Atlantic States Marine Fisheries Commission

Spiny Dogfish Management Board

November 4, 2015
4:15 p.m. – 5:15 p.m.
St. Augustine, Florida

Draft Agenda

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

1.	Welcome/Call to Order (*D. Borden)*	4:15 p.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from November 2014	4:15 p.m.
3.	Public Comment	4:20 p.m.
4.	2015 Spiny Dogfish Stock Assessment Update (*S. Newlin*)	4:30 p.m.
5.	Set 2016-2018 Spiny Dogfish Specifications **Final Action** • Fishery Performance Report (*A. Harp*) • Review Mid-Atlantic Fishery Management Council Specifications (*A. Harp*)	4:50 p.m.
6.	Other Business/Adjourn	5:15 p.m.

The meeting will be held at the World Golf Village Renaissance, 500 South Legacy Trail, St. Augustine, FL

MEETING OVERVIEW

Spiny Dogfish Management Board
November 4, 2015
4:15 – 5:15 p.m.
St. Augustine, Florida

Chair: David Borden (RI) Assumed Chairmanship: 10/15	Vice Chair: VACANT	Law Enforcement Committee Representative: Moran
Spiny Dogfish Technical Committee Chair: Scott Newlin	Spiny Dogfish Advisory Panel Chair: VACANT	Previous Board Meeting: October 2014
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, VA, NC, NMFS, USFWS (13 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from October 2014

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. 2015 Spiny Dogfish Assessment Update (4:30 – 4:50 p.m.)

Background

- Stock is not overfished and overfishing is not occurring
- Compared to the last update (2013), the stock is estimated to be lower (87% of biomass target in 2015) compared to 2013 (135% of the biomass target).
- The primary cause of the reduction in the biomass estimate is that the last update was driven by survey data points that were above average (2011), very above average (2012), and near average (2013) while the current update is driven by survey data points that are near average (2013) and below average (2015).
- There is no NMFS survey value (and therefore no stock size estimate) for 2014 because important spiny dogfish areas were skipped by the Bigelow trawl survey due to a mechanical breakdown.
  (2015 Stock Assessment Update and Monitoring Committee/Technical Committee Summary in Briefing Materials)
- SSC 3 year specification recommendation in Briefing Materials

Presentations

- 2015 Spiny Dogfish Assessment Update by S. Newlin

5. 2016-2018 Spiny Dogfish Specifications (4:50 – 5:15 p.m.)

Background

- Based on advice from the MAFMC SSC and AP, the Council voted to set the 2016 commercial quota at 25.3 million pounds, a 50% reduction from the 2015 quota of 50.6 million pounds.
  (SSC 3-Year Specification Recommendations, Fishery Performance Report and Proposed Specifications in Briefing Materials; MAFMC Motions and Selected Alternatives in Supplemental Materials)

Presentations

- MAFMC Fishery Performance Report by A. Harp
- Review MAFMC Specifications by A. Harp

Board Actions for Consideration at this Meeting

- Set the 2016-2018 Spiny Dogfish Specifications

6. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

SPINY DOGFISH MANAGEMENT BOARD

Hilton Mystic
Mystic, Connecticut
October 30, 2014

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

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ATTENDANCE

Board Members

Terry Stockwell, ME proxy for P. Keliher (AA)
Doug Grout, NH (AA)
Rep. Sarah Peake, MA (LA)
Bill Adler, MA (GA)
David Pierce, MA, proxy for P. Diodati (AA)
Bob Ballou, RI (AA)
Mark Gibson, RI, Administrative proxy
David Borden, RI (GA)
Rick Bellavance, RI, proxy for Sen. Sosnowski (LA)
David Simpson, CT (AA)
Lance Stewart, CT (GA)
Rep. Craig Miner, CT (LA)
James Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
Tony Rios, NY, proxy for Sen. Boyle (LA)
Tom Baum NJ, proxy for D. Chanda (AA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Stewart Michels, DE, proxy for D. Saveikis (AA)
John Clark, DE, Administrative proxy
Roy Miller, DE (GA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Louis Daniel, NC (AA)
Martin Gary, PRFC
Peter Burns, NMFS
Sherry White, USFWS

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

Ex-Officio Members

Scott Newlin, Technical Committee Chair

Staff

Robert Beal
Toni Kerns
Marin Hawk
Melissa Yuen

Guests

Derek Orner, NOAA
Chip Lynch, NOAA
Kelly Denit, NOAA
David Hilton, NMFS
Jason Didden, MAFMC
Cheri Patterson, NH F&G
Brandon Muffley, NJ DFW
Eric Schneider, RI F&W
Stephen Gephard, CT DEEP
Jack Travelstead, CCA
Raymond Kane, CHOIR
Sonja Fordham, Shark Advocates
John Whiteside, Sustainable Fisheries Assn.
Justin LeBlanc, NCFA
Timothy Caldwell, Jamestown, RI
Leo Maher, Chatham, MA
Doug Feeney, Chatham, MA
David Gelfman, Chatham, MA
Luther Bates, Chatham, MA
John Tuttle, Chatham, MA
William Ligenza, Chatham, MA
Theodore Ligenza, Chatham, MA
Ted Platt, Newport, RI

The Spiny Dogfish Management Board of the Atlantic States Marine Fisheries Commission convened in the Grand Ballroom of The Mystic Hilton, Mystic, Connecticut, October 30, 2014, and was called to order at 1:15 o'clock p.m. by Chairman Mark Gibson.

CALL TO ORDER

CHAIRMAN MARK GIBSON: This is the meeting of Spiny Dogfish Board. My name is Mark Gibson from Rhode Island; and I am the Chair. I think this is my last meeting, actually. We have a one-hour time slot for this meeting; in the words of my New England Council Chair, let's roll and turbo through this.

APPROVAL OF AGENDA

The first item on the agenda is the agenda. Are there any suggested changes to the agenda? Seeing none; is there any objection to approving the agenda as presented? Seeing none; the agenda stands approved.

APPROVAL OF PROCEEDINGS

Next is Proceedings from our August 2014 board meeting. Are there any requests for edits or changes to those Proceedings? Seeing none; is there any objection to approving those as presented? Seeing none; those stand approved.

PUBLIC COMMENT

The next item on the agenda is public comment; but this is for items that are not on the agenda. I'm aware that there is a request to make one comment on the Addendum IV final action. We will take that up at a later time. Is there anybody requesting time to speak to this board on matters that are not on the agenda? Seeing none; we will move to Item 4 from Jason Didden on fishery performance and spawning stock biomass reference point update.

REVIEW OF 2015/2016 SPINY DOGFISH SPECIFICATIONS

FISHERY PERFORMANCE REPORT

MR. JASON DIDDEN: I'm taking over for Jim Armstrong at the council for spiny dogfish. Jim accepted a position with the North Pacific Fishery Management Council and I think is in Alaska as we speak. He did most of the heavy lifting on the development of this action; but at least for the time being I will be the contact at the council.

These are the already-specified measures for 2015. The council did multiyear specifications and those are kind of the two critical things; ABC at 28,310 metric tons and the commercial quota at 22,957. Again, that is already specified; and because of how the projections were done, this is up slightly from the year before.

SPAWNING STOCK BIOMASS AND REFERENCE POINT UPDATE

I was asked to touch on a biological update that Paul Rago would have done. Essentially there is no biological update. The survey ship broke down and missed a lot of Mid-Atlantic stations; so we have no update of stock biomass. The last thing we have is the 2013 update, which was the stock is above its target biomass and no overfishing occurring.

With a species with the biology of spiny dogfish, it is not expected with catches in the range of the quota that it actually would change a whole lot from year to year; so the SSC just endorsed what they had previously set for 2015. They didn't see any reason to change. That is a projection trend; and it is still projecting this little dip as we move forward but not dipping below the target, which is the top dotted line.

That's kind of the same projection as you would have seen last year. Just a quick kind of overview of catch over the last few years; the landings were down primarily because of market conditions our advisory panel reports; but overall landings and discards are in the general range of recent history.

You can see the blue line being the landings drop off in the last year; and I'll touch a little bit maybe on some of the reasons for that when I hit the fishery performance report. We asked our advisory panel to create a report every year for their perspective on things that may be driving landings in the fishery; and there it is.

They noted that price last year was quite poor and dampened kind of the interest in fishing for spiny dogfish; not that any decline in spiny dogfish was responsible for the lower landings. They did note that price seems to be improving this year. Again, kind of the same thing I'm sure you've heard before, it is really an export-dependent market.

The frozen backs have been kind of carrying since the EU has put in some bans because of the contaminant issues; although we have gotten some recent indications that spiny dogfish exports to Russia, which is where a lot of the frozen backs have been going to, may get caught up in some of these trade sanction things that have been going on between the U.S. and Russia; so even that demand could have some problems going forward, but it is yet to be seen how that fully plays out.

In terms of the overall kind of viewpoint of what folks want to see, consistency has been kind of the overarching input we've gotten, but there certainly is some variability in that. We had a big meeting when we adjusted the trip limits; and there was a range of people who wanted it wide open to no change at all.

The council bumped it up a little bit to 5,000 pounds; and we have rollover provisions in the plan in terms of the actual regulations; so it is essentially 5,000 pounds until changed. We also keep getting kind of some input from the AP that they'd like to see a male fishery; that the market name, a potential change to that could be useful for this fishery; that people just don't want to buy spiny dogfish, no less.

There is also kind of continued concern of why there was such an apparent speedy recovery of the previously overfished dogfish stock. I think the general kind of idea from the science center is there must have just been a lot of dogfish outside the survey area; and we can only know the dogfish that are in the survey area or at least sample it; and so there must have been a lot of dogfish outside of that and the population was larger than it was thought to be and allowed it to either recover more quickly or fish came from outside the survey area to inside the survey area or some combination thereof.

The Monitoring Committee, which is council and NMFS and science center staff, saw no reason to make any changes from their perspective; and next the council came to the same conclusion and made no changes so the previously set 2015 specifications would continue on as they are now. That's end of my presentation.

CHAIRMAN GIBSON: Thank you, Jason. Are there questions? Yes, Louis Daniel.

DR. LOUIS B. DANIEL, III: Jason, a good friend of yours and mine, Jim Fletcher, keeps asking about this market name change. Is there any legs to that? What would we do because it makes sense, but I've tried to advise him but I really don't know how you would go about doing something like that?

MR. DIDDEN: I know Jim Armstrong has had conversations with Jim Fletcher about some potential ways to do that. There are some procedures going through I think the Department of Agriculture to submit requests for formal kind of market name changes. I can kind of follow up with Jim Fletcher where if he has tried to do that with the Department of Agriculture and kind of explore that further. I'm sure it will be kind of an ongoing issue.

MR. ROB O'REILLY: Jason, I guess the question is I think there has been some, at least, movement towards more of a male fishery. That has also been something that has been talked about for years; but my understanding is there really has been some more thoughts given to it lately. At least I think that is the case, but you can help out on that. I guess the second thing is this testing on the PCBs; is that both sexes or how does that work?

MR. DIDDEN: Since the landings are still predominantly female, I'm guessing it is those. I think it mostly related to the fresh product, which there is a certain treatment for the frozen product and for whatever reason the PCB testing has not shown high results. I know there is ongoing discussions with the EU for them to adjust their PCB tolerance limits, which are a lot lower than ours, and kind of the results of that negotiation are yet to be decided.

MR. O'REILLY: So I'm taking it that the PCB results are mostly female dogfish oriented, spiny dogfish oriented. Then I just wanted to hear has there been some planning about a male fishery, more males in the landings, anything like that that you know of?

MR. DIDDEN: Not that I'm aware of, but I know there has been, as you said, ongoing discussion of how it could be done. Certainly, there is a large biomass of male dogfish out there, but I can follow up on it and get back to you with some more detail on that.

CHAIRMAN GIBSON: Any other questions on those reports? Seeing none; is there any business from the board on dogfish specifications? Seeing none; we will move on to the next agenda item, FMP Review and State Compliance. Marin.

FMP REVIEW AND STATE COMPLIANCE

MS. MARIN HAWK: This is a very brief report. It is the Spiny Dogfish Review and State Compliance. Since Jason touched on the fishery, I'll keep this very brief. The harvest for 2013 was a bit depressed due to the situation in the market. The quota was 41 million pounds but only 16 million pounds were landed. The landing consisted of about 97 percent female.

Recreational landings were 81,570 pounds, which is less than 1 percent of the total catch. Discards were about 11 million pounds, which is similar to previous years. In terms of state compliance, the PRT reviewed all state compliance reports and found that all state regulations were consistent with the FMP. Delaware requested de minimis; and since their landings are less than 1 percent of the coast-wide landings, the PRT recommends that the board grant this request for de minimis. Thank you.

