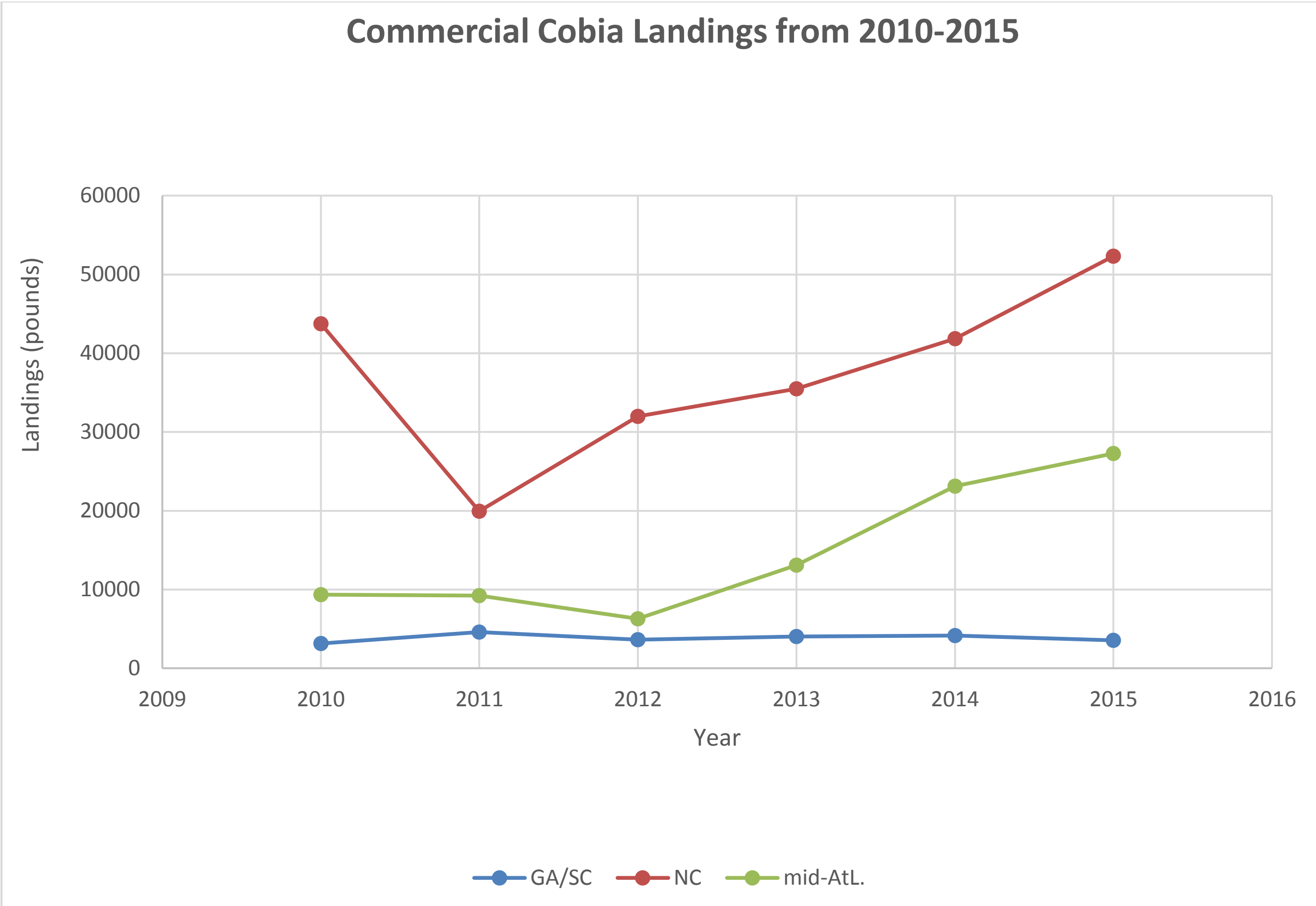

Figure 4. Commercial landings of Cobia (2010-2015)

Table 5. Recreational landings of Atlantic 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	136,859	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 6. 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. Landing are also reported from Rhode Island in New England.

Issues for Public Comment

Public comment is sought on several issues being considered for inclusion in the FMP. The issues are intended to focus the public comment and provide the Board with the necessary input to develop an FMP. The public is encouraged to submit comments on the issues listed below as well as other issues that may need to be addressed in the FMP.

ISSUE 1: COMPLEMENTARY MANAGEMENT WITH THE COUNCIL:

Background: The Council currently manages Cobia through the Coastal Migratory Pelagics 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. The Commission would adopt the ACLs and biological reference points established by the benchmark Cobia stock assessment developed by the Council.

States have historically mirrored the Council's size and bag limit regulations in state waters. The recreational closure in 2015 resulted in the states of Virginia and North Carolina modifying their regulations in order to reduce the impacts of the June 20, 2016 federal closure. The state of

South Carolina has developed various, additional regulations based on area specific genetic work and concern over the condition of a distinct population segment that occurs in their southern waters.

Management Questions:

- Should the Commission develop a complementary Cobia FMP to the Council's CMP FMP?
- What Council management measures should be required in the Commission plan?
- What states should be included in the management unit?
- Given the upcoming workshop in 2017 that will review the most recent genetic information for cobia, should the FMP provide the flexibility to make changes to management unit and stock units to reflect changes in the science?

ISSUE 2: WHAT ARE THE APPROPRIATE MANAGEMENT OBJECTIVES FOR THE COBIA FMP?

Background: 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: CONSISTENT, STATEWIDE MANAGEMENT OF COBIA:

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 Council's ACL level.

Management Questions:

- Are consistent, state-specific management measures, coordinated by the Commission, needed for Cobia?
- Are there regional differences in the fishery and/or in the Cobia that need to be considered when implementing management measures?

***ISSUE 4: WHAT ARE THE APPROPRIATE COMMERCIAL AND RECREATIONAL MANAGEMENT MEASURES FOR COBIA*?**

Background: The Commission could consider different management approaches for the commercial and recreational Cobia fishery. Commercial fisheries are managed consistently throughout state and federal jurisdictions, while recreational management measures vary (Table 1).

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.

Consistent, coastwide measures could potentially include: minimum size restrictions, maximum size restrictions, bag/trip/boat limits, seasons, gear restrictions.

More flexibility to individual states may be available through state-by-state quota shares of the Cobia ACLs. Quota shares can allow limits and seasons to be imposed that maximize the individual state fishery needs, and reduce the impact of events occurring outside state boundaries.

Management Options:

- Should the FMP require a coastwide closure if the Council ACL is met?
- Should the FMP require a coastwide measures (e.g., size and bag limit)?
- Should the FMP develop a suite of options for the allocation of state-specific quota shares, and allow states to adopt unique size, bag, and season measures?
- 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 6: 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.

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Appendix II
State Fishery and Regulatory Summaries

a. GEORGIA

Regulatory Summary

The Georgia Legislature, the Board of Natural Resources and the Department of Natural Resources, an executive agency, share regulatory responsibilities for wildlife in the state of Georgia with the Board and Department as subordinates. Title 27 (Game and Fish Code) Chapter 4 of the Georgia Statutes contain the laws directly related to the management of wildlife including marine fishes (O.C.G.A. 27-4-10). In 2012, the legislature amended the Game and Fish Code extensively and in doing so granted the Board and Department additional powers to promulgate regulations affecting marine fisheries. Previously the legislature maintained management authority over a select group of marine fishes while allowing the Board and Department authority over others. With the 2012 amendment, the legislature set parameters within which the Board and Department regulate marine fishes. Board of Natural Resources Rule 391-2-4-.04, Saltwater Finfishing, contains regulations for these fishes, including cobia.

<u>Current Cobia Regulations in Georgia (March 2017)</u>
Open year round, two fish per person per day, 33-inch fork length minimum size. (Board Rule 391-2-4-.04 (3)(h))

<u>License Requirements</u>
In Georgia, a license is required to fish recreationally (O.C.G.A. 27-2-1) or commercially (O.C.G.A. 27-4-110). Recreational fishing licenses are required of residents and non-residents fishing in state territorial waters as well as the EEZ. All persons under the age of 16, regardless of residency, and resident seniors who are 65 or older are not required to purchase recreational licenses. Other exemptions exist for active military and individuals with disabilities, check with the GADNR for details. Commercial fishing licenses are required to sell seafood landed in Georgia from Georgia waters or from the EEZ.

<u>Penalties for Violations</u>
Penalties for violations of Georgia laws and regulations are established in Georgia Statutes. Most violations of game and fish laws are misdemeanors though some may be elevated to misdemeanors of high and aggravated nature, Title 27, Chapter 4.

<u>Gear Restrictions</u>
There are few restrictions on recreation gear for the harvest of cobia; only gig and gillnet are prohibited. Commercially, cobia may be harvested using trawl nets, cast nets, seines, and pole-and line, though only pole-and-line are practical. (Board Rule 391-2-4-.12)

Commercial Landings and Data Reporting Requirements
Georgia requires commercial harvesters (O.C.G.A. 27-4-118) and seafood dealers (O.C.G.A. 27-4-136) to submit landings data. Information to be supplied for each trip includes trip date; vessel identification; trip number; species; quantity; units of measure; disposition; value; county or port landed; state landed; dealer identification; unloading date; market; grade; gear; quantity of gear; days at sea; number of crew; fishing time; and number of sets.

Commercial finfish harvest limits are equivalent to recreational limits unless otherwise noted. This means that commercial harvesters may land and sell no more than two cobia per person per day and minimum size and landing restrictions are the same as recreational. (Board Rule 391-2-4-.04)

Other Restrictions
Cobia, as with all marine species except sharks, must be landed with head and fins intact. Transfer between vessels at sea is prohibited. (Board Rule 391-2-4-.04 (7)(a) and (b)).

Management Chronology
1957: Gill nets prohibited in state waters.

1989: The Georgia Legislature established O.C.G.A. 27-4-130.1, Open seasons, creel limits, and minimum size limits for certain finfish species. For cobia a closed season of December 1 through March 15 was established ((a)(3)). Furthermore, the legislature authorized the Board to manage cobia seasons beyond this closed season as well as to set size limits between 20 and 40 inches and to establish a maximum daily creel not to exceed 10 fish ((b)(3)).

1989: The Board of Natural Resources adopted Rule 391-2-4-.04, Saltwater Finfishing. Specifically for cobia, it established a March 16 to November 30th open season ((3)(c)), a two cobia per person daily creel and possession limit ((4)(c)), and a 33-inch fork length minimum size ((5)(c)).

2012: The Georgia Legislature repealed O.C.G.A. 27-4-130.1 and moved those species therein to O.C.G.A. 27-4-10. Cobia ((a)(28)) parameters were set at 0 to 40 inches and five fish. Further, the board was authorized to set size limits, open seasons, creel and possession limits and possession and landing specifications on a state-wide, regional and local basis. Finally, the Commissioner of the Department was empowered to close waters to recreational and commercial fishing by species for a period of up to six months within a calendar year.

2012: The Board of Natural Resources implemented the necessary requirements of the Legislative repeal while keeping cobia management intact, with the exception of resorting species; cobia became letter (h).

2014: The Board of Natural Resources amended 391-2-4-.04, Saltwater Finfishing, for Cobia ((3)(h)) to allow fishing all year, but kept the two cobia per person creel and possession limit and the 33-inch fork length minimum size limit as well as the landing restrictions of head and fins intact and prohibition on transfer at sea.

b. SOUTH CAROLINA

Description of the Fishery

1.3.1 Commercial Fishery:

There is a limited commercial fishery for cobia in South Carolina. Cobia are a state-designated Gamefish, and as such, cobia landed in state waters may not be sold commercially. However, cobia landed in Federal waters can be sold commercially under current regulations. Commercial cobia landings have ranged from 2000-4300 lbs a year with an annual mean of 3207 lbs a year for 2005-2016 and dollar values ranging from $4,731-$17,795 annually.

1.3.2 Recreational Fishery:
The recreational fishery for cobia in South Carolina accounts for the majority of cobia landings. The fishery occurs in both nearshore waters and around natural and artificial reefs offshore. Historically, the majority of cobia landings have occurred in state waters in and around spawning aggregations from April through May. However, due to intense fishing pressure in the inshore zone, annual landings of cobia have fallen drastically since 2009 such that the majority of recreationally caught cobia in South Carolina now come from offshore (federal) waters. Anglers begin targeting cobia in late April/early May with the peak of the season typically occurring May into early June. Late season catches can occur on nearshore reefs through October depending on water temps. However, these Fall catches of fish are sporadic. South Carolina has accounted for an average of 1.3% of total landings in state jurisdictional waters along the Atlantic coast for 2010-2016.

1.4 Specific comments for habitat – spawning, larval, juvenile, adult
Cobia enter nearshore waters along the south Atlantic Coast when water temperatures reach 20-21 C, usually late April and aggregate to spawn through June. Histological evaluation of gonads from these nearshore collections suggest cobia are mature and spawning in inshore waters of high salinity estuaries (Callibogue, Port Royal Sound and St. Helena Sound in SC)(Lefebvre and Denson, 2012). The inshore spawning aggregations in South Carolina have been determined to be genetically distinct from the Atlantic stock of cobia (Darden et al. 2014). These findings are corroborated by conventional tag-recapture information and show estuarine fidelity for spawning fish and natal homing annually into estuaries. Eggs and larvae are typically found in nearshore waters where there is significant retention time of estuarine waters; however, juveniles (< 2yrs of age) are only occasionally caught inshore or in protected nearshore waters making it unclear what habitat the majority of this life stage utilizes until they mature and join spawning aggregations (Lefebvre and Denson, 2012).