CHAIRMAN GIBSON: Are there any questions for Marin on that report? If not, we would need a motion to accept the compliance report and the de minimis status request. Bill Adler.

MR. WILLIAM A. ADLER: **I would like to make a motion to accept the compliance report, the FMP review and the de minimis for Delaware.**

CHAIRMAN GIBSON: Is there a second to that; second by Rob O'Reilly. Any board discussion on the motion? Seeing none; is there any objection to the motion? **Seeing none; the motion is approved unanimously**.

SPINY DOGFISH DRAFT ADDENDUM V FOR FINAL APPROVAL

CHAIRMAN GIBSON: Next is Addendum V. This is the final action on Addendum V. I had one request from the audience for a comment. Sonja, come up and read your comment into the record; and then Marin will report on it.

MS. SONJA FORDHAM: Thank you, Mr. Chairman; Sonja Fordham, Shark Advocates International. In partnership with our colleagues we have submitted comments for the record; so I'll be very brief. We appreciate the commission's consideration of action to address inconsistencies between state and federal regulations with respect to enforcement of spiny dogfish finning bans.

To be clear, it is smooth and not spiny dogfish that are exempted from best practice fins attached landing requirements under the Shark Conservation Act. Accordingly, the National Marine Fisheries Service has revised its spiny dogfish regulations to prohibit at-sea removal of fins. While they are not preferred, spiny dogfish fins do enter the global market for shark fins, the global shark fin trade, in substantial quantities.

While there is little incentive for widespread finning of dogfish, consistent bans on at-sea removal of fins across jurisdictions facilitate proper enforcement as well as improved species-specific collection of data for all shark species. They also strengthen our nation's stance as we promote this best practice of fins attached on a global scale through the regional fishery management organizations.

We urge the commission to adopt and promptly implement Option B to replace any remaining

fin-to-carcass ratios in state waters with requirements that spiny dogfish are to be landed with their fins naturally attached. Thank you, Mr. Chairman.

REVIEW OPTIONS AND PUBLIC COMMENT SUMMARY

CHAIRMAN GIBSON: Thank you for that. I'll go to Marin now and review the options and public comments.

MS. HAWK: So just a brief overview of this addendum; it is Draft Addendum V to the Spiny Dogfish Fishery Management Plan. It was initiated in May 2014 and now we are considering it for final approval. As Sonja mentioned, the Shark Conservation Act of 2010 requires all sharks to be landed with fins naturally attached.

Currently the Spiny Dogfish Fishery Management Plan allows processing at sea of dogfish with a maximum fin-to-carcass ratio of 5 to 95. Since a key goal of the Spiny Dogfish FMP is to maintain consistency; this addendum was initiated to address those inconsistencies. There is only one issue to deal with and that is the fins naturally attached policy. Option A is the status quo; fins of spiny dogfish may be removed at sea. If fins are removed, the corresponding carcasses must be retained.

The ratio of the wet weight of fins, the dressed weight of carcasses on board the vessel cannot exceed 5 to 95. Option B; fins naturally attached policy; removing any fin of spiny dogfish at sea is prohibited, including the tail. All spiny dogfish must be landed with fins naturally attached to the corresponding carcass. Gutting and processing fish at sea is permitted so long as the fins remain attached by a portion of uncut skin.

There was one public hearing held in Massachusetts. The individual that attended that hearing provided support for Option B, fins naturally attached. Five e-mail comments were received and they all supported Option 5, fins naturally attached. The LEC had some e-mail communication concerning this issue and they support Option B, fins naturally attached. However, they did note that they would prefer if there was a language change to remove "and processing"; and I have that shown up here on the PowerPoint. The language would be "removing any fin of spiny dogfish at sea is prohibited, including the tail. All spiny dogfish must be landed with fins naturally attached to the corresponding carcass. Gutting fish at sea is permitted so long as the fins remain attached by a portion of uncut skin." They felt that way just to clarify that processing at sea was not allowed. If this addendum is approved today, the board must specify a compliance schedule. Thank you, Mr. Chairman.

CHAIRMAN GIBSON: Any questions or comments on that report? Jim Gilmore.

MR. JAMES J. GILMORE, JR.: Forgive me if I missed this; but is this all consistent with the federal rules on it, because I know we've gone through a couple of rounds with the feds on language problems, whatever; so we're all good with language in both of these?

MS. HAWK: Yes; this will bring the FMP into consistency with the federal plan.

CHAIRMAN GIBSON: Anyone else before we go to the technical committee report? Scott.

TECHNICAL COMMITTEE REPORT

MR. SCOTT NEWLIN: The technical committee agrees that consistency with the federal government is very important; and so as the technical committee, we support Option B; a fin naturally attached policy. We all agree that there is no scientific issues with Option B. Thank you.

CHAIRMAN GIBSON: I'm told there is no advisory panel report; so we are at the point of considering final approval of Addendum V. Doug Grout.

MR. DOUGLAS E. GROUT**: Mr. Chairman, I'd like to make a motion to approve Option B with the following change: that for the law enforcement recommendation, that in Sentence 2 here where says "gutting and**

processing of fish"; that the words "and processing" be eliminated.

CHAIRMAN GIBSON: Seconded by Terry. Discussion on the motion to approve with the law enforcement language change. Tom.

MR. THOMAS O'CONNELL: I was just interested in removing the word "processing", if anybody is knowledgeable as to whether or not that causes any impacts to current practices.

CHAIRMAN GIBSON: I'm not aware of any. Emerson.

MR. EMERSON C. HASBROUCK: Yes; a similar question and that is why are they suggesting that language change to remove "processing"? I'm not really following that.

MR. TERRY STOCKWELL: I can't certainly testify to what the boats are actively doing these days; but a number of years ago when I was dogfishing, we did cut the fish on the way home for a belly. We separated the bellies and the back flaps while we were steaming in. I thought the Law Enforcement Committee's recommendation was spot-on and Doug's modified motion is the one I would like to support.

CHAIRMAN GIBSON: Anything else on that issue? Seeing none; are we ready for the question? Do you need any time to caucus? **Move to approve Option B with the following change: concur with the LEC recommendation to eliminate the words "and processing". Motion by Mr. Grout and seconded by Mr. Stockwell. Is there any objection to this motion? Seeing none; the motion is approved unanimously.**

CHAIRMAN GIBSON: The next item on the agenda is the Rhode Island Alternate Management Proposal. We have a presentation on that proposal from Bob Beal.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Back on the addendum, I think you need one more motion – well, actually two more; one to set the compliance schedule and then one to finally approve the addendum.

CHAIRMAN GIBSON: Does anyone have a motion? We need a motion to approve the addendum with the language change. Doug Grout.

MR. GROUT: **So the implementation date, I'm going to float one here, because I don't think we really discussed this; but I would move that the implementation date be May 1, 2015**.

CHAIRMAN GIBSON: Is there a second to that; seconded by Bill Adler.

MS. HAWK: This is the only additional motion we would need. I just wanted to clarify.

MR. GROUT: We don't need to approve the addendum as modified today, too?

MS. HAWK: Yes; we do need to do that; my apologies.

CHAIRMAN GIBSON: Discussion on the implementation date? Rob O'Reilly.

MR. O'REILLY: Just a question about May 1; as Doug was floating that, what was the thinking there?

MR. GROUT: The beginning of the fishing season.

CHAIRMAN GIBSON: I didn't hear that; could you repeat that?

MR. O'REILLY: Doug said he was floating a date out there and he used May 1; but now he has clarified that it is correspondent with the fishing season. That was a good answer.

CHAIRMAN GIBSON: Any other comments on the motion? Is there any objection to the motion? **Seeing none; that is approved unanimously. Okay, now I need a motion to Addendum V as modified today. Doug Grout.**

MR. GROUT: So moved.

CHAIRMAN GIBSON: Seconded by Bill Adler. Any discussion on that motion? Any

objection to it? **Seeing none; the motion is approved unanimously**.

REVIEW OF RHODE ISLAND ALTERNATE MANAGEMENT PROPOSAL

CHAIRMAN GIBSON: Okay, now I think we're ready to move into the Rhode Island Alternate Management Proposal. Eric Schneider.

MR. ERIC SCHNEIDER: My name is Eric Schneider. I am a biologist with Rhode Island's Division of Fish and Wildlife. I appreciate the opportunity to give you a brief presentation. My goal is to provide a summary of the alternative management proposal that Rhode Island submitted to the commission earlier this month for consideration.

I'll try to be brief and focus only on the major aspects of this proposal. For the benefit of everyone in the room, Section 4.3 of the Interstate FMP for Spiny Dogfish species the requirements for an alternative state management regime; and specifically as you can see on the slide, it states that any state can request permission to implement an alternative to any mandatory compliance measures only if that state can show to the board's satisfaction that the proposed action is consistent with the target fishing mortality rate or will not contribute to overfishing and also is consistent with the goals and objectives of the FMP.

Therefore, in accordance with that section we submitted the proposal that is contained in your briefing packet for consideration. The problem we're trying to address is really an artifact of a combination of low market prices and trip limits. Both of these make participation in the Rhode Island directed and non-directed spiny dogfish fisheries uneconomical.

That is reportedly resulting in high discard levels and clearly an underutilization of the resource. These concerns were summarized in a memo to the board submitted by the Rhode Island Division of Fish and Wildlife on April 28, 2014, and was discussed at the spring meeting. And just for clarity, we completely recognize that there are several factors contributing to this underharvest.

As Jason mentioned earlier in his Mid-Atlantic Performance Report, much of the landings are explained by market conditions; and so that the availability and abundance of the resource is not really constraining harvest. It is the low price for a dogfish trip that dictates the extent to which fishermen are willing to retain dogfish as part of their catch.

We believe this is certainly true in Rhode Island. We also believe that the proposed alternative management proposal may actually improve economics of the fishery, allowing us to more fully utilize the quota in the northern region and do so in a more effective manner by converting some of the landings into discards.

As I mentioned earlier, really one of the key aspects of a conservation equivalency or this alternative management regime is to ensure that whatever the action is, it does not contributed to overfishing. Before I get into what the details of the proposal are, I want to address this topic specifically. What we did to evaluate whether or not our program or would contribute to overfishing; we tried to assess what the potential total Rhode Island landings would be if all dogfish encountered in state waters were retained and landed. We referred to this as the zero discard scenario.

I won't get into too many details; they are in the proposal; and I'm happy questions afterwards; but I also don't want to take up too much time. In short, what we did was we used federal observer data that was collected in NOAA Statistical Reporting Area 539 during the 2010 to 2013 fishing years. We went through and we selected data from trips that intercepted dogfish.

They didn't have to land dogfish; they just need to bring dogfish on board. Using that data, we calculated gear-specific discard rates. We didn't use those discard – or I should say discard-to-landing estimates. We then used those ratios to extrapolate what we think Rhode Island landings could look like.

We did that by taking the 2013 fishing year Rhode Island landings; and we went through, based on gear, and applied these discard ratios so that we could extrapolate based on the number of dogfish that were landed what we also think that trip may have discarded. We arrived at an estimated discard rate; added that to what was landed; and we came up with what is an extrapolated landings' value under this zero discard scenario.

In short, these results suggests that even if all dogfish encountered in Rhode Island state waters were landed; that we don't expect to exceed 2,.6 million pounds. There are some obvious assumptions there; but even under this extreme scenario of all the discards being landed, we don't believe this would contribute to overfishing.

And just to put that 2.6 million pound number in perspective; that is about 9.1 percent of the 2014 northern region quota. Furthermore, we really don't think this would contribute to overfishing, especially considering that the proposal contains several conditions that would prevent that. I'm going to get into the proposal in just a minute; but while I'm on this topic, some of the things that we included to ensure that we don't contribute to overfishing or adversely impact the ability of other northern region states to harvest the available resource is that we included a landings' cap.

In the proposal it is 3 million pounds. I'd like to take this opportunity to note that in the proposal it was written that 3 million pounds equates to 9.5 percent. It should have read 10.5 percent of the 2014 regional quota. In addition, there is also an 80 percent cap; so I'll explain this in just a minute. Here is essentially the proposed alternative management regime that Rhode Island submitted.

To summarize it in one sentence; we're proposing to implement a weekly aggregate possession limit of 28,000 pounds per vessel per week with the following conditions. First, all participants must possess a valid Rhode Island commercial fishing license or landing license authorizing them to harvest or land spiny dogfish in Rhode Island. They must land at a Rhode Island DEM-licensed state dealer who reports landings electronically using SAFIS. They must report fishing effort via a state logbook reporting system or the federal VTR. Rhode Island will monitor landings using SAFIS to ensure compliance with the weekly limits and track total state landings.

I'll expand on this just a little bit that the Division, I imagine like most divisions, has a pretty good capacity to monitor landings. I have a quota monitoring team. They meet weekly and we use our weekly SAFIS reporting to try to monitor our state quotas. This would be another species in which we would certainly be willing to do that. The implementation date of this; we would like to implement it as soon as possible. We would implement it no later than May 2016. If this proposal is approved by the commission, Rhode Island will also apply to NOAA for federal consistency, allowing some federally permitted vessels to participate.

As I said, the weekly possession limit; the proposed action would be establishing the weekly possession permit of 28,000 pounds per vessel per week beginning at the start of the fishing season; and when either 3 million pounds are landed in Rhode Island or 80 percent of the regional quota is harvested, whichever comes first, this aggregate weekly possession limit would end; and Rhode Island would revert to the current ASMFC possession limit of 5,000 pounds per vessel per day. The last element is that the Division requests the authority to exercise or enact seasons as needed. That is my presentation, Mr. Chairman.

CHAIRMAN GIBSON: Thank you, Eric. The way I'd like to proceed now is if there are specific questions on the proposal from Eric; and then after that we'll go to the technical committee report. Then we will have board consideration of approval. David Pierce.

DR. DAVID PIERCE: Thank you for your presentation. It has never been a question of conservation or overfishing. It is about, well, other factors. My questions are these; do you have any idea as to how many fishermen would be participating in this program?

MR. SCHNEIDER: That is a good question. To answer your question directly; I do not have an estimate as to the number of fishermen that would participate. It would be open to all of the Rhode Island licensed fishermen; but I do not have an exact figure that I could provide you.

DR. PIERCE: Okay, so I would assume that this would be an opportunity for fishermen with a Rhode Island state permit but no federal permit, because they would be ruled by the federal restriction; correct, of 5,000 pounds?

MR. SCHNEIDER: That is correct. At least once the commission approves it, if the state of the Rhode Island were to simply go and implement it, as I understand it, fishermen with an active federal spiny dogfish permit would be bound by the most restrictive rule and could not participate unless they dropped that permit.

However, we do intend to submit – if this proposal is approved, we do intend to submit a proposal to NOAA requesting federal consistency for some federal participants to participate. I know that sounds vague; so to elaborate on that slightly, if there were federally permitted fishermen who met the requirements of this program, such as they had the pertinent Rhode Island licenses, the idea would be that they may be able to obtain a letter of authorization or some other mechanism that would allow them to participate. Right now that is not the case; and the first step is to seek board feedback and commission approval.

DR. PIERCE: Okay, that is an important point; and part of the program and part of the approach would be to request the federal government to have a letter of authorization to allow a fisherman, a federal permit holder to land 28,000 – on one day, for example, if they choose to do that, in excess of the federal limit of 5,000; so it's part of the proposal. I didn't realize that was part of the proposal.

I know, as you said, federal permit holders can drop their federal permit, fish in state waters, and then later on get their federal permit back because this is not a limited entry fishery. That is why I asked the original question of how many might get involved. It seemed to me that just about everybody who is landing in Rhode Island could drop their federal permit and then take advantage of your program and then get the federal permit back later on. You've clarified that for me.

Another question would be under the program that you've described; would a fisherman be able to land in Westport, Massachusetts, and offload 5,000 pounds consistent with the Massachusetts rule and then go to Rhode Island and land another 28,000? I think they can unless there is something very specific that would prohibit that.

MR. SCHNEIDER: That is another good question, Dr. Pierce, and there is nothing in the proposal that prohibits that. I guess if they fished and caught 5,000 and went to Massachusetts; I guess I'm under the impression that in order not to violate Massachusetts regulations, they would have to go and fish again. The proposal as currently constructed does not contain a daily regional cap on landings, if that is a fair way to summarize it.

DR. PIERCE: Okay, so they'd have to be caught landing in Westport and offloading 5,000, which is probably a low probability of being caught, and then they can go on to Rhode Island and land 28,000 more or land 28,000 in Rhode Island on a given week, a given day in the week, and then the next day land in Massachusetts 5,000; so this continues to be a question I asked. It is relevant to weekly possession limits that Rhode Island has for not just spiny dogfish, which you propose, but for existing weekly limits that you have for other species that do cause some enforcement and monitoring problems. All right, you have answered my questions; thank you.

MR. ADLER: I believe one of the reasons for something like this had to do with the economical – it is more economical to land a lot like in a day rather than stick to the 5,000. My question here was economical and money; and wouldn't this type of a landing just drive the prices right down through the bottom rather than keep them somewhere near where you can make some money on a dogfish. Wouldn't it overload the market I guess I'm getting at?

MR. SCHNEIDER: Sure, that is a very good point. This proposal was – I guess the impetus for this proposal came our Rhode Island industry. I know they have had discussions amongst themselves as to that tradeoff. They feel that they can work together and that what they're trying to provide is more flexibility; so that if in a given day they come across more fish, they can retain it. When they scoped the project, it wasn't with the goal of going out and harvesting 28,000 in a given day or doing two days, something like that.

The discussions I've have had with them is that they are going to make – it is not in their best interest, either, to drive the price down. They don't want to work harder for the same amount of money is what they also certainly want to be cautious of. If they land a lot of fish and they drive the price down and now they need to land more fish to get the same amount of value; at least they have conveyed that they are well aware of that and they will be cognizant of that.

They will try to work with their fishermen and working with dealers who are in communication with processors as to what the value is and whether it is worth them to land their fish at a Rhode Island dealer to have it trucked up to a processor.

CHAIRMAN GIBSON: I just would like to remind the board that what I'm looking for here is questions for Eric on the elements of the proposal. The discussion about the merits of it and contingencies and so on; that should happen after the technical committee report and we have a motion on the table to consider approval. I have Rick Bellavance next.

MR. RICK BELLAVANCE: I'm going to pass, Mr. Chairman.

MR. GROUT: Eric, one question I had; you talked about this would be open licensed Rhode Island fishermen; would that be open to people with non-resident licenses?

MR. SCHNEIDER: It is a good question. I don't know; I don't want to guess.

MR. GROUT: So it is uncertain right now from your perspective?

MR. SCHNEIDER: It is uncertain only in my inability to answer the question; and for that I apologize.

MR. GROUT: Mr. Chairman is from Rhode Island; do you know?

CHAIRMAN GIBSON: Repeat the question for me.

MR. GROUT: Would this be open to non-resident – can someone get a non-resident Rhode Island license and participate in this program?

CHAIRMAN GIBSON: It will depend on whether we designate it what we call restricted species or not. Restricted species that are designated in our licensing regulations are only available to residents. To be honest, we have not included that in this proposal yet; so we will have to think about that.

MR. GROUT: Okay, could I have a follow-up then? Has this proposal been run by the Law Enforcement Committee as far as any input on enforceability of weekly trip limits?

CHAIRMAN GIBSON: Yes; they've had a discussion on that and I will ask Mark to brief the board on that.

MR. MARK ROBSON: We were briefed on Tuesday about this proposal, but the members did not have an opportunity to actually look at any of the language in the proposal. We did hear a pretty good discussion from the Rhode Island representative on our committee about how law enforcement in Rhode Island is perceiving they would be able to address this. We don't have a consensus viewpoint. We didn't look at actual written language proposal; but we did hear some of the issues from Rhode Island that they felt could be addressed.

DR. DANIEL: This may skirt the line of a technical question; but the typical Rhode Island fleet; is it a small boat fishery, big boat fishery; and do you anticipate by going to a 28,000 pound trip limit – I'll call it a weekly limit; but a

28,000 pound trip limit is going to bring in new participants that haven't really been participating in the fishery and impact those smaller boats?

MR. SCHNEIDER: That is another good and very fair question. We have not had any I guess input or interest from big boats, big draggers specifically when we've had a series of meetings and discussions; and they have not really showed interest one way or another.

Through discussions not that I've had directly but indirect comments given to me suggests that it still would not be worth their while given – I guess specifically the way it was phrased was that it would not be worth a big boat's effort, given that they would need and want to land a high-quality product, to go out and try to retain and land twelve or fifteen thousand dollars' worth of dogfish, because most of them just don't have the capacity to do that. I'm also skirting the line to be fair because this was not conveyed – this is not a discussion I've had directly with the folks who made that comment. It was through industry and some of their representatives. I think that is the best I can offer you.

MR. PETER BURNS: I know we talked about the enforceability a little bit, and I know that the Law Enforcement Committee hasn't had a chance to review this fully; but I was just wondering, Eric, in the context of your proposal is Rhode Island prepared to increase its enforcement of this at all within the context of this; because it seems like it would be difficult to – even though they've got the SAFIS reporting requirements and everything to track the landings, it might be very difficult to track the activities of a boat over a week-long period to ensure that they don't exceed the quota. I'm just curious if your proposal included something like that.

MR. SCHNEIDER: It doesn't include a specific, I guess, promise or reassurance from law enforcement that they'd make extra efforts, but I do have the utmost confidence that they will try to enforce this. We do have other weekly possession limits or other species that are managed during the fishing year with a weekly possession limit. One is our fluke aggregate program and then another which is – the fluke is an aggregate program. We also have a scup aggregate weekly possession limit. Our Division of Enforcement is familiar with this type of process. I guess the best I could say is I don't see any reason why they could not enforce this as they do with those other two fisheries.

MR. HALBROUCK: I'm just curious as to how you came up with 28,000 pounds as a weekly trip limit.

MR. SCHNEIDER: 28,000 pounds equates to five days of the possession limit or 80 percent of the seven-day limit. I think one of the reasons rather than going for a full seven-day limit – obviously, if folks went out now under the current specifications they could go out and bring in 35,000 pounds in a week; we tried to be careful when we scoped this.

With all honesty, we really were trying to be cognizant of the fact that we don't want to largely impact the other states in the region; and that's why we put a cap on the total landings that we thought should be landed under this program. That is also why in part we put that 28,000 pound weekly limit in.

I think it also was an artifact to balance – I believe it might have been Mr. Adler mentioned earlier of not trying to flood the market and have vessels land fish that are going to decrease the price. I think really what our industry is trying to do is have more flexibility so that they can make a trip more worthwhile but not bring in a glut of fish that is going to really cause the price to crash and not make it really worth their while anymore to participate.

CHAIRMAN GIBSON: Any other questions for Eric? Seeing none; I'll move on the technical committee report.

TECHNICAL COMMITTEE REPORT

MR. NEWLIN: The technical committee reviewed this proposal and we agree that from a scientific perspective the management proposal is not likely to have any impact on the spawning dogfish population. We discussed the potential

impact that an aggregate of fish delivered to the processor may have on the market.

We're sure this could potentially have an inverse effect for Rhode Island; but we agree that this is a management concern and not a scientific concern. The technical committee would suggest to Rhode Inland instead of implementing a cap on the program in terms of poundage, 3 million pounds, to implement a cap in percentage to allow for flexibility of quota or management changes in the future. Thank you.

CONSIDER APPROVAL OF RHODE ISLAND'S PROPOSAL

CHAIRMAN GIBSON: Any questions for the technical committee? Seeing none; then I'd like to throw open it up for board discussion and consideration of the proposal. I would like to go to Dave Borden first.

MR. DAVID V. BORDEN: Mr. Chairman, what I'd like to do is I'd like to spend – and I'll do this pretty quickly – just provide a little bit more context for the discussion; and then what I'm going to do is I'm going to ask Eric to put up a slide of the suggestions that many of you have made during the past couple of days.

The background here I think is important to reiterate that the Division originally came to the commission with the specific intent of raising the trip limit. That was the preferred option that the Division came forward with; and as a result of the discussion that took place, that was not implemented by the commission the way we had proposed.

A number of individuals suggested to us, well, do something different under conservation equivalency. Our preferred option, just to be clear, was to raise the trip limit, which would have treated every state around the table equally. Everyone would have had the same trip limit. The reason we supported that position is because of the problems that we identified in the Division of Fish and Wildlife letter of April 28th.

It is about seven pages long and goes into fairly extensive detail on the problems that are being encountered by Rhode Island fishermen. Those problems aren't unique. During the last two meetings, the more I've discussed this issue with both commissioners and members of the industry, the problems are not unique to Rhode Island. They're more extensive than that.

What this comes down to is there is relatively little financial incentive for either dealers or trucking companies to truck low volumes of product extensive distances and particularly at the low prices that we had when we initiated the discussion, which was about fourteen cents. As Eric pointed out, as a result of that about 75 percent of the dogfish that are encountered by Rhode Island fishermen are being discarded.