2.1.1. History of Prior Management Actions

South Carolina: see Appendix A for detailed South Carolina cobia regulatory information

3. MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

ASSESSMENT OF ANNUAL RECRUITMENT: None
ASSESSMENT OF SPAWNING STOCK BIOMASS: None
ASSESSMENT OF FISHING MORTALITY TARGET AND MEASUREMENT: None
SUMMARY OF MONITORING PROGRAMS

Catch, Landings, and Effort Information – Comm & Rec (ACCSP data will be collated by ASMFC and SCDNR staff)
Biological Information:
Observer Programs: None in South Carolina

STOCKING PROGRAM: South Carolina has an experimental stock enhancement program designed to evaluate the methodology necessary for augmenting wild populations. To date experiments have been designed to determine best size and time of year to stock cobia in coastal rivers focused on augmentation of the distinct population segment of cobia in SC. Locally-caught brood stock have been conditioned to spawn in recirculating seawater systems using temperature and photoperiod conditioning and hormone implantations to facilitate final oocyte maturation. To date multiple years of spawning and growout has occurred, and more than 50,000 (60-350 mm TL) cobia have been stocked in the Colleton and Broad Rivers of Port Royal Sound. All fish are genetically identifiable to broodstock group and can be identified in the catch and distinguished genetically from wild-spawned fish. Cobia tissue samples collected from charterboat captains and from carcasses collected at tournaments and cooperating recreational anglers show that as much as 50% of the catch from the 2007 yearclass were from hatchery releases and that these animals have persisted in the catch each year since release. This research has demonstrated the application of stock enhancement as an additional management tool for cobia. In addition to research on production of animals, the SCDNR has developed predictive individual-based genetic models to determine the appropriate number of cobia that should be produced and stocked each year in order to grow the population while minimizing any negative impact on the genetic health of the wild population.

BYCATCH REDUCTION PROGRAM: None in South Carolina

6. MANAGEMENT AND RESEARCH NEEDS

Biological, Social, Economic and Habitat

While the cobia that spawn in South Carolina move offshore and mix with the Atlantic offshore cobia group, their offshore range is not well understood. It has been determined through tag-recapture research that some cobia migrate from waters off of the East coast of Florida to Georgia and South Carolina but it is unclear as to whether that is a large proportion of the population. It has been hypothesized that the majority of the cobia population make an East-West migration as water temperatures increase to 20-21 C in the spring. Current research using acoustically tagged fish should help elucidate the scale of migration of fish tagged in FL, GA, SC and NC. If the Atlantic stock of cobia is a composite of smaller regional groups that are more state specific, current management paradigms could be questioned. Research using satellite tags with a long battery life may help answer questions of East –West migrations as current telemetry arrays are only coastal in nature. Identifying these basic life history characteristics for cobia in South Carolina would aid in the management of the species both at the state and regional level. Additionally, better socio-economic estimates of the impact of cobia fishing in South Carolina would aid in understanding how regulatory changes may impact the economic benefit cobia fishing has throughout South Carolina.

Regulatory Summary

The South Carolina Legislature and the South Carolina Department of Natural Resources, an executive agency, share regulatory and enforcement responsibilities (respectively) for wildlife in the state of South Carolina. Regulatory authority for fisheries (and cobia) in South Carolina occurs in Title 50 of the South Carolina Code of laws (http://www.scstatehouse.gov/code/title50.php). The South Carolina legislature maintains regulatory authority while the Department of Natural Resources has management authority as well as limited emergency proclamation powers (South Carolina Code of Laws: Section 50-5-20 through 25).

Current Cobia Regulations in South Carolina (July 2017)

Catch limit of two fish per person per day, 33-inch fork length minimum size. (South Carolina code of Laws: Section 50-5: Article 17). State waters south of 032^{o} 31.0 N latitude (Jeremy Inlet, Edisto Island) closed from May 1st to May 31st. Federal waters and other state waters are closed when annual catch limit (ACL) is met.

License Requirements

In South Carolina, a license is required to fish recreationally (South Carolina Code of Laws, Section 50-5) or commercially (South Carolina Code of Laws, Section 50-5). Recreational fishing licenses are required of residents and non-residents fishing in state territorial waters as well as the EEZ. All persons under the age of 16, regardless of residency, and resident seniors who are 65 or older are not required to purchase recreational licenses. Other exemptions exist for active military and individuals with disabilities, check with the SCDNR for details. Commercial fishing licenses are required to sell seafood landed in South Carolina from South Carolina waters or from the EEZ.

Penalties for Violations

Penalties for violations of South Carolina laws and regulations are established in the South Carolina Code of Laws. Most violations of game and fish laws are misdemeanors though some may be elevated to misdemeanors of high and aggravated nature (Section 50-5).

Gear Restrictions

The taking of cobia for both recreational and commercial (federal waters only) purposes can occur with either rod and reel or gig, all other gears are prohibited.

<u>Commercial Landings and Data Reporting Requirements</u>
South Carolina requires commercial harvesters (South Carolina Code of Laws: Section 50-5) and seafood dealers (South Carolina Code of Laws: Section 50-5) to submit landings data. Information to be supplied for each trip includes trip date; vessel identification; trip number; species; quantity; units of measure; disposition; value; county or port landed; state landed; dealer identification; unloading date; market; grade; gear; quantity of gear; days at sea; number of crew; fishing time; and number of sets.

Commercial finfish harvest limits are equivalent to recreational limits unless otherwise noted. This means that commercial harvesters may land and sell no more than two cobia per person per day and minimum size and landing restrictions are the same as recreational. (South Carolina Code of Laws: Section 50-5)

<u>Management Chronology</u>

Prior to 1985: No Regulation

1985: Minimum total length of 37 inches or a fork length of 33 inches. No creel limit.

1987: Minimum fork length of 33 inches, no creel limit

1989: Concurrence with Federal regulations which established a fork length of 33 inches and possession limit of 2 fish per person per day.

1990: South Carolina law (SC Code of Laws: Section 50-5) sets state creel limit set at 2 fish per person per day (matching federal regulations).

1992: South Carolina Marine Recreational Fisheries Conservation Management Act, Saltwater Recreational Fishing License established.

2000: Establishment of Marine Resources Act (Chapter 5 re-write) with Federal regulations declared to be law of the state through Section 50-5-2730 when no specific South Carolina regulations exist.

2012: Cobia designated a Gamefish, commercial capture in South Carolina state waters prohibited.

2016:
- Establishment of the Southern Cobia Management Zone for waters south of 032^{o} 31.0 N latitude (Jeremy Inlet, Edisto Island).
- Creel limit of 1 fish per person per day and no more than 3 per boat for waters south of 032^{o} 31.0 N latitude (Jeremy Inlet, Edisto Island) and no more than 2 fish per person per day in all other South Carolina and Federal waters.

- Closure: Cobia harvest prohibited (catch and release only) from May 1st to May 31st in water south of 032° 31.0 N latitude (Jeremy Island, Edisto Island). Federal and other state waters close when annual catch limit (ACL) is reached.

c. NORTH CAROLINA

Cobia have been harvested in North Carolina since at least the 1950s (CMP FMP 1982). The fishery has primarily consisted of recreationally harvested fish either from the charter boat fishery or from private vessels with modest landings from shore based anglers. Commercial landings of cobia are considered incidental in other fisheries with no targeted fishery to date.

Historically, recreational fisherman targeted cobia from a vessel by anchoring and fishing either dead, or live bait or both near inlets and deep water sloughs inshore (Manooch 1984). Fish were also harvested from shore or off of piers using dead or live bait, most commonly menhaden. In the early 2000s, fisherman began outfitting their vessels with towers to gain a higher vantage point to spot and target free swimming cobia along tidelines and around bait aggregations. This method of fishing actively targets cobia in the nearshore coastal zone and has become the primary mode of fishing in most parts of the state.

Recreational harvest of cobia in North Carolina from 1981 – 2016 have ranged from a low of 0 pounds (1983) to a high of 695,842 pounds (2015) with average landings of 165,146 over the 36-year time series (Figure NC1; Table NC1). Landings during the 1980s and 1990s remained relatively constant from year to year. Landings began to increase and become more variable beginning in the mid-2000s. From 2005-2015, recreational cobia landings in North Carolina ranged from 66,258 to 630,373 pounds (avg. = 259,883 pounds). Seasonally, cobia are landed mostly in the spring and summer months corresponding with their spring spawning migration (Smith 1995). Peak landings occur during the latter part of May into June and quickly diminish thereafter. However, recreational landings of cobia can occur through the month of October. By fishing mode, the majority of recreational landings of cobia in North Carolina occur form private vessels (73 %) with charter vessels (14 %) and shore based modes (13 %) accounting for the rest (Table NC2).

Commercial landings of cobia in North Carolina are available from 1950 to the present. However, monthly landings are not available until 1974. North Carolina instituted mandatory reporting of commercial landings through their Trip Ticket Program, starting in 1994. Landings information collected since 1994 are considered the most reliable. The primary fisheries associated with cobia in North Carolina are the snapper-grouper, coastal pelagic troll, and the large mesh estuarine gill net fisheries. Cobia landings from 1950 – 2016 have ranged from a low of 600 pounds (1951; 1955) to a high of 52,684 pounds (2015) with average landings of 16,611 pounds over the 66-year time series (Table NC3). Recently, landings have ranged from 19,004 pounds (2007) to 52,6845 pounds (2015), averaging 34,674 pounds over the last ten years (Figure NC2).

The primary commercial gear used to harvest cobia has changed overtime. This is most likely due to changing fisheries and the fact that it is mostly considered a marketable bycatch fishery, especially after North Carolina adopted the CMP FMP measures of 33-inches minimum fork length and two-per person possession limit in 1991. From 1950 to the late 1970s, cobia were mostly landed out of the haul seine fishery. Most landings that occurred during the 1980s came from the pelagic troll and handlie fishery with modest landings from the haul seine and anchored gill net fishery. From 1994 – 2016, the majority of landings have occurred from the anchored gill net and pelagic troll and handline fishery with gill nets being the top gear during most of those years.

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Tables and Figures

Table NC1. Recreational estimates of cobia harvest from North Carolina from 1981 – 2016.

Year	Harvest (pounds)	Year	Harvest (Pounds)
1981	6,484	1999	47,477
1982	66,342	2000	118,349
1983	0	2001	74,756
1984	191,237	2002	209,043
1985	20,985	2003	84,774
1986	178,128	2004	294,042
1987	79,943	2005	239,195
1988	106,749	2006	184,299
1989	115,372	2007	106,213
1990	118,387	2008	82,566
1991	128,709	2009	166,195
1992	120,261	2010	498,581
1993	94,990	2011	145,796
1994	94,394	2012	104,105
1995	144,757	2013	506,067
1996	99,867	2014	247,386
1997	154,862	2015	695,842
1998	125,546	2016	293,544

Table NC2. Average cumulative harvest totals (pounds and percent) of cobia harvested in North Carolina from 2011 – 2015 by bi-weekly time period.

	Private Vessels		Charter Vessels		Shore based		All Modes Combined	
Day Range	Cumulative Pounds	Cumulative Percent	Cumulative Pounds	Cumulative Percent	Cumulative Pounds	Cumulative Percent	Cumulative Pounds	Cumulative Percent
Apr 16-30	3,311	1					3,311	1
May 01-15	35,385	12	4,893	9			40,278	11
May 16-31	164,469	58	30,160	56			194,629	53
Jun 01-15	248,925	87	37,722	70	14,066	47	300,713	81
Jun 16-30	264,361	93	40,936	76	14,801	49	320,098	87
Jul 01-15	272,865	96	44,423	83	19,439	65	336,727	91
Jul 16-31	279,176	98	46,772	87	21,341	71	347,289	94
Aug 01-15	281,084	98	49,840	93	21,341	71	352,265	95
Aug 16-31	282,292	99	51,734	96	28,091	94	362,116	98
Sep 01-15	284,534	100	52,098	97	28,840	96	365,472	99
Sep 16-30	284,534	100	53,737	100	29,969	100	368,239	100
Oct 01-15	285,630	100	53,790	100			369,389	100

Table NC3. Total commercial landings of cobia from North Carolina from 1950 – 2016.

Year	Landings (Pounds)	Year	Landings (Pounds)	Year	Landings (Pounds)
1950	3,700	1973	2,545	1995	35,143
1951	600	1974	1,174	1996	33,404
1952	1,500	1975	2,081	1997	42,063
1953	10,000	1976	2,019	1998	22,197
1955	600	1977	973	1999	15,491
1956	4,400	1978	1,928	2000	28,754
1957	11,400	1979	3,552	2001	24,718
1958	9,800	1980	5,128	2002	21,058
1959	13,200	1981	5,260	2003	21,313
1960	11,600	1982	10,574	2004	20,162
1961	17,900	1983	4,279	2005	17,886
1962	19,800	1984	6,701	2006	20,270
1963	17,000	1985	6,640	2007	19,005
1964	12,000	1986	18,303	2008	22,047
1965	10,100	1987	32,672	2009	31,898
1966	9,500	1988	15,690	2010	43,715
1967	10,200	1989	14,898	2011	19,924
1968	7,300	1990	21,938	2012	31,972
1969	6,300	1991	23,217	2013	35,456
1970	7,300	1992	18,534	2014	41,798
1971	10,600	1993	20,431	2015	52,684
1972	3,219	1994	30,586	2016	48,244

Figure NC1. Recreational harvest of cobia from North Carolina from 1981-2016.