Now, I just remind everybody in the initial, original, existing dogfish plan, this commission identified the need to reduce dead discards. That is one of the objectives of this plan. In the last year the only thing that has happened is dead discards have gone up; and that is all part of Paul Rago's report. Things have changed here.

The dynamic of the market has kind of changed, it has firmed up a little bit, the price has gotten better since we initiated this dialogue; but the reality is that some of the problems still exist. Those problems, in my view, can get resolved two ways. One is by increasing the trip limit and the other is by tailor-making a program to try to get at these issues through conservation equivalency.

Eric, if you could put up the slide, I'd just like to run through these issues, and this will take about two minutes to do. These are issues that many of you, including the technical committee, have raised. The first suggestion was to spread out the allocation. In other words, nobody wants a market – least of all Rhode Island – nobody wants a market glut.

The idea would be to spread whatever allocation Rhode Island got as part of this, if this proposal is approved, spread it over the year. One way to do that is with trimesters. Then the technical committee had recommended that there be a percentage in there; so that if the program continued for a couple of years and the quota went up or down, there would be another

mechanism that would be included to basically control the amount that is being fished.

Particularly if the quota went down; it would basically lower the amount in the program. Eric had put in and noted that there was a typo in it, but in my discussions with individuals, I have basically suggested that we would include like a 9 percent value; in other words, 9 percent or 3 million pounds, whichever is less.

The next issue that came up was this issue of how long is the program going to last? I think the simple way to answer that is just put a limit on it; and we would suggest two years. The next issue is market weakness. We had individuals tell us basically that the market in August was the weakest and the program shouldn't operate there. I think the way to address that is basically to prohibit the program from operating in August.

Then there is a lot of concern – and you have already heard some of it around the table – about product quality. I think this can be pretty simply addressed by putting in a maximum daily limit so that folks don't go out and land 28,000 pounds all at one. I guess the suggestion that was made to me is that we cap the limit at 10,000.

Those are basically the list of comments that I've heard from many of you. I have talked to the Rhode Island delegation and we would be willing to include those in any conservation equivalency proposal that gets implemented. Now, the last point that I'd like to make is this issue of possession limits. Dave Pierce raised this issue about landing in other states and kind of tag-teaming.

The possession limits – everyone should be clear possession limits should trump. If Rhode Island had this program in operation and Massachusetts had a 5,000 pound trip limit or the federal government a 5,000 trip limit, the boats are going to be bound by 5,000 pounds. If they go into Massachusetts and they've got 10,000 pounds, they're going to be in violation of the law. I think I'll stop here and take questions, Mr. Chairman, but we would gladly include all these provisions within the proposal. Thank you.

CHAIRMAN GIBSON: I'm almost 20 minutes into the Policy Board time slot. I think we need a motion to get more productive board dialogue going. Terry Stockwell.

MR. STOCKWELL: Mr. Chairman, I know a lot of this work has gone into this proposal and on the onset it is quite attractive. It is something that could be applied to Maine and the other New England states, but I see it at this point fraught with enforcement and monitoring issues. David just highlighted an issue that has been near and dear to me, which is raising the daily trip limit.

It would be equitable, it would be enforceable and it would be accountable**. I'm going to cut to the chase and make a motion that we increase the daily trip limit to 7,000 pounds.** I realize this is another two-thirds vote. I raised it up the flagpole in the summer and I'd like to do it again.

CHAIRMAN GIBSON: Is there a second to that; seconded by Doug Grout. Okay, board discussion on the motion. David Pierce.

DR. PIERCE: The motion is attractive. I thought Terry was going to go for an even higher limit that would have really put me in a difficult position because I'm still trying to be sensitive to the concerns of those in the industry, small boats primarily, who are concerned about too much dogs in the market, depression of price, all of that.

MR. STOCKWELL: I was talked out of ten.

DR. PIERCE: Good! So, seven, we can support going to seven, especially because it is a far better alternative than that which is offered up by Rhode Island with their weekly limit. I appreciate what they've done; good work on their part; good arguments on their part; but there are some enforcement concerns and some monitoring concerns and some other concerns as well that I won't get into in the interest of time. We will support the 7,000.

I suspect it is not as high as what Rhode Island would want in order to deal with their specific concerns. Maybe it is high enough; I'm not sure. I hope they would find 7,000 to be high enough to convince them they should move away from consideration of a weekly limit that is a concept that I really can't support.

CHAIRMAN GIBSON: I'm going to the maker of the motion. I should have asked it before the rest of the board; how do you envision us moving ahead for a council process that had divergent views on the trip limits as well as NOAA Fisheries, which we have already conformed with once and has their rule in place? This is for the May 1, 2015, fishing year you'd be talking about?

MR. STOCKWELL: No; this would be for the 2015 and 2016 specifications. Someone has got to do it; and I think my comrade, Bill Adler, has always said why are we always the dog getting wagged by the tail. If we're going to move ahead and try to initiate a change, there are many members on this board that participate in both councils and we have a representing from the Fisheries Service here. If this motion does succeed, then it is the first step of many.

REPRESENTATIVE SARAH K. PEAKE: Thank you to my colleague commissioner from Maine for making this motion. I think in my heart of hearts I would – or maybe I should say my brain of brains, I would prefer status quo; but in the spirit of compromise that we spent so many hours working on yesterday and I think got to a good result with striped bass; in that same spirit of compromise I think that this is a way to satisfy some of the concerns that have been raised by Rhode Island while also addressing the concerns that many of the people who asked questions of the scientists from Rhode Island raised.

My overall impression as the presentation was given by Rhode Island is that there are as many questions that remain as to the rollout of this as there were answers that were supplied today. I think a significant change like this; it is important in making a proposal to make sure we have the T's crossed and the I's dotted. We're still thinking about who the permit holders might be in the underlying proposal. I think I heard you say the fishermen say they don't need 28,000 pounds; they just need more. I think that this motion before us is providing the more that they're looking for. We can address some of the fish quality issues, the pricing at the processor; and for me and thinking about some of the small boat fleets in Massachusetts, certainly this lessens the potential negative impact on them and it lessens the potential for gear conflict as well. For all of those reasons; I'd be happy to support this motion.

MR. GROUT: Mr. Chairman, again, I appreciate Rhode Island's proposal. They did a wonderful job of trying to address an issue and an issue that wasn't being addressed because this commission could not support at least last year a higher trip limit. If you remember, the New England Council voted to eliminate trip limits.

It was because we were only comfortable with going to 4,000 pounds at that point despite the fact that we had a majority vote to consider that, but obviously like this motion, that previous motion requires a two-thirds majority to pass this. I certainly support it. My small boat fleet was asking for it last year. They think the market is even stronger this year; and that the market could support it. For all those reasons, I think it is time for us to stop constraining the market and try and at least give some flexibility here.

MR. BORDEN: Mr. Chairman, I intend to vote for the proposal; but before I do, I'd just like to talk a little bit about the sequence that I would envision taking place. I think if this motion passes, I think the next appropriate step is – and Terry is sitting on the opposite side of the table – is to request the New England Council to put it on its next agenda and formalize a position; and then if the council does that, then I think it is appropriate to ask the Mid-Atlantic Council to do the same thing.

Once you get those three groups together, they can forward a recommendation to the National Marine Fisheries Service and NMFS can then deal with it in the appropriate timeline. They

may not be able to get it in place for procedural issues by May 1st, but you can simply say we want this adopted as soon as possible. Thank you.

MR. DAVID SIMPSON: David helped with answering part of my question, which was how this might roll out; but at the same time I heard a lot of discussion about smaller vessels, state waters; do we contemplate and is it possible that this could move ahead in state waters only and not be held up by a federal process. I wondered about sentiment about that. We sort of have complementary management. We're not joined at the hip, so to speak, as we are with some of the other species.

CHAIRMAN GIBSON: I suppose that is a possible outcome were the commission to pass this, states could conceivably go back and go through their regulatory process. Most of the clear constraint from the commission that we couldn't do that, it seems states could go back and go through their regulatory process and put an elevated trip limit for their state-only permitted fishermen. That is just my view on it.

MR. GROUT: Yes, I agree we could do that, but that would not be the preferred alternative. I think clearly I'd like to move this forward through the council and federal process to see if we can get traction. If we can't, quite frankly, we've done this before years ago where we had a higher trip limit than the feds.

DR. PIERCE: I prefer the approach that was suggested by Doug. Of course, there is another approach that could be taken that I don't find very attractive, but I've already highlighted it and that is because there is no limited entry. If we were to implement this right away, then someone could simply say, well, I'm giving up my federal permit and they can then fish in state waters or pretend they fished in state waters and land the state limit.

Then they get their federal permit back whenever they want it because it is the way it works for the non-limited entry fishery. To me that is sort of disingenuous – that would be disingenuous on our part and it would be promoting an approach that, frankly, would run counter to council intent and runs afoul of some of the past reasoning we have used regarding, for example, groundfish controls. Fishermen should their permit at the beginning of the year.

They should keep it; they should not give it up; but in this particular case they could with dogfish. It makes far more sense to work with our federal counterparts – and, of course, many of us are council members, anyways – to have it done in a reasonable way, in a way that everyone will understand and the councils and the service will support.

CHAIRMAN GIBSON: What say NOAA Fisheries?

MR. BURNS: It is certainly a very interesting proposal, but the first thing that comes to my mind is the consistency issue. As we know, the board acted at the last meeting to bring the trip limits in parity with the 5,000 pound federal limit. And above and beyond the consistency issue is also the fact that we've got some federal permit holders who all federal permit holders wouldn't be able to take advantage of this increased limit until if there was any kind of change in the federal regulations.

I believe we'd have to go through the council process and NMFS would have to do new regulations in order to implement that. I'm not aware of an LOA or any other mechanism that I'm aware of that would allow us to do that without changing regulations. Jason may be able to elaborate on this a little bit more, but the Mid-Atlantic Council, since it has already set the specifications for the 2015 fishing year, and I think they also voted to make no further changes to that; so going through the council process may not get the result to come up with a federal change that would be consistent with what the states are looking at here.

Certainly, it is an interesting concept, a lot more conservative, certainly, than the 28,000 pound trip limit, which seemed to have a lot of enforcement issues and some uncertainty about how that could be enforced and overseen. This new proposal here certainly does take into consideration the fact that fishermen are trying

to utilize the resource in a more efficient way. With that, I will leave it at that.

DR. DANIEL: Mr. Chairman, just a couple of points. First, I have been approached as the chairman of the commission to just express concerns over consistency; that the fishermen need to have a consistent numbers, and these have changed from three to four to five and now seven. That does create some issues and problems for planning.

I think whatever we do, it would probably be a good idea for the New England states to have something remain in place for a period of time. I would normally not even comment on these issues involving you. We have our own state quota; but we do 10,000 pounds in state waters; and that is inconsistent with the federal plan. My two other quick questions; are you going to take comments from the public; and is it two-thirds majority vote of the members present or the board; because you might have a problem there.

CHAIRMAN GIBSON: It is my understanding that we need nine out of the thirteen present. Yes, given it is a new concept, I was going take some comment from the public, but I wanted to wrap up the board discussion. Peter.

MR. BURNS: Mr. Chairman, just one more point. I was just curious as to whether we have any input from the Law Enforcement Committee or the technical committee on the implications of a 7,000 pound limit in state waters.

CHAIRMAN GIBSON: I'm assuming their comments would be similar to what it was for the Rhode Island conservation equivalency, but I'll let Scott make his comments.

MR. NEWLIN: I think the comment would be similar to what we've always had; trip limits are more of a management decision and not so much a scientific one. The quota deals with that so we would have no problem with it.

MR. ROBSON: Well, of course, there is already a 5,000 pound daily trip limit in place; so in terms of Rhode Island's enforcement, they're dealing with that and so this would not be that much different except the amount. Trip limits are somewhat difficult from an enforcement perspective from the get-go; but certainly a daily limit, if you look at traditional law enforcement, which is dockside, then it is a manageable way to monitor those limits.

The challenge is moving to an aggregate trip limit such as was being discussed; and there you do need to have the resources, the real-time monitoring of trip data and communications necessary to monitor those individual permitted fishermen that come up with those aggregate weekly limits. But going to the 7,000 pounds wouldn't be much different than the daily trip limits that we are used to seeing now.

CHAIRMAN GIBSON: I'm going to go to the audience now. Is there anyone in the audience wishing to comment in favor of this proposal? Yes, sir.

MR. DAVID GELFMAN: I'm Dave Gelfman. I'm a commercial dogfish fisherman. I fish out of Chatham, Massachusetts. I want to comment. I'm not sure if it is favorable or unfavorable. There are a few points that I want you to think about because you talked about them in your science and in your preliminary discussion. One thing, the male/female marketing; so they don't want the males at the processors. They don't want them. We target females. Right now we're actually having a difficult time catching them.

I think from a science point of view – this is my own observation, but I suspect that your stock assessment is incorrect and that there is more males than females; so you might be overly optimistic about your overall quotas. This goes back to your daily catch limit ideas in that 5,000 pounds a day might be worth holding onto for a while, because I don't think your science is fully complete.

From a pragmatic standpoint, most of us in Chatham fish out of relatively small points, under 50 feet. Some of us, myself included, 5,000 pounds is pretty much a maximum load. If there is downward pressure on the price due to increased landings, it will become uneconomical

for some of us who are already participating to continue participating.

The guys who are complaining that it is not economical for them to participate yet; I'm not sure what their justification is over our participation. Roughly speaking, I would encourage 7,000 as opposed to anything more; but the fact of the matter is you have changed the daily catch limit several times in very short order, which for some people has had adverse consequences.

Some people are now looking at bigger boats and maybe they're not going to get a big enough boat. Another consideration that may or may not apply is gear type. We're fishing mostly with tub-trawl gear, which is hooked gear. If the price goes down, the cost of the bait doesn't go down. That is another reason why our fishery is fragile and might actually not be able to go anymore.

CHAIRMAN GIBSON: Sir, can I ask you to kind of summarize whether your position is for or against this motion.

MR. GELFMAN: Please keep the limit at 5,000 pounds; don't go over seven.

CHAIRMAN GIBSON: Thank you. Anyone else in the audience like to comment on this motion?

Please, only a couple of minutes apiece; we're well into the Policy Board's time slot at this point.

MR. TED PLATZ: I'll be brief. I'm Ted Platz from Newport, Rhode Island; primarily a monk fisherman. We do some dogfishing in the summer in Rhode Island. Typically our problem is a trucking problem. I'm one of the few Rhode Islanders that does bring in dogfish because I own my own refrigeration truck; so I can run them at cost and make it work.

Most of these guys cannot. The dealers price dogfish down and disincent the fishermen to go after them. That is why Rhode Island has a hard time landing dogfish between our monkfish seasons in the spring and fall. That is what Dave Borden is talking about when he is talking about what is driving the bus. That is our reality.

If you're trucking fish from Point Judith to New Bedford, your trucker is going to want twelve cents a pound, anyway, and it doesn't leave much. I recognize our proposal isn't going to go anywhere, it seems. So regarding the landing limit, what I've said it before and I'll say it again; if you go up too fast on the dogfish limit, you're going to erode the price structure. If we land 7,000 pounds at twenty cents or we can land 5,000 pounds at thirty cents, at 7,000 pounds we're doing more work and we have more gear overhead and we're making the same or less money.

You're trying to do us a favor and you're really not. We saw this in the monkfish fishery when the limits went up way too fast about ten years ago. I would advocate 6,000 pounds. I know it is well-intentioned. This is totally consistent with my comments on this from the conversation last winter. We need to protect price structure.

We need to build markets; and the way you build the markets and protect price structure is you make gradual incremental increases in your landing limit. We just bumped up to five. I think it would be safe to go to six; but I think seven you're pushing it. Then if the price drops, it is kind of like a seesaw, the picture collapses.

We don't want to drop the price; so I would encourage you to rethink seven, go to six, we revisit it in a year and a half or two years, and then we go to seven. Markets love stability; and when we go up too fast we erode market stability and we're going to erode the price and fishermen are going to work harder for the same money; and that is not a positive development. Thank you.

CHAIRMAN GIBSON: Thank you, Ted. Anyone else wishing to comment on this motion?

MR. LUTHER BATES: My name is Luther Bates. I'm a commercial dog fishermen out of Chatham. I am also a graduate of Cornell University in economics. I'd like to state my preference to maintain the existing 2015

specifications. We have an objective to ensure a sustainable fishery for the next five to ten years and not just capture an immediate opportunity.

The biomass I directly observed contains a reduced amount of targeted large females. As such, I would urge the commission to use caution with any specification adjustments to allow adequate time for direct observation of the fishery's status.

The trip limit moved up 5,000 just seven weeks ago. I don't believe that is an adequate time to observe the market, observe the fishery's condition and make an objective analysis and move forward.

We need consistency to implement our business models; and I'm concerned about the impact that this measure would have on an increased mortality rate in the industry. If we do have to go to 7,000 or any higher, even six, I would suggest a seasonal adjustment starting in December. Thank you.

CHAIRMAN GIBSON: I am going to go back to the board at this time. Addressing the audience; is there anybody in opposition to this motion who wants to speak?

MR. THEODORE LIGENZA: Theodore Ligenza. I would like to keep it at five. The reason I've taken the time to speak is because the fact of the matter is in the past, fifteen, twenty years, Chatham has landed the vast majority of dogfish and we will probably continue doing that. You've got to realize when you raise the limit, we have a shallow bar that is six feet deep at low water, and about ten years ago we lost two boats.

This summer we had another boat that was lost. It wasn't destroyed but it was sunk. That needs to be taken into consideration when you raise this limit you're putting the Chatham fishermen at danger. I would propose for a while, anyways, keeping it at five for that very reason there. I just cannot agree to go out because of the safety of my friends.

CHAIRMAN GIBSON: Is there anyone in support of the motion? If you're in support, come up and speak to it. I will take someone in opposition after that and then I'm going to close the door on public comment.

MR. JOHN WHITESIDE: Attorney John Whiteside, representing the Sustainable Fisheries Association, the dogfish processors. Prior to coming to today's meeting, my clients had asked me to urge the commission to increase to a 10,000 pound daily trip limit and oppose the Rhode Island Proposal of whatever the weekly trip limit was of 28,000 a week. Given the arguments today and the proposal for 7,000 pounds, we would support that. I ask that the commission approve that on behalf of the members of the Sustainable Fisheries Association. Thank you.

MR. JOHN TUTTLE: John Tuttle, Chatman fisherman 37 years. I gave up a day's pay to come and see you today. I think that the 5,000 should stay for a while. We haven't had it in place that long to do a good analysis. I think that would be my feeling today,

CHAIRMAN GIBSON: I'll go back to the board and to the motion. Is there anymore board discussion on the motion? Are you ready to caucus on it? This will be a roll call vote.

(Whereupon, a caucus was held.)

CHAIRMAN GIBSON: Emerson,

MR. HASBROUCK: Mr. Chairman, did we resolve the issue of whether or not we need two-thirds of the board or two-thirds of the board present?

EXECUTIVE DIRECTOR BEAL: The rule states that it is two-thirds of all voting members of the board; so that is present or not. The good news is all of them are here. It means the same thing today, but the rule reads the full membership.

CHAIRMAN GIBSON: That means of thirteen, we need nine affirmative votes. Representative Peake.

REPRESENTATIVE PEAKE: A point of order question and for the lack of a better word, the

Rhode Island Proposal; was that a simple majority because we're not changing a trip limit or would that also require a two-thirds majority to carry?

EXECUTIVE DIRECTOR BEAL: Yes; that one is a simple majority since it is essentially a conservation equivalency proposal.

CHAIRMAN GIBSON: Let's call the roll.

MS. HAWK: Maine.

MAINE: Yes.

MS. HAWK: New Hampshire.

NEW HAMPSHIRE: Yes.

MS. HAWK: Massachusetts.

MASSACHUSETTS: Yes.

MS. HAWK: Rhode Island.

RHODE ISLAND: Yes.

MS. HAWK: Connecticut.

CONNECTICUT: Yes.

MS. HAWK: New York.

NEW YORK: Yes.

MS. HAWK: New Jersey.

NEW JERSEY: No.

MS. HAWK: Delaware.

DELAWARE: No.

MS. HAWK: Maryland.

MARYLAND: No.

MS. HAWK: Virginia. (No response) North Carolina.

NORTH CAROLINA: No.

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

U.S. FISH AND WILDLIFE SERVICE: Abstain.

MS. HAWK: National Marine Fisheries Service.

NATIONAL MARINE FISHERIES SERVICE: Abstain.

CHAIRMAN GIBSON: **The motion fails for lack of a super majority.**

ADJOURNMENT

Is there any other business to come before the Dogfish Board? Seeing none; we stand adjourned.

(Whereupon, the meeting was adjourned at 2:45 o'clock p.m., October 30, 2014.)

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Update on the Status of Spiny Dogfish in 2015 and Projected Harvests at the Fmsy Proxy and Pstar of 40%

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Northeast Fisheries Science Center
National Marine Fisheries Service

Mid Atlantic Fishery Management Council
Scientific and Statistical Committee
August 26, 2015
Last Update: August 26, 2015

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Executive Summary

The purpose of this report is to summarize the most recent information on the status of spiny dogfish (*Squalus acanthias*) in 2015. Information on the NEFSC spring bottom trawl survey trends and total removals are provided along with an analysis of estimated stock size, fishing mortality rates, and projections of stock size under varying fishing mortality rates. The spiny dogfish population is not overfished and overfishing is not occurring.

US landings increased by 46% from 7,312 in 2013 to 10651 mt in 2014. Canadian landings for 2013 and 2014 were not available but averaged about 77 mt per year between 2009 and 2012. The recreational, Canadian and foreign fleets in 2014 collectively accounted for only 64 mt. Total landings since 2011 have averaged 9,696 mt.

Estimates of recreational landings were updated for the period 2004 to 2011 to account for changes resulting from the application of an alternative estimator to the historical data collected under the Marine Recreational Fisheries Statistics Survey (MRFSS). Differences between the Recreational landings and discard estimates for 2004 to 2010 were relatively minor. MRIP estimates of landings are about 18% lower than MRFSS. MRIP estimates of discards are about 7% lower. In view of the small overall magnitude of the change and the minor contribution of recreational catch to the total removals, NO historical adjustments of recreational catches were made.

Total discards in 2014 of 15,327 mt were slightly above the 14,206 mt average of the preceding 10 yrs. Total dead discards in 2014 of 5783 were about the same as the 2003-2013 average of 5365 mt. The ratio of dead discards to landings since 2011 has been about 0.54 suggesting a general improvement in the utilization of the spiny dogfish resource (ie. landings/catch)

Overall survey abundance , measured as a 3 yr moving average of NEFSC spring bottom trawl survey indices declined about 41% between 2013 and 2015 (Table 7). The 2012 survey abundance index may have been anomalously high since all size groups and sexes increased by average of 58%. Such increases are unlikely in a population subject to relatively low fishing mortality and exhibiting relatively slow growth and recruitment. irrespective of fishing intensity. T The raw 3-yr average of female SSB swept area biomass in 2013 of 235,900 mt was about the same as the 241,000 mt in 2012. Pup production in 2015 of 2.4 kt was slightly below the long-term average of 2.59 kt (Fig. 7) in the NEFSC spring survey. Male biomass in the 36 to 79 cm size range declined by about the same fraction as mature females, suggesting a common underlying year effect in survey availability apart from harvest. This paper is unlike the interannual changes that occurred in the mid 1990s when female biomass fell much more rapidly and male biomass remained consistently high.

Female spawning stock biomass estimates from 2009 to 2013 have exceeded the biomass reference point. Therefore, the stock is not overfished and is rebuilt. Stochastic model estimates of mean female spawning stock biomass in 2015 was 138,997 mt (compared to 211,372 mt in 2013). The drop in abundance is due primarily to the absence of the very high 2012 abundance estimate from the 3 point moving average. Due to the absence of the 2014 survey the abundance estimate for 2015 relies entirely on the 2013 and 2015 indices. An examination of the ratio of the average weight per tow of females in the complete survey strata to average weights based on the incomplete strata set in 2014 suggested a range of 1 to 3.5 for 2009 to 2015 (Appendix 3, Fig. 1). In contrast, the same computation for male weight per tow was approximately 1.0 for all years. Hence the strata not sampled in 2014 are highly influential to the abundance estimate for female spiny dogfish and imputation based on average ratio of complete to incomplete was judged inappropriate. The probability of stock size being above the SSB target is about 35% in 2015; the sampling distribution of SSB in 2015 suggested that the probability of SSB being below the SSB threshold is about 10%.

Estimated fishing mortality rates in 2012 and 2014 were 0.149 and 0.214, respectively. Increased variability the stochastic biomass estimate led to increased dispersion in the stochastic estimate of F and a very skewed distribution in 2014 (Fig. 11b). The mean estimate of fully recruited F on the exploitable population in 2014 was 0.214, below the Fmsy proxy of 0.2439. If catches in 2015 are assumed to be equal to those estimated in 2014, and all other factors are held constant, the projected F in 2015 would approximately equal the Fmsy proxy. This conclusion is based on a projection and should be considered preliminary until the updated assessment is completed in 2016.