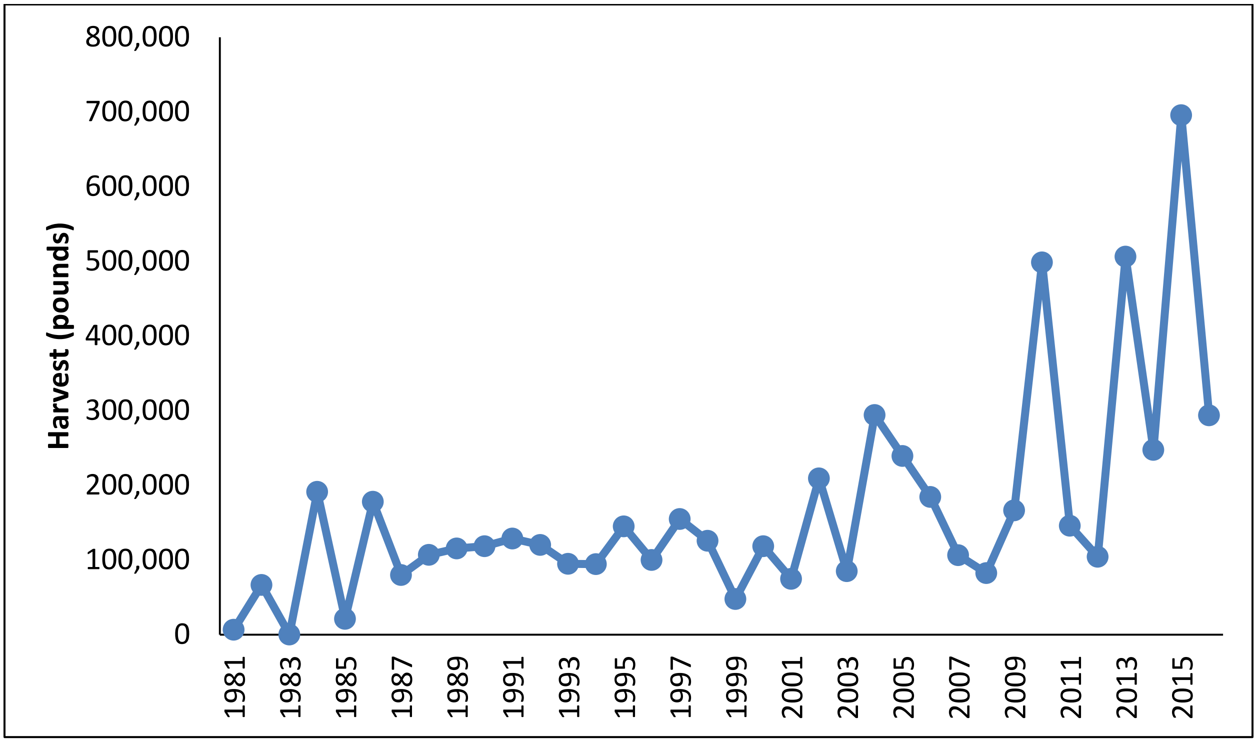
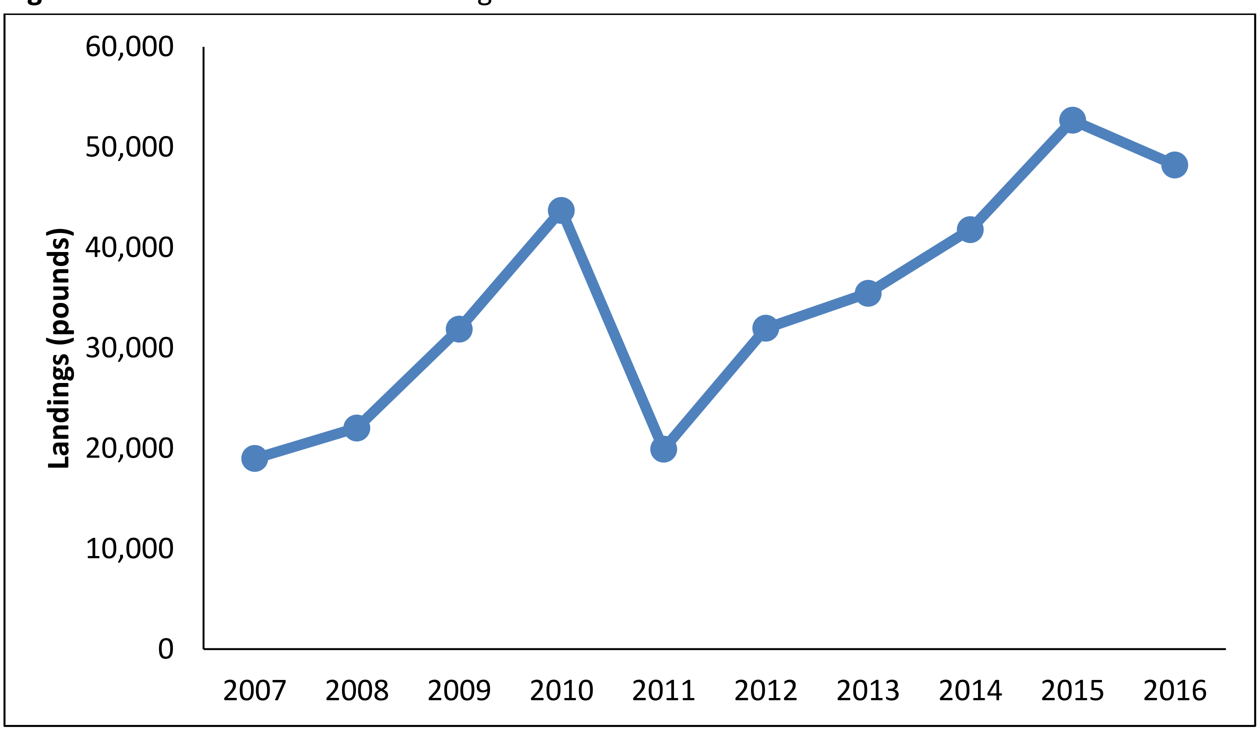


Figure NC2. Total commercial landings of cobia from North Carolina from 2007 – 2016.



IV. VIRGINIA

Description of the Fishery

1.3.1 Commercial Fishery

Virginia has had variable commercial landings of cobia since the Virginia Marine Resources Commission instituted mandatory reporting in 1993, with landings being high in the mid-1990s, lower in the mid-2000s, and peaking in the past three years (2014-2016; Table VA1). There is a small, but directed hook-and-line fishery, with mainly bycatch landings from gillnets and pound nets, although these landings can be sizable (Table VA2). The "Other" category is predominantly gillnet landings, but they were combined with other gears for confidentiality purposes. Hook-and-line landings have been the largest, by gear, since 2007.

Table VA1. Commercial cobia landings for Virginia in pounds, 1993-2016. Data before 2004 are more likely to contain duplicates and misclassifications.

Year	Landings (lbs.)
1993	5,982
1994	7,786
1995	21,942
1996	20,871
1997	11,710
1998	13,419
1999	5,808
2000	7,525
2001	10,228
2002	12,735
2003	7,698
2004	5,778
2005	5,719
2006	9,064
2007	6,052

2008	7,084
2009	6,282
2010	8,974
2011	8,755
2012	5,549
2013	10,865
2014	20,971
2015	25,516
2016	31,473

Table VA2. Percentage of commercial cobia landings for Virginia, by gear, 1993-2016

Year	Hook & Line	Pound Net	Other
1993	39	45	16
1994	32	50	18
1995	27	46	28
1996	51	38	10
1997	12	69	19
1998	38	48	13
1999	19	64	17
2000	20	21	60
2001	38	42	20
2002	45	28	27
2003	26	21	53
2004	29	10	61
2005	35	9	56
2006	31	15	54
2007	36	21	43
2008	51	13	37
2009	54	20	26
2010	66	3	31
2011	81	2	17
2012	61	3	36
2013	73	7	20
2014	85	6	9
2015	81	8	12
2016	81	7	11

1.3.2 Recreational Fishery

According to the Marine Recreational Fisheries Statistics Survey (MRFSS) and Marine Recreational Information Program (MRIP), Virginia's estimated recreational landings of cobia have been highly variable since 2000, with the lowest estimate being 26,537 pounds in 2012 and 898,542 pounds in 2006 (Table 3). Although still preliminary, the estimate for 2016 is 919,992 pounds. It is believed the recreational fishery has grown in recent years, both in the number of participants, and the effectiveness of fishing due to the advent of sight-casting—especially when aided by "cobia towers." Traditionally, cobia had been targeted using live-bait bottom-fishing, but these new techniques are causing a shift in preference among anglers. However, the extent of this change is not clear for Virginia's recreational fishery.

In addition to a large private recreational industry, there is a small, dedicated group of for-hire participants. Many of these captains/fishing guides utilize cobia towers and prefer sight-casting, although some still chum and fish using live bait.

Table VA3. MRFSS (1981-2003) and MRIP (2004-2016) estimates for recreational cobia landings in Virginia. The value for 2016 is preliminary.

Year	Harvest (pounds)	PSE
1981	4,705	.
1985	103,391	23.9
1986	77,695	39.4
1987	24,956	.
1989	105,819	50.4
1990	86,345	60.7
1991	412,996	49.5
1992	159,502	21.8
1993	93,858	47.8
1994	159,460	36.6
1995	200,794	45.6
1996	152,759	64.1
1997	358,225	59.5

1998	141,566	48.1
1999	101,308	41.8
2000	324,562	58.9
2001	367,003	40.7
2002	75,489	54
2003	37,213	.
2004	35,189	75.5
2005	516,764	53
2006	898,542	49.8
2007	352,071	41.7
2008	116,420	65.1
2009	445,993	31.3
2010	254,414	38.9
2011	107,424	57.8
2012	26,537	74.3
2013	224,442	49.9
2014	173,772	46.5
2015	882,022	48.9
2016	919,992	17.9

1.3.4 Non-Consumptive Factors

There are no known, considerable non-consumptive factors in Virginia's cobia fishery.

1.3.5 Interactions with Other Fisheries, Species, or Users

There are no known, considerable or problematic interactions between Virginia's cobia fishery and other fisheries, species, or users.

1.5 Impacts of the Fishery Management Program

1.5.1 Biological and Environmental Impacts

There are no known, considerable biological and environmental impacts from Virginia's cobia fishery.

1.5.2 Social Impacts

1.5.2.1 Recreational Fishery

Because of declines in the fisheries for other species in Virginia, the recreational cobia fishery has become one of the most important for anglers in recent years. MRIP estimates that this is a predominantly private-recreational fishery, but there is a small group of for-hire captains who fish mostly for cobia during summer months. As a result, any changes to the recreational cobia fishery can have considerable impacts on anglers and captains who have come to identify primarily as cobia anglers.

1.5.2.2 Commercial Fishery

Similar to the situation for the recreational sector, commercial hook-and-line fishermen have come to depend more on cobia as the quality of other fisheries in Virginia has deteriorated. In fact, it has become an actively targeted species for many such commercial fishermen, even though cobia has often been considered a bycatch species in other states and for other gears.

1.5.2.4 Non-consumptive Factors

There are no known, considerable non-consumptive factors in Virginia's cobia fishery.

1.5.3 Economic Impacts

1.5.3.1 Recreational Fishery

According to a National Marine Fisheries Service report, in 2014, angler expenditures generated $350 million in sales in Virginia (Lovell et al. 2016), and cobia has been among the top ten species for estimated recreational harvest since 2012. Additionally, the recreational cobia fishery is considered gear-intensive, as it can entail large, specific bucktail jigs for sight-casting or live bait, usually eels, for the more passive method of fishing. Larger nets can also be expensive for those who do not or cannot gaff cobia. The economic investments for the sight-casting fishery can be even higher, as some elect to have "cobia towers" installed on their boats and tend to travel to different spots more actively, thus using more fuel than those who chum and fish with live bait. However, those using chum and live boat often spend more money on those items, despite perhaps not using as much fuel. Altogether, the recreational cobia fishery can contribute considerable economic benefits to luremakers, marinas, bait shops, and other businesses in the Chesapeake Bay region.

1.5.3.2 Commercial Fishery

The dockside value of Virginia's commercial cobia fishery matches the variability in landings since the early 1990s, with the highest values occurring in the years 2014-2016. There have also been years of relative high value in the mid-1990s and low value in the mid-2000s. All dockside values are static and thus not adjusted for inflation.

Table VA4. Dockside values, not adjusted for inflation, of Virginia's commercial cobia fishery, 1993-2016.

Year	Landings (pounds)	Value (dollars)
1993	5,982	$9,602
1994	7,786	$4,184
1995	21,942	$35,221
1996	20,871	$26,235
1997	11,710	$12,506
1998	13,419	$13,626
1999	5,808	$10,373
2000	7,525	$11,883
2001	10,228	$18,898
2002	12,735	$23,104
2003	7,698	$14,706
2004	5,778	$10,890
2005	5,719	$7,979
2006	9,064	$11,687
2007	6,052	$10,009
2008	7,084	$13,275
2009	6,282	$12,061
2010	8,974	$17,469
2011	8,755	$17,968
2012	5,549	$11,584

2013	10,865	$28,136
2014	20,971	$55,838
2015	25,516	$70,764
2016	31,473	$84,032

1.5.3.4 Non-Consumptive Factors

There are no known, considerable non-consumptive factors for Virginia's cobia fishery that would be impacted economically.

1.5.4 Other Resource Management Efforts

1.5.4.2 Bycatch

There is no known, considerable bycatch in Virginia's cobia fishery.

3.0 MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

3.4 Summary of Monitoring Programs

3.4.1 Catch and Landings Information

In 2017, the Virginia Marine Resources Commission instituted mandatory reporting for the recreational cobia fishery. Required data include date of trip, number of anglers, and number of cobia caught and released (even if zero). Permits are also used to track the number of participants in the fishery. As this program develops, it could have potential for usage in stock assessments (e.g., as an index of abundance) or in management decisions (evaluating trends in harvest).

3.4.2 Biological Information

In June 2007, the VMRC began the Marine Sportfish Collection Project (MSCP). This project places freezers at various high traffic weigh stations, where recreational anglers can voluntarily leave legal size whole fish or carcasses. These fish are used to collect biological information such as length, age, and sex. Cobia is one such species accepted for processing and thus has a relatively large dataset for biological information. From 2007 through 2015, the VMRC received a total of 1,265 cobia donations. Before 2007, staff collected cobia carcasses sporadically from various fishing tournaments, totaling 376 samples from 1999 through 2006. In total, there are 1,687 samples of age data, with an average age of 5.3 years.

The Virginia Game Fish Tagging Program (VGFTP) began in 1995 and is jointly operated by the VMRC and the Virginia Institute of Marine Science (VIMS). It utilizes trained volunteers who target and tag several primary species depending on data needs for the current year. From 1995 through 2015, there were 2,865 tags reported for cobia, with the most tags reported in 2012 (n=457, Musick and Gillingham 2016). During that same time period, 298 recaptures were reported, with 66 of them coming in 2015.

3.4.3 Social Information

There are no social impact programs monitoring Virginia's cobia fishery.

3.4.4 Economic Information

There are no economic programs monitoring Virginia's cobia fishery.

3.4.5 Observer Programs

There are no observer programs monitoring Virginia's cobia fishery.

3.5 Stocking Program *(if appropriate)*

The Virginia Institute of Marine Science (VIMS) began an experimental stocking program in the Chesapeake Bay in 2003 to explore stock enhancement and study juvenile movement and habitat utilization (VIMS 2017). Juvenile cobia were tagged and released into the Chesapeake Bay in 2003, 2006, 2007, and 2008, with more than 300 coming in those first two years. Recapture information indicated habitats ranging 1-4 m in depth and consisting of sandy and grass-bed bottoms. It is unclear whether this program had any effect on the population of cobia in Virginia, although it is assumed it did not due to the small number of releases.

3.6 Bycatch Reduction Program

There is no bycatch reduction program in place for Virginia's cobia fishery.

3.7 Habitat Program

There is no habitat program for cobia in Virginia.

References

Cobia Tagging. 2017. Virginia Institute of Marine Science. http://www.vims.edu/research/departments/fisheries/programs/tagging_research/cobia/index.php

Lovell, SJ, J Hilger, S Steinback, and C Hutt. 2016. The Economic Contribution of Marine Angler Expenditures on Durable Goods in the United States, 2014. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-165, 72 pp.

Musick, S, and L Gillingham. 2016. Virginia Game Fish Tagging Program Annual Report, 2015. Virginia Institute of Marine Science Marine Resources Report No. 2016-05. 102 pp.

Appendix III

Cobia Management Options from the Working Group

for South Atlantic Board Review

The Atlantic States Marine Fisheries Commission's (ASMFC) Cobia Plan Development Team and Working Group have met on several occasions by conference call since the February 2017 South Atlantic Board (Board) meeting. The draft FMP should be completed soon and be ready for consideration of approval at the August meeting for public meetings in the early fall.

The purpose of this review is to provide the information discussed by the Working Group and to solicit Board recommendations for the various management options to be considered in the FMP for public review.

Background:

Based on data through 2011, the SEDAR 28 (2013) stock assessment concluded that Atlantic cobia and Gulf cobia were not overfished (SSB>MSST) and overfishing was not occurring (F>MFMT). SEDAR 28 also incorporated genetic and tagging data, and the stock boundary was set at the Georgia/Florida line. The Councils modified the stock boundary and updated the annual catch limits for Atlantic Migratory Group (GA-NY) cobia and Florida east coast cobia through CMP Amendment 20B. The changes were implemented in March 2015.

In 2015 and 2016, Atlantic cobia landings exceeded the ACL and the overfishing level (OFL) recommended by the SSC after SEDAR 28. As defined by the Council, landings > OFL indicate that overfishing occurred in 2015 and 2016. NMFS reduced the recreational season length of Atlantic cobia in 2016 and 2017.

As a result of the overages of the recreational ACL, the Atlantic States Marine Fisheries Commission was asked to consider complementary management of the AMG cobia stock. The ASMFC directed the South Atlantic Board to develop a complementary plan with the basic objectives to maintain catches within the Council prescribed catch limits and to provide states with the flexibility to provide maximum opportunities for their respective stakeholders involved in the fishery.

Summary of the Fishery:

Recreational landings and commercial landings and value are presented in Tables 1 and 2. Landings north of Virginia are sporadic and will be included in the FMP. For purposes of this discussion, we focused on the 4 primary states that land cobia.

Table 1. Recreational landings of Atlantic Cobia from 2005-2015 in pounds. Data sources: SEFSC

Year	VA	NC	SC	GA	Total
2005	577,284	322,272	5,793	3,358	908,707
2006	733,740	104,259	101,018	4,824	943,841
2007	322,887	90,197	268,677	64,708	746,469
2008	167,949	66,258	50,108	257,690	542,006
2009	552,995	123,061	76,229	3,997	756,282
2010	232,987	561,486	65,688	79,855	940,015
2011	136,859	121,689	3,565	90,375	352,488
2012	36,409	68,657	224,365	105,193	434,623
2013	354,463	492,969	19,130	29,224	895,786
2014	214,427	277,489	31,927	20,642	544,485
2015	718,647	630,373	123,952	67,804	1,565,186

* There are no MRIP-estimated recreational landings of AMG Cobia in states north of Virginia.

Table 2. 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. Landing are also reported from Rhode Island in New England.

BOARD DISCUSSION ISSUES:

Size and Bag Limits:

The current Council plan proposes a 1 fish bag limit and a 36" FL minimum size limit for federal waters. States appear prepared to complement these measures in state waters if they haven't already. The Working Group suggests that the ASMFC FMP complement these actions and not provide opportunities to adjust at this time.

State by State Allocations:

Arguably, one method to provide states with the greatest flexibility in managing their recreational cobia fishery is to provide a specific allocation or percentage of the current Annual Catch Limit (ACL) to each state. The Working Group has spent significant time reviewing the AMG cobia landings data, recognizing that cobia are a pulse fishery that are considered a rare event species in the MRIP program.

The SAFMC used the SEFSC data for the SEDAR 28 Cobia stock assessment and those data have been certified as best available data by the Council's Science and Statistics Committee (SSC). The Board directed staff to use the SEFSC data in developing this plan, however, understanding and recognizing the differences in the two methods is important moving forward.

Concerns have been raised regarding the differences between the recreational landings data estimated from MRIP data from the Office of Science and Technology (OST MRIP) and landings generated by the Southeast Fishery Science Center (SEFSC). The primary difference in the methodologies center around average weights of the fish used to expand numbers harvested to pounds landed by state. The OST MRIP estimates are based on actual fish observed and may be estimated based on one fish, while SEFSC estimates require a sample of at least 30 fish to generate an average (Table 3).

States without a sample size of 30 for a specific year may use an average over several years (e.g., Virginia) or lumped with another state to meet the required sample size of 30 fish (e.g., SC and GA).

Table 3. Comparison of OST and SEFSC average weights for Virginia, North Carolina, South Carolina, and Georgia (2010-2015) (source: SEFSC; MRIP website).

State-Year	Cobia #	OST Landings	OST Weight (lbs.)	SEFSC Landings	SEFSC Weight (lbs.)
Va-2010	7,056	254,414	36.1	239,153	33.9
Va-2011	4,119	107,424	26.1	139,622	33.9
Va-2012	1,051	26,537	25.2	35,614	33.9
Va-2013	10,735	224,442	20.9	363,865	33.9
Va-2014	6,490	173,772	26.8	219,993	33.9
Va-2015	21,173	882,022	41.7	717,676	33.9
NC-2010	15,125	498,581	33.0	558,984	37.0
NC-2011	4,478	145,796	32.6	119,347	26.7
NC-2012	2,050	104,106	50.8	66,302	32.3
NC-2013	19,224	506,067	26.3	491,527	25.6
NC-2014	9,804	247,386	25.2	275,777	28.1
NC-2015	16,166	695,842	43.0	642,213	39.7
SC-2010	2,102	67,946	32.3	61,424	29.2
SC-2011	0	0	0	0	0

SC-2012	6,835	201,223	29.4	221,024	32.3
SC-2013	634	9,873	15.6	15,146	23.9
SC-2014	1,137	26,439	23.3	28,377	25.0
SC-2015	4,182	124,933	29.9	124,316	29.7
GA-2010	2,637	89,840	34.1	77,064	29.2
GA-2011	3,304	74,651	22.6	88,049	26.6
GA-2012	3,185	97,766	30.7	102,996	32.3
GA-2013	1,189	25,183	21.2	28,427	23.9
GA-2014	792	19,079	24.1	19,768	25.0
GA-2015	2,282	26,499	11.6	67,851	29.7

Staff and the Working Group expressed concerns regarding the average weights as being high. In some years, the average size exceeds the weight required to receive a citation for an outstanding catch.

Staff provided the Working Group with multiple views of the landings from both the OST MRIP and SEFSC that included head boat landings, various time series (3, 5, and 10 years), and an option that considered 50% of the 10 year time series to account for historical landings and 50% of the 5 year average to account for the more recent time series (Tables 4-7).

Table 4. Average AMG Cobia landings and percentage by state for the 3 yr., 5 yr., 10 yr., and 50% 10 yr. + 5 yr. averages (**2005-2014**) (Data source: SEFSC w/ headboat).

State	3yr/%	5yr/%	10yr/%	5yr/10yr%
Georgia	51,051 lbs. 8.1%	63,873 lbs. 10.1%	64,391 lbs. 9.0%	64,132 lbs. 9.5%
South Carolina	91,174 lbs. 14.5%	67,751 lbs. 10.7%	83,054 lbs. 11.7%	75,402 lbs. 11.2%
North Carolina	279,163 lbs. 44.5%	303,329 lbs. 47.8%	221,266 lbs. 31.1%	262,297 lbs. 39.0%
Virginia	206,491 lbs. 32.9%	199,649 lbs. 31.5%	342,608 lbs. 48.1%	271,128 lbs. 40.3%
Total	627,879 lbs. 100%	634,602 lbs. 100%	711,319 lbs. 100%	672,959 lbs. 100%

Table 5. Average AMG Cobia landings and percentage by state for the 3 yr., 5 yr., 10 yr., and 50% 10 yr. + 5 yr. averages (**2006-2015**). (Data source: SEFSC w/ headboat).

State	3yr/%	5yr/%	10yr/%	5yr/10yr%
Georgia	39,474 lbs. 4.0%	61,993lbs. 8.2%	71,100 lbs. 9.2%	66,546 lbs. 8.7%
South Carolina	58,845 lbs. 5.9%	80,088 lbs. 10.6%	95,212 lbs. 12.3%	87,650 lbs. 11.4%
North Carolina	471,250 lbs. 47.0%	320,015 lbs. 42.2%	253,529 lbs. 32.7.0%	286,772 lbs. 37.4%
Virginia	433,845 lbs. 43.2%	295,354 lbs. 39.0%	354,811 lbs. 45.8%	325,082 lbs. 42.4%
Total	1,003,414 lbs. 100%	757,450 lbs. 100%	774,652 lbs. 100%.	766,050 lbs. 100%

Table 6. Average AMG Cobia landings and percentage by state for the 3 yr., 5 yr., 10 yr., and 50% 10 yr. + 5 yr. averages (**2005-2014**) with headboat landings (Data source: OST MRIP website).

State	3yr/%	5yr/%	10yr/%	5yr/10yr%
Georgia	47,997 lbs. 8.6%	61,916 lbs. 10.6%	68,249 lbs. 10.0%	65,082 lbs. 10.3%
South Carolina	82,170 lbs. 14.7%	63,653 lbs. 10.9%	76,263 lbs. 11.1%	69,958 lbs. 11.0%
North Carolina	286,507 lbs. 51.3%	300,944 lbs. 51.5%	228,728 lbs. 33.4%	264,836 lbs. 41.7%
Virginia	141,584 lbs. 25.4%	157,318 lbs. 27.0%	311,639 lbs. 45.5%	234,478 lbs. 37.0%
Total	558,258 lbs. 100%	583,831lbs. 100%	684,879 lbs. 100%.	634,354 lbs. 100%

Table 7. Average AMG Cobia landings and percentage by state for the 3 yr., 5 yr., 10 yr., and 50% 10 yr. + 5 yr. averages (**2006-2015**) with headboat landings (Data source: OST MRIP website).

State	3yr/%	5yr/%	10yr/%	5yr/10yr%
Georgia	24,379 lbs. 2.5%	49,211 lbs. 6.6%	70,868 lbs. 9.1%	60,039 lbs. 7.8%
South Carolina	56,647 lbs. 5.7%	74,809 lbs. 10.0%	88,334 lbs. 11.3%	81,571lbs. 10.7%
North Carolina	483,890 lbs. 48.8%	340,418 lbs. 45.5%	274,266 lbs. 35.1%	307,342 lbs. 40.2%
Virginia	426,745 lbs. 43.0%	282,839 lbs. 37.8%	348,164 lbs. 44.5%	315,501 lbs. 41.3%
Total	991,661 lbs. 100%	747,277 lbs. 100%	781,632 lbs. 100%.	764,453 lbs. 100%

Excluded from all these analyses are landings data from north of Virginia. Using SEFSC data, those landings are:

2005 – Delaware – 1,480 lbs.