In the mid 1990's F on fully recruited spiny dogfish was about 2 to 3 times greater than contemporary rates and a greater fraction of the mature female population was vulnerable to fishing mortality. The reduced rate of fishing mortality and shift in selectivity led to major reductions in the overall force of mortality on the population. Fishing mortality rates on male dogfish are negligible (<0.01).

This report examines a two harvest scenarios based on fishing mortality rates at the Fmsy proxy (0.2439) and a forecast based on iterative application of the Pstar control rule . The Pstar method assumes that the OFL is lognormally distributed with a CV of 100%. The probability of exceeding the target F is set at 40% when the stock is above Bmsy and declines linearly as the ratio of current SSB to target SSB declines.

Scenario	***Year***	***Median Catch***	***5-th Percentile***	***95-th Percentile***
OFL based on F=	2016	24,247	14,551	33,962
Fmsy Proxy=0.2439	2017	25,090	15,013	35,182

	2018	25,775	15,306	36,257
Catch based on iterative application of Pstar adjusted for Stock Status.	2016	16,765	NA –constant catch	NA –constant catch
	2017	16,526	NA –constant catch	NA –constant catch
	2018	16,636	NA –constant catch	NA –constant catch

For management purposes it is important to recognize that projections rely on continuation of current fishery selectivity patterns in the future. Changes in management regulations or economic value of spiny dogfish would reduce the tenability of these assumptions.

Projections provide guidance on projected landings, probabilities of overfishing and probabilities of falling below SSB targets and thresholds. A common feature of these projections and earlier updates is the oscillation in future stock sizes induced by the stanza of low recruitment between 1997 and 2003. Higher rates of fishing mortality tend to induce greater declines in abundance and a greater chance that the population will fall to levels requiring rebuilding measures. These future oscillations have important implications for selection of contemporary harvest policies, especially with respect to variability of landings streams and the risk of introducing measures to reduce overfishing or rebuild the stock. Given the state of the resource in 2015, it appears that the likelihood of falling below the threshold biomass level is relatively low even when fishing at Fmsy. Increased recruitment, especially in the past 4 years, has resulted in an increased abundance of fish under 60 cm. This "filling out" of the size frequency distribution tends to diminish the expected oscillations in future population trajectories. However, it should be noted that all of these conclusions are conditional on little change in the selectivity patterns over time.

Assuming that the 2015 catches are equal to those in 2014, the projected median OFL for 2016 is 24,247 mt with a 90% confidence interval of 14,551 to 33,962 mt. The projection for 2016 in Rago and Sosebee (2013, Table 12 therein) was 32,346 mt with a 90% confidence interval of 18,125 to 46,590 mt. Table 14 in Rago and Sosebee (2013) uses a harvest rate of F=0.19 to predict a median OFL of 28,664 mt with a 90% confidence interval of 16,705 to 40,642 mt. The median projected catch for 2016 (a 4 year ahead forecast) based on Table 16 in Rago and Sosebee (2012b) was 24,991 mt with a 90% confidence interval of 17,689 to 32,301mt. This forecast used a F=0.19; this is approximately equal to the realized F on the population during the 2012 to to 2014 period.

	Predicted Catches for 2016		
Source	***Median Catch (mt)***	***90% Confidence interval (mt)***	***Harvest Projection***
This assessment, Table 12	24,247	14,551 to 33,962	F=0.2439
Rago and Sosebee 2013, Table 14	32,346	18,125 to 46,590	F=0.2439
Rago and Sosebee 2013, Table 14	28,664	16,705 to 40,642	F=0.19 (this is about observed average)
Rago and Sosebee 2012b, Table 16	24,991	17,689 to 32,301	F=0.19 (this is about observed average)

Background

This report draws heavily on the results of the last peer-reviewed stock assessment vetted at SARC 43 in 2006, assessment model described in Rago and Sosebee (2009), and a revision of the biological reference points for spiny dogfish described in Rago and Sosebee (2010). The revised biomass reference points were peer-reviewed by the Transboundary Resource Assessment Committee in April 2010. The revised biological reference points required an update of the size and sex-based selectivity estimates of the fishery. Previous biomass reference points for spiny dogfish were based on a Ricker stock-recruitment model derived from Northeast Fishery Science Center trawl survey data. SSBmax, the biomass that results in the maximum projected recruitment, is the proxy for BMSY. The revised biomass reference point incorporates additional information on the average size of the recruits as an important explanatory variable. A hierarchical AIC-based model building approach is used to identify the best model. Comparisons of maximum likelihood and robust nonlinear least squares regression models suggested that the robust estimator had the lowest AIC and highest precision for the estimate of SSBmax.

The revised target reference point, expressed in terms of average weight (kg) per tow of female spiny dogfish greater than 80 cm, is estimated as 30.343 kg/tow. Conversion of this metric to swept area biomass depends on the average swept area per tow, i.e., the trawl footprint. The nominal footprint of the R/V Albatross is 0.01 nm^2. Using this value, the swept area estimate of SSB_{max} is 189,553 mt. Using an alternative footprint more consistent with recent gear mensuration suggests that a footprint of 0.0119 nm^2 is more appropriate. The revised swept area biomass target (SSB_{max}) corresponding to this footprint is 159,288 mt. Applying the convention defined in the current control rule in the Spiny Dogfish Fishery Management Plan, the threshold biomass is one half of the target or 79,644 mt. Based on the revised biomass reference point and using the trawl footprint of 0.0119 nm_2, the US spiny dogfish resource was rebuilt in 2008 when the swept area female spawning stock biomass was 194,616 mt.

Changes in the estimated selectivity of the fishery also led to revised estimates of fishing morality reference points. The updated target and threshold fishing mortality rates of 0.207 and 0.325, respectively were based on a life history model described in Rago et al. 2008. During the Meeting of the MAFMC SSC on September 21, 2010 the committee noted that the longterm projections were inconsistent with these reference points. The SSC recommended that the fishing mortality reference points be reexamined. Additional analyses were conducted with the projection model to identify fishing mortality rates that would lead to a stable population structure and a finite rate of increase of 1. A revised fishing mortality rate of 0.2439 was estimated (Rago 2011). These analyses and results were reviewed and approved on August 19, 2011 by the SSC.

A. Catch Trends

1. This document summarizes the most recent information on spiny dogfish stock status using survey data from the spring 2015 NEFSC bottom trawl survey and catch data from 2014. Catch data include landings from US and Canadian commercial fisheries, and US recreational landings. Discard information includes discards from US commercial fisheries and US recreational fisheries. Estimates of dead discards are obtained by multiplying the total discards by the gear-specific discard mortality rates.

2. Total landings estimates are summarized in Table 1 and Fig. 1. US landings increased by 46% from 7,312 in 2013 to 10651 mt in 2014. Canadian landings for 2013 and 2014 were not available but averaged about 77 mt per year between 2009 and 2012. The recreational, Canadian and foreign fleets in 2014 collectively accounted for only 64 mt. Total landings since 2011 have averaged 9,696 mt.

3. The estimates of recreational landings were updated for the period 2004 to 2011 (Table 2). The changes represent the application of an alternative estimator to the historical data collected under the Marine Recreational Fisheries Statistics Survey (MRFSS). The new program, known as the Marine Recreational Information Program (MRIP) is in the process of revising the historical data as well as advancing an improved sampling design for future surveys. At the time this report was prepared, the changes in the historical data bases were restricted to 2004 to 2011. To be clear, the re-estimation of recreational catch estimates for 2004 onward represents the application of a revised estimator to the historical MRFSS data. The revised estimates are now consistent with the actual sampling collection program employed under MRFSS.

4. Differences between the Recreational landings and discard estimates for 2004 to 2010 were relatively minor (Table 2). MRIP estimates of landings are about 18% lower than MRFSS. MRIP estimates of discards are about 7% lower (Fig. 2). In view of the small overall magnitude of the change and the minor contribution of recreational catch to the total removals, NO historical adjustment of recreational catches were made. In 2011 the ratio of recreational catch to total catch was 3.3%. Hence changes of 18% and 7%, respectively to recreational landings and discards would represent negligible changes to the historical catch series (Fig. 3).

5. Total discards in 2014 of 15,327 mt were slightly above the 14,206 mt average of the preceding 10 yrs. Total dead discards in 2014 of 5783 were about the same as the 2003-2013 average of 5365 mt (Table 3). Total dead discards in 2014 (5,783 mt) were about 17% higher than the previous 5 year average of 4,925 mt.

6. Most of the increase in discards occurred in the otter trawl fleet. Sink gill net discards in 2014 were among the lowest on record. (Table 3). The ratio of dead discards to landings in 2014 of 0.45 is the second lowest value since the closure of the fishery in 2000 (Table 4, Fig. 5). These data suggest a general improvement in the utilization of the spiny dogfish resource (ie. landings/catch)

7. Biological samples collected by port agents are used to estimate size composition and sex ratios for spiny dogfish in landings (Table 5). Overall landings are dominated by females, a trend that has persisted since the US EEZ fishery began (Fig. 6). Most fishing takes place near shore where females are more abundant (Appendix 4, Fig. 1 and 2). The fraction of females in the landings in 2014 (94%) was nearly equal to the landings fractions in the previous two years and consistent with the longterm pattern of a female dominated fishery. (Table 5).

8. The sex ratios of discarded fish are similarly dominated by females, but females represent only 65% of total discards by weight (Table 6). This difference, compared to landings, is likely due to the much higher rate of discarding of male fish. On a numerical basis, 18% of the males caught in 2014 were landed; for females this fraction was62% in 2014(Table 5, 6).

9. Discard rates are declining as a fraction of total catch. The decrease in discards represents an improvement in the utilization of the spiny dogfish resource (Table 4, Fig. 4, 5).

B. Survey Indices

1. Beginning in 2009 the NEFSC spring bottom trawl surveys were conducted by the FSV Bigelow instead of the R/V Albatross IV. The Bigelow is a larger, acoustically-quiet vessel. It tows a larger net and has different sampling protocols. A large-scale side-by-side calibration experiment was conducted in 2008 to compare catches between the two vessels. A peer-review committee met in August 2009 to review the results of the experiment and to provide additional guidance on methodology for estimating the magnitude of the gear-vessel-protocol differences.

2. The calibration factor for spiny dogfish was estimated using a beta-binomial estimator (Miller et al. 2010). Overall the Bigelow caught 1.1468 times as many spiny dogfish per tow as the Albatross. The standard error of the estimate was 0.0441 and the 95% confidence interval was 1.0636 to 1.2365. The 2012 Bigelow-based estimates of relative abundance were converted to predicted Albatross equivalents by dividing each estimate by 1.1468.

3. The use of a calibration coefficient increases the variance of the estimated Albatross equivalent because this prediction includes the sampling errors of the original Bigelow survey value and the calibration coefficient. A Taylor series expansion method was used to estimate the variance as

   a. $$Var\left[\frac{I_{Bigelow}}{\gamma}\right] = \frac{Var\left[I_{Bigelow}\right]}{\gamma^2} + \frac{I_{Bigelow}^2 Var[\gamma]}{\gamma^4}$$

   b. Application of this formula to 2015 Bigelow survey increased the CV by less than 2%. See example computational details in Appendix 1.

4. Overall swept area biomass estimates in 2015, using a nominal trawl survey footprint of 0.010 nm^2 declined about 58% from record high levels in 2012 (Table 7). This table is included to facilitate comparisons with previous summaries of this information. The raw average of female SSB swept area biomass 2015 (based on 2013 and 2015) also decreased by about 57% to 135.5 kt as compared to 235.9 kt in 2013. Pup Production in 2015 of 2.4 kt was slightly below the long-term average of 2.59 kt (Fig. 7) in the NEFSC spring survey.

5. Size frequency plots for males and females in the spring surveys are depicted in Fig. 17. The 2-yr survey average for 2013 and 2015 suggests a large number of recruiting females in the 40 to 60 cm range. This pattern is consistent with high recruitments since 2009. A similar pattern is revealed

for male dogfish size compositions. The loss of the high 2012 mature female abundance estimate in 2012 from the 3yr average for 2013-15 led to a marked drop in relative abundance of female spiny dogfish above 80 cm (Fig 17, bottom left panel).

6. The stochastic estimates of stock size and fishing mortality, described in the following sections, explicitly take the variability into account and dampens the interannual changes by using a 3-year moving average of survey estimates. Stochastic estimates of swept area biomass given in Table 8, suggest about a 34% decline in females SSB and 15% decrease in total biomass.

C. Stochastic Estimates of Biomass and Fishing Mortality

1. The simple arithmetic average of stock size does not incorporate sampling variations in the underlying survey data or uncertainty in the size of the footprint of the average trawl tow. A stochastic estimator of spawning stock biomass and fishing mortality for female dogfish is described in SARC 43. . Computational details on this estimator may be found in Rago and Sosebee (2009). The stochastic estimator incorporates uncertainty in the sampling observation (ie. the variance of the relative abundance index) of a 3 yr average and variation in the survey footprint. Estimates of various biomass estimates are summarized in Table 8 and Fig. 10b. Average biomass estimates are summarized in Table 8 while Fig. 8a and 8b depict the variability in biomass estimates for 2008-15. It is important to note that the estimate for 2015 is based on two surveys only: 2013 and 2015. Comparison of female spawning stock biomass estimates for the raw data, 3 yr average and stochastic estimators (Fig. 9) show how the observation error in the surveys tends to smooth the interannual changes compared to the simple 3 point moving average.

2. The estimator for fishing mortality is based on the ratio of total catch and swept area biomass. Ostensibly this assumes that the trawl is 100% efficient in capturing dogfish between the wings. Alternatively, it implies that the trawl is about 50% efficient in capturing dogfish between the doors. Dogfish in schools are known to herd between trawl doors. An external mass balance model was first applied at SARC 43 and has been recently updated in Rago and Sosebee (2009). The mass balance model supports the biomass estimates based on simple swept area concepts. However, it is acknowledged that this is a source of uncertainty in the assessment and subject to change at a future benchmark assessment. Importantly, recent information provided by Sagarese et al. (2014, 2015) will be helpful for refining estimates of relative abundance and incorporating covariates that may elucidate the role of environmental fluctuations on abundance estimates.

3. Female spawning stock biomass estimates from 2009 to 2013 have exceeded the biomass reference point. Therefore, the stock is not overfished and is rebuilt. Stochastic model estimates of mean female spawning stock biomass in 2015 was 138,997 mt (compared to 211,372 mt in 2013)(Table 8). The drop in the abundance estimate is due primarily to the absence of the very high 2012 abundance estimate from the 3 point moving average (see Table 7). Due to the absence of the 2014 survey the abundance estimate for 2015 relies entirely on the 2013 and 2015 indices. An examination of the ratio

of the average weight per tow of females in the complete survey strata to average weights based on the incomplete strata set in 2014 suggested a range of 1 to 3.5 for 2009 to 2015 (Appendix 3, Fig. 1). In contrast, the same computation for male weight per tow was approximately 1.0 for all years. Hence the strata not sampled in 2014 are highly influential to the abundance estimate for female spiny dogfish and imputation based on average ratio of complete to incomplete was judged inappropriate. The probability of stock size being above the SSB target is about 35% in 2015; the sampling distribution of SSB in 2015 suggested that the probability of SSB being below the SSB threshold is about 10%. (Table 10, Fig. 8b). A comparison of the raw, 3-yr moving average and stochastic estimators are shown in Fig. 9. The magnitude of the increase between 2011 and 2012 is improbable given the biology of spiny dogfish.

4. Estimated fishing mortality rates in 2012 and 2014 were 0.149 and 0.214, respectively (Table 9). Increased variability the stochastic biomass estimate led to increased dispersion in the stochastic estimate of F and a very skewed distribution in 2014 (Fig. 11b). The mean estimate of fully recruited F on the exploitable population in 2014 was 0.214, below the Fmsy proxy of 0.2439. If catches in 2015 are assumed to be equal to those estimated in 2014, and all other factors are held constant, the projected F in 2015 would approximately equal the Fmsy proxy. This conclusion is based on a projection and should be considered preliminary until the updated assessment is completed in 2016.

5. In the mid 1990's F on fully recruited spiny dogfish was about 2 to 3 times greater than contemporary rates and a greater fraction of the mature female population was vulnerable to fishing mortality. The reduced rate of fishing mortality and shift in selectivity led to major reductions in the overall force of mortality on the population. Fishing mortality rates on male dogfish are negligible (<0.01).

6. The probability that female spiny dogfish SSB in 2015 exceeds the biomass reference point is about 35% (Fig. 8b, Table 10). This conclusion is based on a projection that assumes the catch by sex in 2015 is equal to catch in 2014.

7. Fishing mortality estimates incorporate uncertainty in the biomass as well as landings and discards. Variance estimates of discards by gear type and sex are computed for trawls, gillnets and recreational catch (Appendix 2, Table 1,2). Results of the fishing mortality estimates are summarized in Table 9 and 10, and Figure 11a and 11b. Fishing mortality rates for female spiny dogfish are about 87% of the F msy proxy of 0.2439 (Table 9). The median F on the exploitable stock of female biomass in 2015 is 0.228 or about 93% of the Fmy proxy , IF the total catch in 2015 equals the 16,498 mt (Table 10). It should be noted that the distribution of fishing mortality is highly skewed in 2015 (Fig. 11b).

8. Additional details on the variability in survey indices and discard estimation may be found in Appendix 2.

D. Harvest Scenarios

Stock projections are based on a stochastic model that incorporates uncertainty in initial population size. Uncertainty in population size is derived by consideration of sampling variability of a 3 year average

abundance, and uncertainty in the average area swept per tow. The effects of harvest policies are estimated using length-based sex-specific projection model that has been used for catch and status projections since 2003. (See Rago and Sosebee, 2009 for a summary and example. Other examples in NEFSC 2003, and 2006).

In addition to specifying target fishing mortality rates and/or quotas, it is necessary to specify a number of key assumptions about future fisheries. The key assumptions include:

- All life history parameters, especially those related to reproduction are effectively constant
- Selectivity patterns in the fishery remain the same over time.
- Discard patterns and proportions of total catch remain constant over time
- Recent recruitment trends will continue and that the low recruitment period from earlier will not return
- The relationship between male and female fishing mortality rates scales directly with the magnitude of female fishing mortality. When Fs are increased to the Fmsy proxy (0.2439) it is assumed that the F on males would increase proportionally(Table 11).

D.1 Scenarios

All of the scenarios assumed that the 2015 fishery had the same selectivity and fishing mortality properties as the 2013 fishery. Catch in 2015 was assumed to be equal to the catch in 2014 = 16,542 mt. The implications of this assumption are illustrated in Table 10, which demonstrates that the there is about a 40% chance that the fishing mortality rate would exceed the Fmsy proxy in 2015. However there is about a 35% chance that the population would exceed the Bmsy proxy of 159 kt. The scenario planning horizon was 15years (2015-2030) (Fig. 12). The longer term projections should be viewed as informative of potential trends, but the absolute values are less reliable. Longer term trends are useful for comparing the likely state of the resource after a sustained harvest period. An F-based scenario with F= Fmsy proxy =0.2439 was used to create a sampling distribution of catch (Fig. 13 Panel A), total landings (Panel C) and a sampling distribution of female SSB (Panel B) and fraction of the SSB target (Panel D).

A second scenario was based on iterative application of a Pstar adjusted catch. The Fmsy proxy was used to estimate the OFL in year t=2016 by assuming that the catch in 2015 was 16,498 mt. A Pstar value was estimated based on the SSC's control rule for Typical stocks, adjusted for the relative fraction of the population biomass to Bmsy. The OFL was assumed to be distributed lognormally with a 100% CV. The resulting ABC was substituted back into the projection model as a quota, and the OFL for the next year was computed. The OFL was then used to derive a new ABC and the process was repeated. The same assumptions about 2014 fishery were used to initialize these projections. Details on the iterative estimation of ABCs are summarized in the text table below.

Computation of Female and Male quotas								
				ABC				
	OFL(F)	B/Bmsy	Pstar	Total	Females	Males	frac_Fem	frac_Mal
2015				16498	13811	2687	0.837132	0.162868
2016	24277	0.834	0.326222	16686	13968	2718		
2017	25427	0.768	0.296889	16,310	13653	2656		
2018	26577	0.735	0.282222	16,449	13770	2679		

Results of this scenario are given in Table 13 and 14.

D.2 Results

The constant F harvest policies lead to a static population and catch when F=Fmsy proxy (Fig. 12B). The short term response is dominated by oscillations that are primarily a function of the contemporary size structure of the population. A common feature of these projections and earlier updates is the oscillation in future stock sizes induced by the stanza of low recruitment between 1997 and 2003. Fig. 12A provides a comparison of projections in 2013 in Rago and Sosebee (2013). These future oscillations have important implications for selection of contemporary harvest policies, especially with respect to variability of landings streams and the risk of introducing measures to reduce overfishing or rebuild the stock. Given the state of the resource in 2015, it appears that the likelihood of falling below the threshold biomass level is relatively low even when fishing at Fmsy. Increased recruitment, especially in the past 4 years, has resulted in an increased abundance of fish under 60 cm. This "filling out" of the size frequency distribution (Fig. 17) tends to diminish the expected oscillations in future population trajectories. The abundance of mature females in the 2015 survey suggests that either the cumulative effects of low recruitment in the late 1990s and early 2000s are beginning to show up OR that large females may have shifted their distribution patterns in 2015. However, it should be noted that all of these conclusions are conditional on little or no change in the selectivity patterns over time.

Box plots are used to convey the predicted uncertainty in catch, landings, and female SSB (Fig. 13); numerical details are provided in Tables 11 and 12. Table 12 provides detailed information on the percentiles of catch, landings, discards and female SSB for 2016 to 2018. The 40%-ile of catch under F=0.2439 averages about 23 kt for 2016 to 2018 with no meaningful variation between years.

Table 12 can be viewed as an approximation of the sampling distribution of the Overfishing Level (i.e., a function of the Fmsy proxy and the uncertainty in the population size).The median of the Overfishing Limit (OFL) for 2016 is 24,247 mt. The 90% confidence interval for the 2016 OFL is 14,551 to 33,962 mt.

Figure 13 illustrates the expected increases in uncertainty over time. The expectations for SSB (panels B and D) are particularly instructive for selection of harvest policies. The last four columns of Table 11 include important information for the comparison of alternative harvest scenarios. Estimates of the

probability of falling below the target and below the threshold biomass targets can be used to evaluate the risk of initiating a rebuilding program in future years or other management measures. The last two columns provide estimates of the probabilities of F exceeding the overfishing limit and the target F. These considerations are relevant only for quota based policies. Decrease in stock size may occur by 2020 but current runs suggest the stock has a low probability of declining below the threshold biomass. The Pstar harvest based policy is evaluated in Tables 13 and 14. Median projected catches for 2016 to 2018 are 16,765, 16,526, and 16,636 mt, respectively (Table 14). Owing to the lower relative abundance of 80 cm + females in 2015, the female SSB is expected to decrease about 12% during this period.

E. Sources of Uncertainty

1. The long term dynamics of spiny dogfish are an important guide for structuring harvest scenarios. The current size structure and sex ratio of the population have important implications for stock dynamics over the next decade. However, it should also be noted that long-term forecasts are inherently uncertain. The history of this resource during periods of high exploitation is informative about the magnitudes of likely fishing mortality rates. Changes in average size in both the surveys and landings suggest that the magnitude of population biomass from the swept area computations is approximately correct.

2. Scientific advice on catch levels for spiny dogfish needs to be carefully crafted. A longer term perspective is necessary to ensure that the transient effects of the current population size and sex structure are considered over a period of several decades. At the same time, such longer term projections become increasingly uncertain and are driven by the assumptions used to model the stock dynamics. It is imprudent to look at short term changes in harvest levels without considering the longer-term implications.

3. Recent changes in survey-based abundance suggest that changes in availability play an important role in abundance indices. As the male population is largely unexploited, it may offer additional insights into changes in availability to the survey since inter-annual changes in the male component of the stock should be less variable. The sharp increase in survey abundance in 2012 may represent increased availability to the survey area or concentrations of the resource in larger offshore strata. Such changes in resource allocation are, in theory, not expected to alter abundance indices. However, even slight changes in catchability among strata and high sampling variability could lead to very high or low abundance estimates in a given year. Recent publications by Sagarese et al. (2014) are relevant to the issues of changing distributions.

4. Changes in discard patterns could become extremely important. In 2014, discard mortality presently constitutes 76% of fishing mortality by weight on male dogfish and 27% by weight on females. The male population is at or near historic highs, but its low marketability and offshore distribution reduce the chances of male dogfish contributing significantly to future landings. All of the projections described herein assume that there will not be major increases in male dogfish landings. While the sex ratio of mature male to mature female dogfish declined through 2007, it appears to be increasing

slightly since then and is higher than expected (Fig. 14). A targeted fishery to land male dogfish would not be detrimental to the population in the short run but the consequences for changes in selectivity for co-occurring female populations should be evaluated.