2006 and 2012– New Jersey – 27,863 lbs., 69,655 lbs.

2010 and 2016 – Maryland – 1,287 lbs., 1,762 lbs.

Average landings and percentages by state vary based on the time series selected and the landings estimate used. As a result of concerns raised over the variability in average weights throughout the management unit and the observation that total numbers of fish harvested were consistent between methods, we examined the landings by number of fish to eliminate any bias or concern relative to average weights. While any time series of landings may be selected, the time series of 2005-2014 using 50% of the 10 year average and 50% of the 5 year average appears to smooth out the variability in the results from other time series, and was used in this simple comparison (Table 8).

Table 8. Average AMG Cobia landings and percentage by state 50% 10 yr. + 5 yr. averages compared to numbers of fish harvested (**2005-2014**) with share of ACL (620,000 pounds) for both methods (Data source: SEFSC w/ headboat).

State	5yr/10yr-lbs.	ACL	5yr/10yr-#	ACL
Georgia	64,132 lbs. 9.5%	58,900 lbs.	n = 2,221 10.2%	63,240 lbs.
South Carolina	75,402 lbs. 11.2%	69,444 lbs.	n = 2,521 11.6%	71,920 lbs.
North Carolina	262,297 lbs. 39.0%	241,800 lbs.	n = 8,932 41.2%	255,440 lbs.
Virginia	271,128 lbs. 40.3%	249,860 lbs.	n = 7,999 36.9%	228,780 lbs.
Total	672,959 lbs. 100%		n = 21,673 100%	

Based on the review of the Working Group, there was clear interest in considering numbers of fish to examine allocations among states if that is a direction of the Board.

Board Decisions:

Time series options (years used and number of years)

Use average weights (SEFSC or MRIP) or numbers of fish

Seasonal Options:

Data are sparse for analysis of seasonal options outside of wave data and are variable based on the years chosen for review (Figure 1). Peak landings occur during wave 3 from Georgia through North Carolina (May-June) with limited landings after wave 3. Landing vary for Virginia with peaks occurring during waves 3 and 4 (July-August) and landings occurring as late as wave 5.

Figure 2 provides coastwide landings for the most recent years (2013-2015) and indicates an extension of availability later into the fall (wave 5).

The SAFMC examined the potential for changing the start date to the fishing year to May 1 using the most recent landings information (2013-2015). This option was removed from the framework document because fishing year changes can only be done through an amendment. Based on their analysis, and recognizing that landings of AMG cobia are minimal prior to May 1, Table 5 indicates that season lengths could be extended by 3-4 days by delaying the coastwide opening until May 1.

Based on review, coastwide, seasonal options are limited. A January 1 start date for the fishing year and vessel limits that range from 1 to 6 fish, result in seasonal closures that range from July 15 – August 22. Changing the fishing year to begin May 1, provides coastwide seasons that close from July 19 – August 25.

State specific impacts of a coastwide seasonal closure vary. Based on the most recent years (2013-2015), the majority of the catch is taken during waves 2 and 3 in Georgia (80%), South Carolina (82%), and North Carolina (90%), whereas 70% of the catch is taken during waves 4 and 5 in Virginia.

While Virginia had no wave 2 landings reported from 2006-2015, wave 2 accounted for nearly 100% of the landings in Georgia, and 16-26% of the landings in North Carolina and South Carolina respectively, in some years.

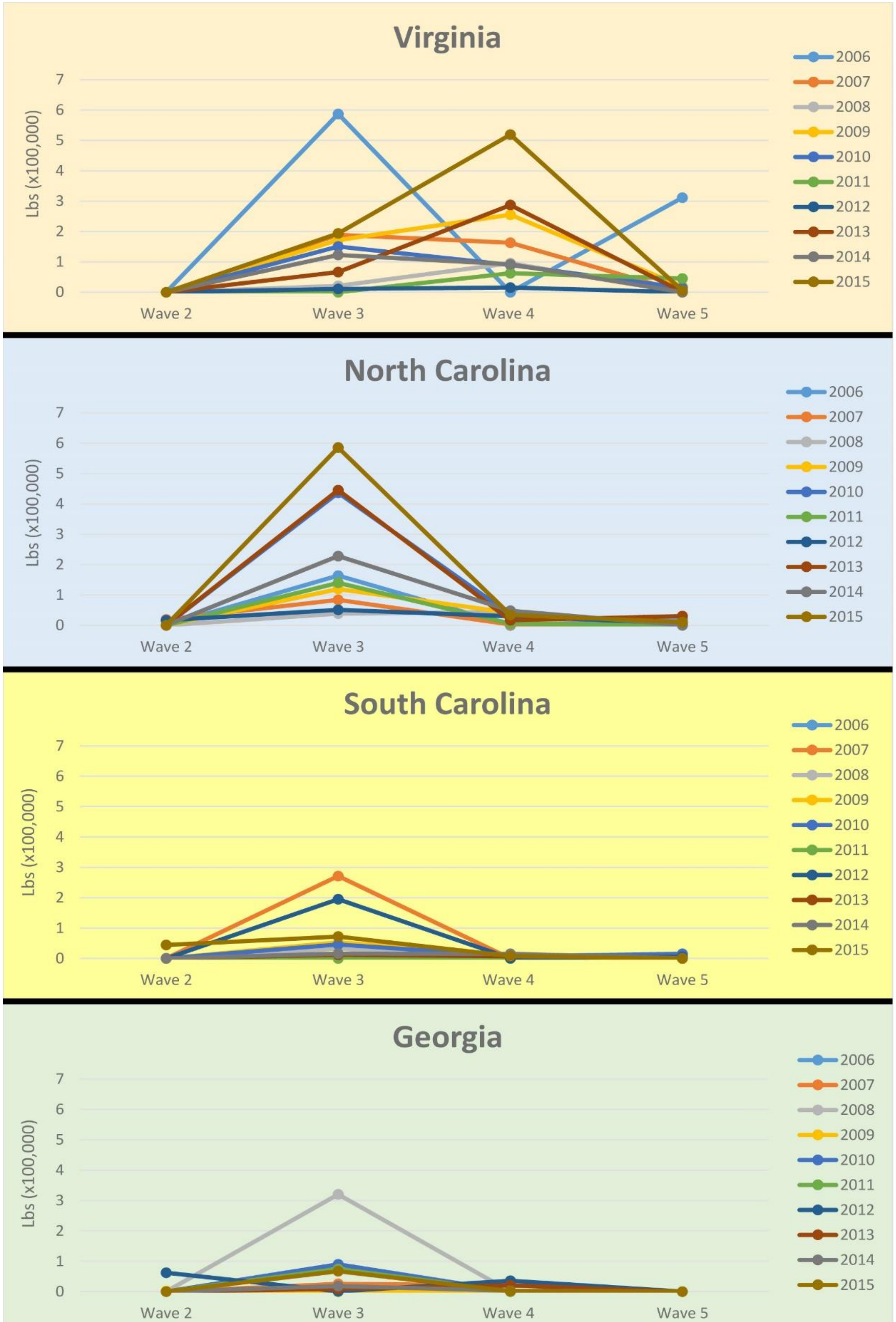


Figure 1. Recreational catch of Atlantic cobia by wave from 2006-2015 for Waves 2-5. Data sources: SERO and MRIP database—Framework 4.

Table 9. Framework 4 proposed but omitted Table 2.2.1. Estimated dates when Atlantic cobia recreational landings would meet the recreational ACL under the range of minimum size limits, bag limits, and vessel limits, if the fishing year is changed to May 1-April 30. Highlighted cells are the current Preferred Sub-alternatives in Action 1.

	Minimum Size Limit (inches fork length)								
	33	34	35	36	37	38	39	45	50
Bag Limit									
1 per Person	5-Jul	8-Jul	13-Jul	19-Jul	26-Jul	3-Aug	8-Aug	None	None
2 per Person	2-Jul	6-Jul	10-Jul	16-Jul	23-Jul	31-Jul	4-Aug	None	None
Vessel Limit									
1 per Vessel	2-Aug	7-Aug	14-Aug	25-Aug	20-Mar	None	None	None	None
2 per Vessel	14-Jul	18-Jul	23-Jul	31-Jul	8-Aug	18-Aug	24-Aug	None	None
3 per Vessel	8-Jul	12-Jul	16-Jul	23-Jul	30-Jul	8-Aug	13-Aug	None	None
4 per Vessel	6-Jul	9-Jul	14-Jul	21-Jul	27-Jul	5-Aug	10-Aug	None	None
5 per Vessel	5-Jul	8-Jul	13-Jul	20-Jul	26-Jul	4-Aug	9-Aug	None	None
6 per Vessel	3-Jul	7-Jul	11-Jul	18-Jul	24-Jul	1-Aug	6-Aug	None	None

Note: As with **Table 2.1.1** this analysis assumed consistent regulations in state and federal waters, and estimated the dates based on recreational landings from 2013-2015.

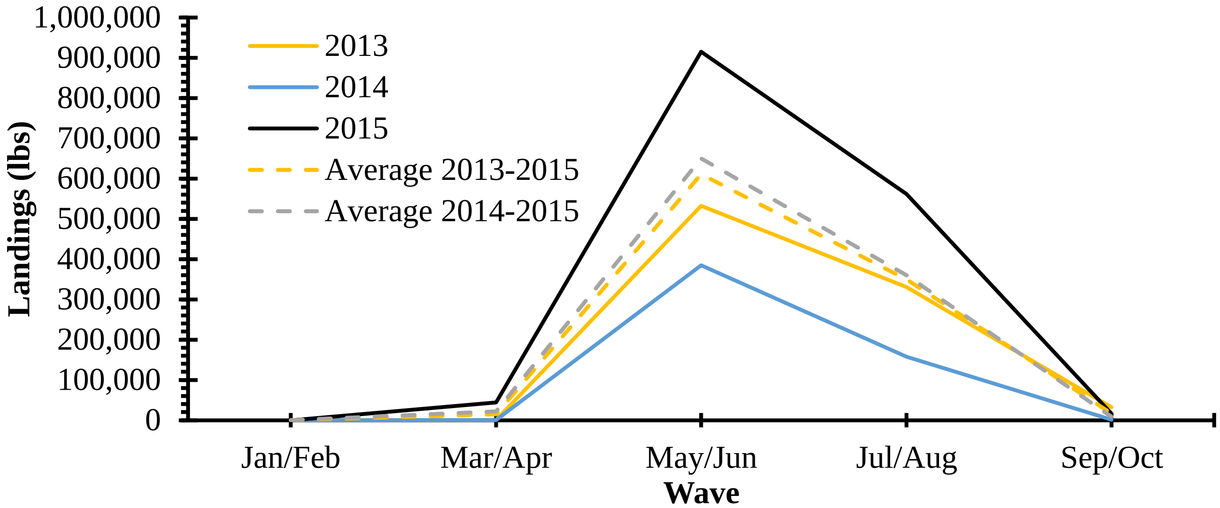


Figure 2. Framework Figure 2.2.1. Atlantic recreational landings for January-October of 2013, 2014, 2015, average 2013-2015 landings, and average 2014-2015 landings by two-month wave. The landings for 2015 are preliminary. Source: SEFSC Recreational ACL Dataset

A detailed analysis of state specific landings information was conducted by C. Wilson with NC DMF. The analysis was provided to members of the Working Group and the PDT. Summary findings illustrate the variability in the impacts of seasons, size limits, bag and vessel limits on the individual states. These data tend to indicate that mandated seasonal options remove flexibility from the states and that the data are available, though confidence varies, for states to modify seasonal opening based on the interests of their unique situation.

A summary table provides some of the general information from the state specific analysis (Table 10). The analysis also provides state specific information at the month level as opposed to wave. The analyst does not recommend reducing time periods less than 1 month due to data limitations.

Table 10. Cobia Harvest reductions by state from a 36" FL size limit (36"), a 36" FL size limit with a 1 fish bag limit and season open May 1 (May 1), a 36" FL size limit with a 1 fish bag limit and season open June 1 (June 1)

State	36"	May 1	June 1
Georgia	28%	37%	60%
SC	11%	58%	66%
NC	5%	49%	73%
VA	11%	44%	48%
Total	**11%**	**47%**	**61%**

In summary, variability in catch rates over the past decade indicate that landings are increasing and have recently exceeded the ACL by a wide margin. A consistent size limit of 36" FL in state and federal waters along with a 1 fish bag limit is unlikely to constrain catches if recent years harvest are an indication of future success. Consequently, vessel limits, season start dates, and season lengths are the primary mechanisms we examined to further constrain landings to achieve the FMP objective of maintaining catches within the ACL.

<u>Board Decisions/Discussion:</u>

Are specific seasons options wanted for the FMP or are they best left to the states to develop and have approved by the TC and Board?

If specific seasons are needed in the FMP, should, they be based on a state specific allocation? What would be another viable option to ensure equity and accountability?

Regardless of the allocation scheme used, if at all, concern has been raised over tracking the ACL on a state or coastwide basis in real time using MRIP. While all states may have port agents to observe catches, effort data are unavailable until after waves are complete and could result in impacts despite best efforts to control.

Should the plan attempt to develop alternative quota monitoring methods that use a multiple of years to provide states to adjust after year 1 or an overage if landings are too high or too low based on initial measures? These efforts would have to be developed with NMFS and the Council.

The PDT expressed some interest in spawning season closures, suggesting that an early season closure that extended through May would provide an increase in population egg production. The state of South Carolina has implemented a May closure in their southern management unit to reduce harvest and facilitate spawning.

Based on current state actions that implement 3-4 fish vessel limits, we are unclear as to how those limits may constrain catches to the level required for NMFS to re-open the EEZ to harvest. Providing access to the cobia resource in federal waters is a critical need for most states. Prior to final approval of the draft for public hearings, we need to discuss how we might complement federal actions in state waters or vice versa. Based on recent performance in the fishery, vessel limits greater than 2 may impact the fishery in the EEZ. However, later start dates or in season closures at the state level may provide NMFS with the assurance they need to minimize the chances of exceeding the ACL.

September 6, 2017

Maryland proposal to initiate addendum to reopen historic commercial black drum fishery.

Introduction:
The state of Maryland is seeking to reopen its historic commercial black drum fishery at levels commensurate with other South Atlantic States. We welcome review of the following proposal by the Black Drum Technical Committee and would hope to discuss initiating an Addendum at the annual meeting of the Commission in October 2017.

Background:
During the late 1990's, the state of Maryland began a tag and release program for Black Drum in order to gather critical life history, migration and recreational harvest data for the species. This program compensated commercial watermen for black drum encountered in pound nets. The watermen were prohibited from taking the fish, but were paid for fish that were tagged and released from their nets. In 1998, the compensation/tagging program was eliminated but commercial harvest was not reinstated. Commercial watermen would periodically request reinstatement of harvest, but this never became a priority issue and commercial harvest was not remained closed. Then in 2013, the fishery was formally and permanently closed when ASMFC approved the Interstate Fishery Management Plan for Black Drum in 2013, which states in section 4.2: "*In order to avoid the establishment of any new commercial fisheries for black drum, all states shall maintain their current level of restrictions, i.e. no relaxation of current commercial fisheries management measures.*" As a result of this language in the plan, the Maryland Chesapeake Bay was frozen in a commercial moratorium, which is the most conservative management for black drum among the South Atlantic states.

Maryland Proposal:
With findings of a positive stock status and to honor requests from the commercial fishing community, Maryland proposes to initiate an Addendum that would allow modest commercial harvest of black drum within Maryland.

We are proposing to reopen the Chesapeake Bay commercial black drum fishery with a ten fish per vessel per day harvest limit and a 28 inch minimum total length size limit. This equates to a daily trip limit of approximately 500 pounds.

Vessel Limit Rationale: Maryland DNR conducted a tagging study from 1995-1997 in which 457 black drum were weighed. Mean weight for fish over 28 inches was 46.6 pounds, indicating a ten fish limit would be similar to a 500 pound per day limit. Ninety-one percent of the weights were taken in 1997, which appeared to be a year in which mean length may have been higher than normal. Maryland DNR has also conducted a pound net survey from 1993 to the present, which encounters low numbers of black drum. Mean length from the late 1990's tagging study was 1104 mm total length (n=900) compared to a pound net survey mean length of 883 mm total length from 1993-2016 (n=131), indicating greater variability in lengths than the tagging study. This indicates that 10 fish will often weigh less than 500 pounds.

Size Limit Rationale: The 28 inch total length size limit represents the length of 100% maturity, would ensure no increase in mortality on immature black drum. Tagging study and pound net survey length frequencies indicate 3% and 37% of black drum, respectively, would have been discarded if a 28 inch size limit had been in place. Again the broader time period of the pound net survey takes more inter annual variability into account, making it likely, that in the long term, the higher discard rate is more accurate.

Both North Carolina and Florida currently have 500 pound per day commercial limits, and Maryland's proposal would allow for a Maryland harvest that is comparable to harvest regulations along the Atlantic Coast (Table 1).

Estimated Impacts of Maryland's Proposal: The objective of this request is to reinstate a historical fishery which would have little impact on the coastal harvest. From 1973-1997, the time period for which landings by area are available in Maryland, Chesapeake Bay commercial black drum harvest ranged from zero to 41,552 pounds, with an annual average harvest of 11,475 pounds. The majority of these landings were taken in pound nets. There were no commercial harvest restrictions from 1973-1993, and a 16 inch minimum total length size limit and 30,000 pound annual Chesapeake Bay commercial quota from 1994-1997. Compared to the 2015 total coast-wide harvest 1,486,327 pounds, the addition of Maryland's historical average or maximum Chesapeake Bay harvest would lead to increases in total harvest of 0.8% and 2.8% respectively. Our proposal is more restrictive than the regulations that were in place from 1973 to 1997, so impacts of Maryland harvest to the coast-wide total would likely be on the low end of this range.

The 2015 coastwide benchmark stock assessment (data through 2012) indicated the stock was not overfished and overfishing was not occurring. The current total harvest target is 2.12 million pounds and the threshold is 4.12 million pounds, with a 2015 total harvest of 1.49 million pounds. Current fishing levels are 30% below the target indicating additional landings from reopening the Maryland Chesapeake Bay commercial harvest, at a more restricted level, would be unlikely to exceed the target and very unlikely to lead to overfishing.

[1]**Table 1. Black drum regulations for 2015.** The states of New Jersey through Florida are required to meet the requirements in the FMP. All size limits are total length.

State	Recreational		Commercial			Notes
	Size limit	Bag limit	Size limit	Trip Limit	Annual Quota	
ME - NY	-	-	-	-	-	
NJ	16" min	3/person/day	16" min	10,000 lbs	65,000 lbs	
DE	16" min	3/person/day	16" min	10,000 lbs	65,000 lbs	
MD	16" min	1/person/day 6/vessel (Bay)	16" min		1,500 lbs Atlantic Coast	Chesapeake Bay closed to commercial harvest
VA	16" min	1/person/day	16" min	1/person/day *	120,000 lbs	*without Black Drum Harvesting and Selling Permit
NC	14" min - 25" max; 1 fish > 25" may be	10/person/da y	14" min - 25" max	500 lbs		

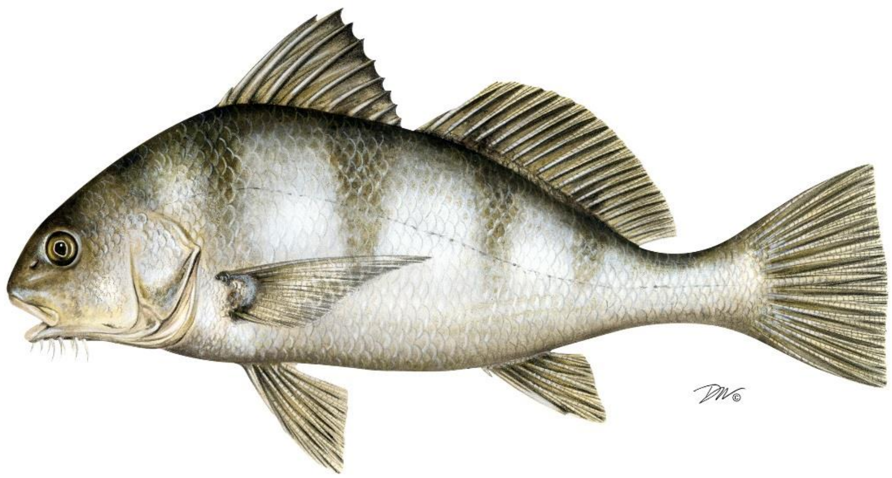
[1] Table is taken from: 2016 Review of the Atlantic States Marine Fisheries Commission Management Plan for Black Drum (*Pogonias cromis*), 2014 and 2015 Fishing Years. Located online at: http://www.asmfc.org/species/black-drum

SC	14” min - 27” max	5/person/day	14” min - 27” max	5/person/day		Commercial fishery primarily bycatch
GA	14” min	15/person/da y	14” min	15/person/day		
FL	14” min - 24” max; 1 fish >24” may be	5/person/day	14” min - 24” max	500 lbs/day		

2017 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR

BLACK DRUM (*Pogonias cromis*)

2016 FISHING YEAR



The Black Drum Plan Review Team
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Chris McDonough, South Carolina Department of Natural Resources
Michael Schmidtke, Atlantic States Marine Fisheries Commission

Table of Contents

I. Status of the Fishery Management Plan

Date of FMP Approval: Original FMP – June 2013

Management Areas: The entire Atlantic coast distribution of the resource from New Jersey through the east coast of Florida

Active Boards/Committees: South Atlantic State/Federal Fisheries Management Board; Black Drum Technical Committee, Stock Assessment Subcommittee, Plan Review Team; South Atlantic Species Advisory Panel

The Atlantic States Marine Fisheries Commission (ASMFC) adopted an interstate Fishery Management Plan (FMP) for Black Drum in 2013. Prior to the FMP, management was state-specific, from no regulations in North Carolina to various combinations of size limits, possession limits, commercial trip limits, and/or annual commercial quotas from New Jersey to Florida. The Maryland portion of the Chesapeake Bay was closed to commercial fishing in 1998.

The FMP requires all states with a declared interest in the species to have established a maximum possession limit and minimum size limit of at least 12 inches by January 1, 2014, and to have increased the minimum size limit to at least 14 inches by January 1, 2016. The FMP also includes a management framework to adaptively respond to future concerns or changes in the fishery or population.

There are four plan objectives:

- Provide a flexible management system to address future changes in resource abundance, scientific information, and fishing patterns among user groups or area.
- Promote cooperative collection of biological, economic, and sociological data required to effectively monitor and assess the status of the black drum resource and evaluate management efforts.
- Manage the black drum fishery to protect both young individuals and established breeding stock.
- Develop research priorities that will further refine the black drum management program to maximize the biological, social, and economic benefits derived from the black drum population.

The management unit for black drum under the FMP is defined as the range of the species within U.S. waters of the northwest Atlantic Ocean, from the estuaries eastward to the offshore boundaries of the Exclusive Economic Zone (EEZ).

II. Status of the Stocks

In the 2015 Black Drum Benchmark Stock Assessment, the Stock Assessment Subcommittee (SAS) selected the Depletion-Based Stock Reduction Analysis (DB-SRA; Dick and McCall 2011) as the preferred method for estimating catch reference points. The SAS considered the Depletion-

Corrected Average Catch (DCAC; McCall 2009) analysis, but ultimately rejected this method. DCAC did not incorporate removals into a population dynamics process, and uncertainty existed over how changes in the exploitation rate time series may impact the sustainable yield relative to the current stock condition.

Based on the DB-SRA results, black drum life history, indices of abundance, and history of exploitation, the black drum stock is not overfished and not experiencing overfishing (ASMFC 2015). Median biomass exhibited slow and steady decline from 135.2 million pounds in 1900 to 90.78 million pounds in 2012, though the median biomass estimate in 2012 is still well above the necessary level to produce maximum sustainable yield (B_{MSY}; 47.26 million pounds). The median maximum sustainable yield (MSY) estimate is 2.12 million pounds and provides an annual catch target that can be used to sustainably manage the fishery. The median overfishing limit (OFL) estimate is 4.12 million pounds and provides a catch threshold that indicates overfishing when exceeded. The OFL is the maximum exploitation rate at the current biomass that does not lead to overfishing.

III. Status of the Fishery

The following discussion utilizes results from direct queries of the Marine Recreational Information Program (MRIP) data through their website. Adjustments needed to make these consistent through time (convert pre-2004 MRFSS data, adjust for changes in for-hire component of survey, and deletion of 1981-1985 headboat data) have not been made here.

Total black drum landings from New Jersey through the east coast of Florida are estimated at 1.53 million pounds in 2016, a 2.8% increase from total harvest in 2015 (Tables 2 and 3, Figure 2). 2016 harvest is 30% below the previous ten-year (2006-2015) average. The commercial and recreational fisheries harvested 14.7% and 85.3% of the 2016 total, respectively.

Commercial landings of black drum span from New Jersey through Florida, excluding the Maryland portion of the Chesapeake Bay (Table 2). Coastwide commercial landings show no particular temporal trends, ranging from approximately 120,000 to 400,000 pounds annually over the last 14 years (Figure 2). Black drum commercial landings in 2016 were estimated at 225,253 pounds, a 5% decrease from those of 2015. North Carolina led commercial harvest with 40% of the landings, followed by Virginia and Delaware with 25% and 22%, respectively (Table 2). Virginia and North Carolina have historically been the major commercial harvesters, while Delaware has caught increased percentages of the commercial harvest over the last two years.

Recreational harvest of black drum peaked in 2008 at 789,216 fish (or 5.2 million pounds; Tables 3 and 4). Since 2000, the number has fluctuated without trend between 166,334 and 789,216 fish (weight has fluctuated between 744,267 and 5.2 million pounds; Figures 2 and 3). Recreational harvest increased from 166,344 fish in 2015, the lowest number since 1993, to 396,021 fish in 2016.

After a year where the coastwide recreational average weight per fish (recreational harvest in pounds divided by recreational harvest in numbers) showed a large increase (7.5 pounds per fish in

2015), average weight declined in 2016 to 3.29 pounds per fish, which is closer to the time series average from 1981-2016 of 3.74 pounds per fish. Years that have shown large increases in coastwide average weight (i.e. increases to recreational harvest in pounds without proportional increase to recreational harvest in numbers) have typically occurred during years when Mid-Atlantic states (Virginia-New Jersey) have caught increased percentages of the coastwide recreational harvest (Tables 3 and 4).

The 2016 recreational harvest represents a 6% decrease in numbers and a 32% decrease in pounds from the previous ten year (2006-2015) average. Florida anglers landed the largest share of the coastwide recreational harvest in numbers (59%), followed by North Carolina (18%) and South Carolina (16%). Since the beginning of the recreational time series (1981) anglers have released increasing percentages of caught fish, with percentages of recreational fish released exceeding 70% in each of the past 3 years. In 2016, 73% (1.1 million fish) of the recreational catch was released (Figure 3, Table 5). It is worth noting that release rates seemingly plateaued around 50% from the late 1990s through 2013, when the FMP took effect, establishing minimum sizes in every state and requiring that undersized drum be released for the first time. Recent high release rates can be attributed to these measures, as well as encouragement of catch and release practices.

It should also be noted that depending on the state, percent standard error (PSE) of recreational harvest in numbers ranged widely in 2016, from 29.3-102.2%. Values in most previous years were greater than 50%. PSE values above 50% are regarded as uncertain and are typically attributed to a high level of variability in the harvest estimates. Since harvest estimates are expansions of field intercepts and phone surveys, these high PSE levels indicate higher levels of uncertainty in the expansion estimates for harvest as well as B2 (released alive) estimates. However, this is common for many recreational fisheries and the data trends indicated are still reliable for general management advisement.

IV. Status of Assessment Advice

Current stock status information comes from the 2015 benchmark stock assessment (ASMFC 2015) completed by the ASMFC Black Drum Stock Assessment Subcommittee and Technical Committee, peer reviewed by an independent panel of experts, and approved by the South Atlantic State-Federal Fisheries Management Board for use in management decisions.

The stock assessment could be improved by applying a more complex, data-rich assessment method such as a statistical catch-at-age model. Data limitations that need to be addressed to successfully make this transition are biological sampling (length and age) of recreational and commercial fisheries and a fishery-independent survey to track abundance and age structure of the mature stock. Additionally, information about commercial discards and movement of fish along coast and between water depths would improve the assessment.

V. Status of Research and Monitoring

There are no monitoring or research programs required annually of the states except for the submission of a compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2016 reports.

Fishery Dependent Monitoring

- New Jersey DEP – Sampled from commercial fishery. Total length and sex were recorded and otoliths collected (n=53).
- Delaware DFW – Black Drum were not sampled in 2016 due to the unavailability of commercially and recreationally caught fish. Black drum sampling is being conducted in 2017.
- Maryland DNR – Conducted commercial pound net survey from late spring through summer. (2016: 4 fish, mean total length: 952 mm).
- Virginia MRC –
  - Conducted a biological monitoring program to sample commercial and recreational harvest (2016 – commercial: 447 samples for length and weight, 434 for sex, and 393 for age; recreational: 88 samples for length, 21 for weight, 80 for sex, and 87 for age).
  - Conducted Virginia Game Fish Tagging Program with volunteer anglers (2016: 96 fish tagged and 5 recaptured).
- North Carolina DMF – Conducted commercial sampling of black drum bycatch (2016: n=811; mean total length=17 in).
- South Carolina DNR – Terminated the state finfish survey and took over MRIP intercept sampling in 2013 (information reported through MRIP). Commercially reported black drum are captured through commercial monitoring program.
- Georgia CRD – Collected age, length, and sex data through the Marine Sportfish Carcass Recovery Project (2016: 115 black drum, mean length 402.3 mm centerline length).
- Florida FWC – Conducted Florida trip ticket program monitoring commercial catch and effort. Numbers of fish per trip in 2016 decreased from 2015, but were above the long-term average of the time series (1986-2016).
- NMFS – Collected recreational catch, harvest, release, and effort data, as well as length measurements via MRIP.

Fishery Independent Monitoring

- New Jersey DEP –
  - Ocean Trawl Survey: 28-year time series average is 0.16 (2016: 0.07).
  - Delaware Bay Trawl: 26-year time series average is 0.15 (2016: 0.04)
  - Delaware River Seine: 37-year time series average is 0.06 (2016: 0.04).
- Delaware DFW – Conducted two finfish trawl surveys (16ft for juveniles; 30ft for adults). Older than young-of-year (YOY) black drum are rarely captured, and no long term trend is evident.
- Maryland DNR – Conducted the Coastal Bays Fisheries Seine Survey in Maryland's coastal bay and generally catches juvenile fish. Annual mean catch per haul exhibits no trend and

high variation. Annual mean catch per haul in 2016 was near the time series mean and increased from 2015.

- North Carolina DMF – Conducted a gill net survey in Pamlico Sound to characterize size and age distribution, and to produce an abundance index (2016: CPUE=1.33, above the time series average of 1.00).
- South Carolina DNR – Conducted an estuarine trammel net survey for subadult abundance (2016: CPUE=0.458, increase from 2015).
- Georgia CRD –
    - Conducted an estuarine trammel net survey for subadult biological data and abundance index (2016 – Altamaha: n=29, CPUE=0.23; Wassaw: n=10, CPUE=0.08).
    - Conducted an estuarine gill net survey for YOY biological data and abundance index (2016 – Altamaha: n=23, CPUE=0.13; Wassaw: n=7, CPUE=0.05).
- Florida FWC-FWRI – Conducted two seine surveys monthly in northeast and central southeast Florida to develop annual estimates of adult relative abundance. Declining trend is seen in the northeast, while the southeast exhibits an increasing trend.

VI. Status of Management Measures and Issues

Fishery Management Plan

The Black Drum FMP requires all states with a declared interest in the species to have established a maximum possession limit and minimum size limit of at least 12 inches by January 1, 2014, and to have increased the minimum size limit to no less than 14 inches by January 1, 2016.

De Minimis

The black drum FMP allows states to request *de minimis* status if, for the preceding three years for which data are available, their average combined commercial and recreational landings (by weight) constitute less than 1% of the average coastwide commercial and recreational landings for the same three-year period. A state that qualifies for *de minimis* will qualify for exemption in both their commercial and recreational fisheries.

De Minimis Requests

No state requested *de minimis* status through the annual reporting process.

VII. Implementation of FMP Compliance Requirements for 2014 and 2015

The PRT finds that all states have implemented the requirements of the Fishery Management Plan.

VIII. Recommendations of the Plan Review Team

<u>Management and Regulatory Recommendations</u> (H) =High, (M) =Medium, (L) =Low

- Develop management mechanism (e.g., traffic light analysis) to evaluate annual fishery independent and dependent indices to assess stock status and recommend management action if needed. (H)

Prioritized Research and Monitoring Recommendations (H) =High, (M) =Medium, (L) =Low

Stock Assessment and Population Dynamics

- Age otoliths that have been collected and archived. (H)
- Collect information to characterize the size composition of fish discarded in recreational fisheries. (H)
- Collect information on the magnitude and sizes of commercial discards. Obtain better estimates of black drum bycatch in other fisheries, especially juvenile fish in south Atlantic states. (H)
- Increase biological sampling in commercial fisheries to better characterize the size and age composition of commercial fisheries by state and gear. (H)
- Increase biological sampling in recreational fisheries to better characterize the size and age composition by state and wave. (H)
- Obtain estimates of selectivity-at-age for commercial fisheries by gear, recreational harvest, and recreational discards. (H)
- Continue all current fishery-independent surveys and collect biological samples for black drum on all surveys. (H)
- Develop fishery-independent adult surveys. Consider long line and purse seine surveys. (H)
- Collect age samples, especially in states where maximum size regulations preclude the collection of adequate adult ages. (H)
- Conduct reproductive studies, including: age and size-specific fecundity, spawning frequency, spawning behaviors by region, and movement and site fidelity of spawning adults. (M)
- Conduct a high reward tagging program to obtain improved return rate estimates. Continue and expand current tagging programs to obtain mortality and growth information and movement at size data. (H)
- Conduct tagging studies using implanted radio tracking tags that are compatible with coastal tracking arrays along the Atlantic coast in order to track movement and migration of adults. (H)
- Improve sampling of night time fisheries. (M)
- Conduct studies to estimate catch and release mortality rates in recreational fisheries. (H)
- Collect genetic material (i.e., create “genetic tags”) over a long time span to obtain information on movement and population structure, and potentially estimate population size. (M)
- Obtain better estimates of harvest from the black drum recreational fishery, especially in states with short seasons. (M)

IX. References

ASMFC. 2013. Interstate Fishery Management Plan for Black Drum. Arlington, VA.

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MacCall, A.D. 2009. Depletion-Corrected Average Catch: a simple formula for estimating sustainable yields in data-poor situations. ICES Journal of Marine Science, 66: 2267-2271.

X. Figures

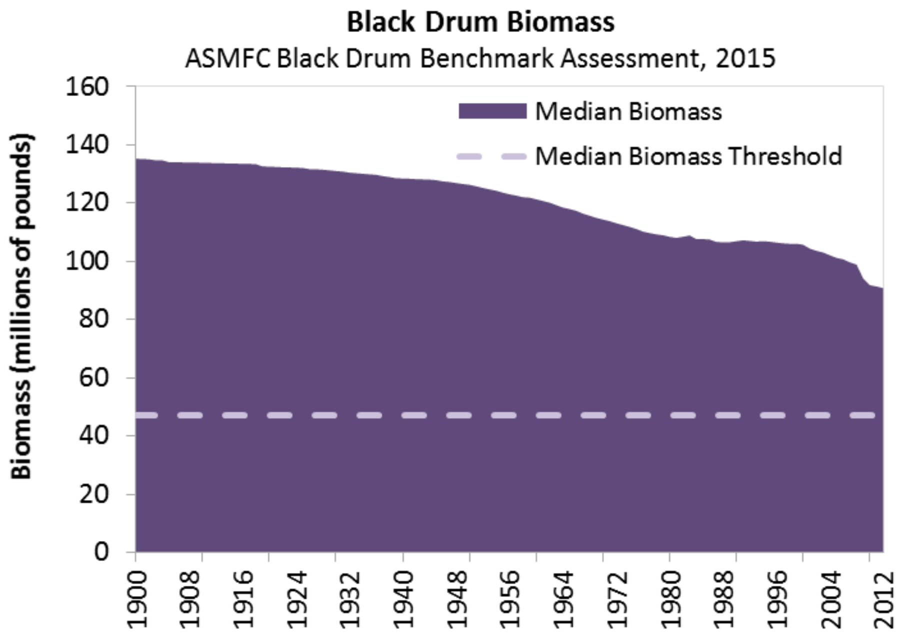

Figure 1. DB-SRA estimates of Median biomass and threshold 1900-2012 (Source: ASMFC 2015).

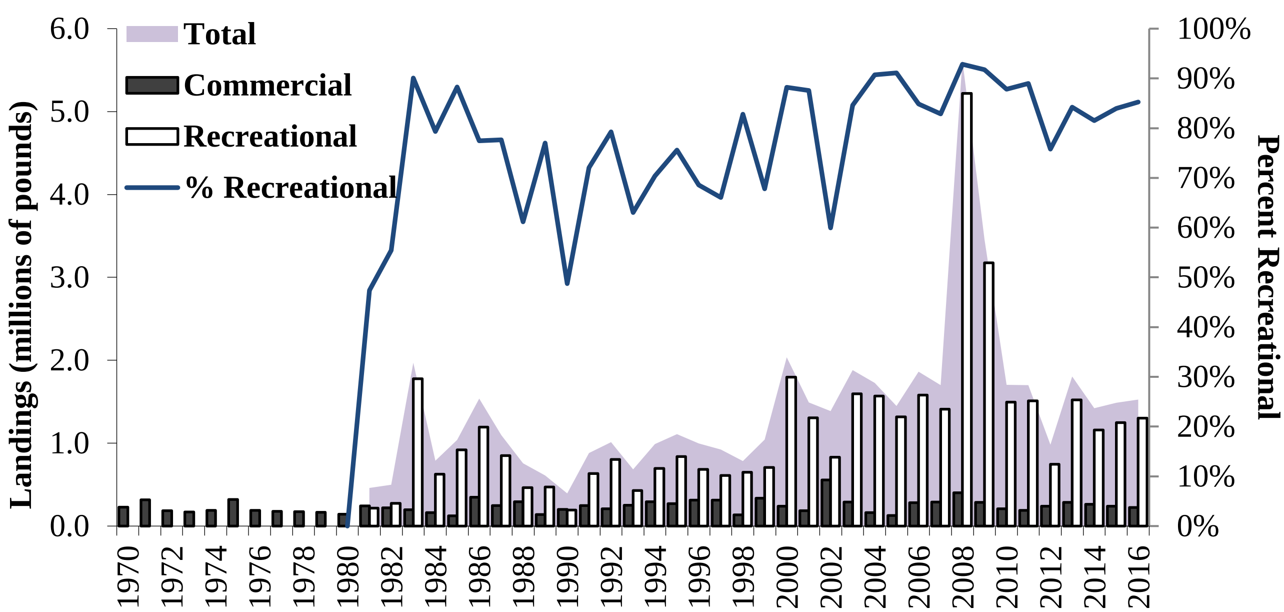

Figure 2. Commercial and recreational landings (pounds) of black drum. Recreational data not available prior to 1981. See Tables 2 and 3 for values and data sources.

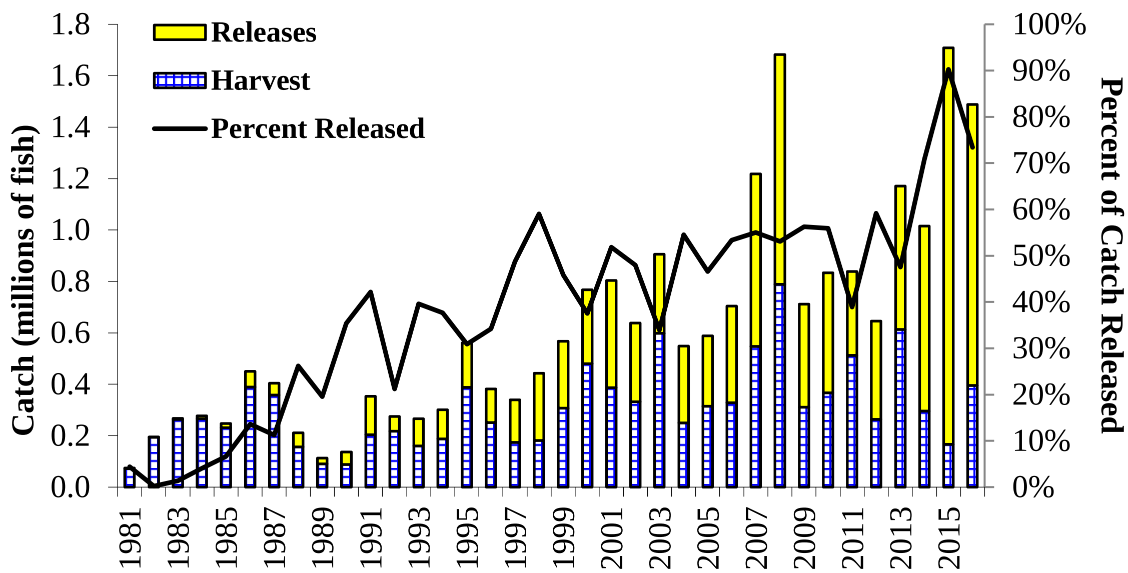

Figure 3. Recreational catch (harvest and alive releases) of black drum (numbers) and the proportion of catch that is released. See Tables 4 and 5 for values and data sources.

XI. Tables

Table 1. Black drum regulations for 2015. The states of New Jersey through Florida are required to meet the requirements in the FMP. All size limits are total length.

State	Recreational		Commercial			Notes
	Size limit	Bag limit	Size limit	Trip Limit	Annual Quota	
ME - NY	-	-	-	-	-	
NJ	16" min	3/person/day	16" min	10,000 lbs	65,000 lbs	
DE	16" min	3/person/day	16" min	10,000 lbs	65,000 lbs	
MD	16" min	1/person/day 6/vessel (Bay)	16" min		1,500 lbs Atlantic Coast	Chesapeake Bay closed to commercial harvest
VA	16" min	1/person/ day	16" min	1/person/ day*	120,000 lbs	*without Black Drum Harvesting and Selling Permit
NC	14" min - 25" max; 1 fish > 25" may be retained	10/person/ day	14" min - 25" max	500 lbs		
SC	14" min - 27" max	5/person/day	14" min - 27" max	5/person/day		Commercial fishery primarily bycatch
GA	14" min	15/person/ day	14" min	15/person/ day		
FL	14" min - 24" max; 1 fish >24" may be retained	5/person/day	14" min - 24" max	500 lbs/day		

Table 2. Commercial landings (pounds) of black drum by state, 2003-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD and ACCSP, Arlington, VA, except where noted below)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
2003			631	111,554	90,525		*	9505	289,312
2004	15,202	4,092	1,039	64,823	62,445		*	12,653	160,254
2005	1,970	10,059	165	66,660	44,989		*	5,249	129,092
2006	16,454	70,097	552	65,973	125,214		*	3,975	282,265
2007	1,218	37,704	172	91,385	148,231		*	12,770	291,480
2008	1,487	9,563	*	69,825	301,998	*	*	19,348	402,221
2009	6,408	30,551	*	82,437	148,995	*	*	15,671	284,062
2010	3,079	49,535	*	69,659	69,195	*	*	15,677	207,145
2011	3,130	49,514	*	56,747	56,084	*	*	22,333	187,808
2012	19,017	10,828	*	98,789	94,353	*	*	14,302	237,847
2013	16,251	24,507	*	87,730	127,170	*	*	28,450	284,632
2014	14,731	18,498	*	86,711	51,216	*	*	91,585	262,741
2015	3,865	39,282	*	93,552	51,089	*	*	50,447	238,235
2016	2,210	49,109	270	56,832	90,012	*	0	26,820	225,253

*indicates confidential landings because less than three dealers reported.

Table 3. Recreational landings (pounds) of black drum by state, 1981-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981	0	0	0	95,051	0	3,495	7,614	111,369	217,529
1982	0	0	0	0	2,720	13,222	6,278	253,705	275,925
1983	69,193	0	603,101	706,113	0	61,594	6,765	328,922	1,775,688
1984	0	0	0	38,672	0	5,452	31,848	549,047	625,019
1985	0	50	43,946	301,264	3,838	63,206	37,646	467,715	917,665
1986	103,942	3,220	219,916	395,311	62,146	24,503	52,558	330,239	1,191,835
1987	0	623	0	462,348	51,463	61,011	45,848	230,085	851,378
1988	0	0	0	36,203	79,484	60,861	28,804	258,667	464,019
1989	0	0	192,996	54,086	2,170	44,234	44,715	131,163	469,364
1990	0	2,378	0	8,147	3,767	22,270	51,723	103,101	191,386
1991	0	1,399	0	83,090	10,558	13,878	96,295	428,316	633,536
1992	0	0	0	237,596	20,082	30,276	30,037	485,267	803,258
1993	0	1,153	0	1,087	31,474	43,092	26,842	326,596	430,244
1994	0	0	0	2,807	92,749	15,801	99,814	484,657	695,828
1995	0	0	149,158	20,685	227,582	66,787	53,721	319,812	837,745
1996	0	4,027	0	97,782	172,959	68,865	8,635	330,368	682,636
1997	0	11,372	0	36,130	156,981	190,835	28,366	186,417	610,101
1998	0	15,499	0	91,296	102,534	51,655	19,004	368,574	648,562
1999	0	2,203	8,498	0	170,793	81,777	12,058	430,690	706,019
2000	0	6,381	17,207	12,097	259,623	276,622	188,957	1,036,211	1,797,098
2001	165,041	356	0	331	188,201	16,813	32,496	903,239	1,306,477
2002	9,492	5,930	10,246	14,554	474,619	58,679	24,880	233,136	831,536
2003	214,250	0	12,282	96,730	355,717	243,887	135,127	535,717	1,593,710
2004	809,306	2,592	20,891	11,880	221,925	30,190	57,953	411,968	1,566,705
2005	519,635	25,945	0	83,349	63,161	58,997	46,485	520,948	1,318,520
2006	792,896	23,607	25,212	26,834	162,932	63,057	33,147	452,507	1,580,192
2007	202,375	14,830	0	238,718	220,454	71,471	84,495	576,048	1,408,391
2008	2,998,236	19,795	0	497,913	524,138	115,043	244,350	817,806	5,217,281
2009	1,435,892	43,001	0	1,036,270	121,038	42,903	30,203	464,661	3,173,968
2010	251,577	76,316	48,166	8,203	305,517	120,224	169,331	516,412	1,495,746
2011	126,647	15,844	0	284,264	151,407	46,847	19,504	867,708	1,512,221
2012	13,718	2,869	0	5,508	243,965	103,088	59,278	315,841	744,267
2013	36,406	6,832	0	30,749	713,047	102,429	59,219	571,489	1,520,171
2014	3,567	9,144	20,822	26,213	60,406	79,185	66,955	891,379	1,157,671
2015	184,862	12,169	11,157	17,538	115,609	35,668	15,761	855,328	1,248,092
2016	74,936	772	7,442	22,772	238,012	154,870	51,946	751,782	1,302,532

Table 4. Recreational landings (numbers) of black drum by state, 1981-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981	0	1,502	0	2,874	0	8,642	3,665	54,969	71,652
1982	0	0	0	0	1,682	11,028	8,464	172,414	193,588
1983	2360	0	13,308	30,797	0	27,161	9,867	179,691	263,184
1984	0	0	1,915	1,886	0	7,575	14,239	240,470	266,085
1985	0	114	937	5,630	5,196	16,810	38,835	163,720	231,242
1986	2,798	14,605	5,668	11,767	18,697	21,108	55,040	259,168	388,851
1987	0	943	3,019	11,760	41,644	27,347	40,390	233,092	358,195
1988	0	0	0	1,225	10,553	15,568	21,525	107,293	156,164
1989	0	0	4,284	1,188	394	9,125	39,162	36,922	91,075
1990	0	1,704	0	840	2,112	15,048	16,227	52,741	88,672
1991	0	2,240	0	1,153	8,712	5,121	32,697	154,133	204,056
1992	0	0	0	5,330	7,877	13,600	19,021	171,190	217,018
1993	0	3,786	0	1,827	32,184	16,136	20,736	85,739	160,408
1994	0	0	0	1,411	53,345	8,635	18,254	106,267	187,912
1995	0	0	4,064	3,505	272,426	26,774	25,056	56,086	387,911
1996	0	206	0	3,993	134,926	28,033	6,718	77,295	251,171
1997	0	411	0	643	53,107	43,432	9,997	66,691	174,281
1998	0	412	649	3,271	44,822	14,073	5,378	112,404	181,009
1999	0	714	528	10,403	116,407	50,997	5,572	122,718	307,339
2000	0	1,194	964	2,708	113,205	63,284	62,637	235,869	479,861
2001	7,983	1,385	0	1,200	144,088	11,570	13,360	207,575	387,161
2002	5,496	3,314	3,358	4,547	197,211	28,376	23,074	67,024	332,400
2003	15,828	0	2,158	11,431	273,024	114,905	43,902	137,191	598,439
2004	15,152	320	2,351	2,485	97,262	18,384	18,568	94,967	249,489
2005	19,998	1,303	0	9,439	75,924	83,874	20,355	103,462	314,355
2006	42,070	11,462	701	1,556	92,956	93,384	20,080	66,415	328,624
2007	21,095	4,152	0	21,697	209,372	96,494	50,670	144,434	547,914
2008	74,982	6,973		26,097	359,702	54,490	91,777	175,195	789,216
2009	35,782	1,151		21,535	92,058	18,613	15,610	126,384	311,133
2010	8,593	1,450	2,731	730	122,709	34,383	69,547	127,214	367,357
2011	8,590	918	0	30,386	211,396	13,660	10,590	236,625	512,165
2012	526	111	0	1,577	139,363	28,006	19,134	74,596	263,313
2013	4,207	1,111	0	1,944	363,466	35,994	18,290	188,578	613,590
2014	150	506	1,881	3,071	24,058	30,238	15,304	220,565	295,773
2015	4,917	320	733	824	35,529	16,017	8,287	99,717	166,344
2016	2,997	54	190	2,187	71,708	61,642	24,126	233,117	396,021

Table 5. Recreational alive releases and dead discards (numbers) of black drum by state, 1981-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD.)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981		0		0		0	1,008	2,300	3,308
1982					0	417	0	0	417
1983	0		0	0		0	852	2,832	3,684
1984			646	0		1,360	0	9,296	11,302
1985		0	564	0	0	0	3,250	12,677	16,491
1986	0	0	138	0	7,659	1,091	8,988	43,219	61,095
1987		452	0	0	473	485	6,519	37,558	45,487
1988				0	6,186	892	2,975	45,339	55,392
1989			0	0	213	1,575	8,892	11,455	22,135
1990		752		0	3,291	824	2,002	41,648	48,517
1991	996	273		0	1,931	0	11,664	134,080	148,944
1992				0	731	0	5,998	51,623	58,352
1993		2,270		4,214	6,053	2,375	2,487	87,653	105,052
1994				2,601	4,969	5,655	2,241	98,061	113,527
1995			1,250	19,077	101,866	2,829	1,114	47,413	173,549
1996		0	2,534	14,945	55,227	2,214	363	55,446	130,729
1997		0	1,106	6,671	35,537	6,380	213	115,821	165,728
1998		2,893	0	17,432	50,208	1,548	6,312	182,776	261,169
1999		0	0	1,859	75,409	14,086	2,504	166,416	260,274
2000		0	0	886	56,741	47,605	20,643	162,054	287,929
2001	6,319	21,271	1,173	28,902	139,525	7,219	13,820	198,900	417,129
2002	20,246	3,332	7,998	44,056	82,297	11,697	18,851	117,831	306,308
2003	1,003	3,132	0	20,588	128,873	4,051	27,804	122,288	307,739
2004	0	524	0	16,093	98,385	19,076	42,326	123,266	299,670
2005	21,172	12,960	2,525	19,620	95,255	17,847	10,458	94,682	274,519
2006	29,024	1,031	0	81,509	93,229	27,296	29,285	114,635	376,009
2007	27,550	3,980	470	27,351	226,463	37,763	34,869	311,372	669,818
2008	223,332	5,961	0	9,327	188,680	124,748	65,881	274,681	892,610
2009	105,053	1,111	0	10,594	69,484	35,395	22,622	155,665	399,924
2010	25,592	1,575	1,744	19,637	102,348	25,677	39,981	249,265	465,819
2011	1,775	5	7,971	60,724	104,286	20,483	4,671	126,563	326,478
2012	10,498	356	19,351	7,182	91,895	67,242	19,765	165,569	381,858
2013	0	27,135	6,414	22,192	121,306	78,262	10,066	291,543	556,918
2014	10,669	4,886	0	63,623	361,514	66,209	8,248	204,889	720,038
2015	172,650	2,439	4,969	69,560	559,251	483,046	13,087	237,077	1,542,079
2016	5,388	211	107	13,524	566,785	217,342	15,686	272,681	1,091,724