5. Other important source of uncertainty include
    a. Potential changes in fishery selectivity. Large increases in catches could induce changes in the overall selectivity pattern in the fishery.
    b. Implications of changing selectivity on estimation of biological reference points
    c. Potential inconsistency between the life history based estimates of fishing mortality rates and the biomass reference points derived from the Ricker stock recruitment curve.
    d. Total discard estimates AND estimated mortality of discarded dogfish.

F. Potential Indicators of Stock Status during Multi-year fishery management Quotas

Potential Indicator	*Metric*	*Evaluation*	*Reference*
Discards	Changes in ratio of discard to landings	Ratio has been steadily declining since 2004 suggesting more efficient utilization of the resource	Figure 5, Table 4
	Changes by gear type	Sink gill net discard rates have declined over time. Otter trawl discards have increased slightly but remain about 3375 mt in last 5 years.	Table 3.
Survey Abundance Trends	Average Size of Mature females	Mean length of mature females has been increasing since 1999. Average size of mature females is still well below rates observed in mid 1980s.	Figure 15
	Ratio of mature males to females	Ratio has decreased to between 3 to 4 from earlier ratios near 7. Ratio has been increasing modestly since 2008. Expected ratio, based on growth and maturity rates should be about 2.	Figure 14.
	Recruitment	Recruitment indices have averaged about 6.0 kt since 2009 which is well above the 1969-2008 average of 2.1 kt	Table 7. Figure 7.
	Pup Size	Average length of male and female pups have increased steadily from a low of 26 cm in 1997 to a record high of 32 cm in 2015. Average size now exceeds that observed in the 1980s.	Figure 16.
	Size composition	Sizes of mature females are increasing slightly; males are relatively unchanged. Size composition of sub adults is broadening and approaching distribution seen prior to major fisheries in 1990s. High abundance of dogfish in the 40 to 60 cm size range suggests a robust future stock size.	Figure 15. Figure 17.
	Spatial Distribution	Large Female spiny dogfish were less abundant in the inshore areas in 2014 and 2015. This may be responsible for the lower overall abundance estimates. Examination of environmental influences on distribution may be instructive.	Appendix 4. Figure 3-6.
Commercial Landings	Average Size	Average weight of landed females of about 2.9 kg has been steady since 2004.	Table 5
	Sex ratio	Landings remain dominated by females with no apparent trend.	Table 5
	Changes in Canadian Landings	Landings remain low and are not available for 2014 and 2015.	Table 1.
	Spatial distribution of landings	Seasonal maps by quarter 1 and 2 pooled and quarter 3 and 4 pooled suggest fishing is concentrated in the vicinity of major fishing ports with little or no activity near the shelf break where males are more abundant.	Appendix 4. Fig. 1 and 2.
Forecast	Comparison of OFL	Comparison of 3 and 4 year ahead forecasts show	Executive

accuracy	and ABC predictions between assessments	reasonable agreement with current ABC estimates for 2016 based on Pstar.	summary, page 3.

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Table 1. Total spiny dogfish landings (mt, live) in NAFO Areas 2 to 6, 1962-2014.

	United States						United States				
Year	Commer-cial	Recre-ational	Canada	Distant Water Fleets	Total Landings	Year	Commer-cial	Recre-ational	Canada	Distant Water Fleets	Total Landings
1962	235		0	0	235	1988	3,105	359	1	647	4,112
1963	610		0	1	611	1989	4,492	418	167	256	5,333
1964	730		0	16	746	1990	14,731	179	1,309	393	16,611
1965	488		9	198	695	1991	13,177	131	307	234	13,848
1966	578		39	9,389	10,006	1992	16,858	215	868	67	18,008
1967	278		0	2,436	2,714	1993	20,643	120	1,435	27	22,225
1968	158		0	4,404	4,562	1994	18,798	155	1,820	2	20,774
1969	113		0	9,190	9,303	1995	22,578	68	956	14	23,615
1970	106		19	5,640	5,765	1996	27,136	25	431	236	27,827
1971	73		4	11,566	11,643	1997	18,351	66	446	214	19,078
1972	69		3	23,991	24,063	1998	20,628	39	1,055	607	22,329
1973	89		20	18,793	18,902	1999	14,855	53	2,091	554	17,552
1974	127		36	24,513	24,676	2000	9,257	5	2,741	402	12,405
1975	147		1	22,523	22,671	2001	2,294	28	3,820	677	6,819
1976	550		3	16,788	17,341	2002	2,199	205	3,584	474	6,462
1977	931		1	7,199	8,131	2003	1,170	40	1,302	643	3,155
1978	828		84	622	1,534	2004	982	105	2,362	330	3,778
1979	4,753		1,331	187	6,271	2005	1,147	45	2,270	330	3,792
1980	4,085		660	599	5,344	2006	2,249	94	2,439	10	4,792
1981	6,865	1,493	564	974	9,896	2007	3,503	84	2,384	31	6,002
1982	5,411	70	389	364	6,234	2008	4,108	214	1,572	131	6,025
1983	4,897	67		464	5,428	2009	5,377	34	113	82	5,606
1984	4,450	91	2	391	4,935	2010	5,440	21	6	127	5,594
1985	4,028	89	13	1,012	5,142	2011	9,480	32	124	143	9,779
1986	2,748	182	20	368	3,318	2012	10,660	19	65	137	10,881
1987	2,703	306	281	139	3,429	2013	7,312	37	NA	61	7,410
						2014	10,651	31	NA	33	10,715

Table 2. Summary of spiny dogfish landings and discard estimates based on Marine Recreational Information Program estimates, 1981-2014. As in previous assessments, the average weight of landed discarded spiny dogfish is assumed to be 2.5 kg. Discard mortality is assumed to be 20%. The revised MRIP estimator was used for 2004 to 2012. Differences between MRFSS and MRIP were considered minor relative to total catch (ie Commercial landings and discards); no adjustments were made to historical recreational data.

	Catch in Numbers								Numbers		*Weight (mt)*			Estimates used in Previous assessments				
Year	Observed Harvest (A)	PSE	Reported Harvest (B1)	PSE	Released Alive (B2)	PSE	Total Catch A+B1+B2	PSE	Total Landings A+B1 (number)	Discards B2 (number)	Landings (A+B1) (mt)	Discards (B2) (mt)	Dead Discards (mt)	Landings (mt)	Discards (mt)	% dif Landings	% dif Discard	Estimator
1981	5,943	49.1	591,300	52.1	118,440	31.3	715,683	43.4	597,243	118,440	1493	296	59	1,493	59	0.0	0.4	MRFSS
1982	12,460	38.6	15,712	45.5	139,730	21.4	167,902	18.5	28,172	139,730	70	349	70	70	70	0.6	-0.2	MRFSS
1983	13,154	36.3	13,675	34.1	215,973	23.7	242,803	21.2	26,829	215,973	67	540	108	67	108	0.1	0.0	MRFSS
1984	9,606	48.1	26,918	45.1	169,574	35.1	206,099	29.6	36,524	169,574	91	424	85	91	85	0.3	-0.3	MRFSS
1985	5,495	47.7	30,172	38.3	385,745	41.8	421,412	38.4	35,667	385,745	89	964	193	89	193	0.2	-0.1	MRFSS
1986	11,598	26.5	61,688	22.8	474,930	17.7	548,216	15.6	73,286	474,930	183	1187	237	182	237	0.7	0.2	MRFSS
1987	14,286	44	108,171	28.9	422,387	21.6	544,844	17.8	122,457	422,387	306	1056	211	306	211	0.0	0.1	MRFSS
1988	46,068	30.6	98,002	19.8	350,410	24.4	494,480	18	144,070	350,410	360	876	175	359	175	0.3	0.1	MRFSS
1989	63,031	40.6	104,511	34.4	539,731	17.2	707,273	14.5	167,542	539,731	419	1349	270	418	269	0.2	0.3	MRFSS
1990	22,364	26.1	49,045	28.6	468,085	14.6	539,494	13	71,409	468,085	179	1170	234	179	234	-0.3	0.0	MRFSS
1991	30,459	21.9	21,884	22.7	539,883	13.5	592,227	12.4	52,343	539,883	131	1350	270	131	270	-0.1	0.0	MRFSS
1992	46,753	22.8	50,483	23.1	407,485	10.6	504,721	9.1	97,236	407,485	243	1019	204	215	204	11.6	-0.1	MRFSS
1993	23,350	21.6	24,535	30.8	444,077	15.5	491,963	14.1	47,885	444,077	120	1110	222	120	222	-0.2	0.0	MRFSS
1994	17,714	34	44,230	35.6	387,274	15.2	449,218	13.6	61,944	387,274	155	968	194	155	194	-0.1	-0.2	MRFSS
1995	15,447	31.2	11,583	37.2	261,465	11.5	288,496	10.7	27,030	261,465	68	654	131	68	131	-0.6	-0.2	MRFSS
1996	8,500	29.8	1,843	48.4	131,672	12.7	142,015	11.9	10,343	131,672	26	329	66	25	66	3.3	-0.2	MRFSS
1997	21,017	24.4	5,582	54.9	337,431	12.1	364,030	11.3	26,599	337,431	66	844	169	66	167	0.7	1.0	MRFSS
1998	14,831	28.7	9,445	78.2	243,988	13.2	268,264	12.4	24,276	243,988	61	610	122	39	122	35.7	0.0	MRFSS
1999	11,995	52.5	9,710	68.2	214,974	11.5	236,679	11.1	21,705	214,974	54	537	107	53	106	2.3	1.4	MRFSS
2000	1,773	46.6	271	89.5	276,258	16.3	278,302	16.2	2,044	276,258	5	691	138	5	137	2.2	0.8	MRFSS
2001	7,771	39.7	3,459	44.6	842,583	9.1	853,812	9	11,230	842,583	28	2106	421	28	420	0.3	0.3	MRFSS
2002	2,281	32.3	79,691	43.8	669,469	10.6	751,440	10.5	81,972	669,469	205	1674	335	205	335	0.0	-0.1	MRFSS
2003	8,314	36.2	7,560	33.9	1,199,490	8	1,215,364	7.9	15,874	1,199,490	40	2999	600	40	597	-0.8	0.5	MRFSS
2004	19,328	44.7	28,761	38.9	1,315,796	14.1	1,363,885	13.6	48,089	1,315,796	120	3289	658	105	698	12.7	-6.1	MRIP
2005	6,894	33.5	7,230	37.9	1,339,412	19.9	1,353,536	19.7	14,124	1,339,412	35	3349	670	45	702	-27.4	-4.8	MRIP
2006	7,592	40.1	24,221	65.7	1,420,564	11.6	1,452,377	11.4	31,813	1,420,564	80	3551	710	94	768	-18.2	-8.1	MRIP
2007	2,134	44.2	32,352	67.3	1,557,079	12.7	1,591,565	12.5	34,486	1,557,079	86	3893	779	84	860	2.6	-10.5	MRIP
2008	10,930	35.3	34,701	38	1,078,307	12.6	1,123,938	12.2	45,631	1,078,307	114	2696	539	214	623	-87.6	-15.6	MRIP
2009	6,155	40.3	10,929	31.9	1,031,866	13	1,048,951	12.8	17,084	1,031,866	43	2580	516	34	574	20.4	-11.3	MRIP
2010	2,270	34.4	4,158	60.3	790,412	20.7	796,840	20.6	6,428	790,412	16	1976	395	21	386	-30.7	2.3	MRIP
2011	5,742	42.6	7,063	48.6	924,891	14.8	937,696	14.6	12,805	924,891	32	2312	462	NA	NA	NA	NA	MRIP
2012	3,413	65.7	4,103	63.6	549,820	18	557,336	17.7	7,516	549,820	19	1375	275	NA	NA	NA	NA	MRIP
2013	7,381	48.1	7,294	56.9	1,061,125	11.9	1,075,800	11.8	14,675	1,061,125	37	2653	531	NA	NA	NA	NA	MRIP
2014	2052	41.9	10470	28.5	1897300	52.5	1,909,822	52.1	12522	1897300	31	4743	949	NA	NA	NA	NA	MRIP

Table 3. Estimated total discards of spiny dogfish (mt) from commercial and recreational US fisheries, 1981-2014. The values for otter trawl and gill net from 1981-1989 are hindcast estimates (see SARC 43)

								Assumed Discard Mortality Rate					
								0.50	0.30	0.75	0.10	0.20	
	Total Discards (mt)							Dead Discards					
Year	Otter Trawl	Sink Gill Net	Scallop Dredge	Line gear	Recreational	Total		Otter Trawl	Sink Gill Net	Scallop Dredge	Line gear	Recreational	Total Dead
1981	36,360	5,360	na	na	296	42,016		18,180	1,608	na	na	59	19,847
1982	42,910	4,454	na	na	349	47,713		21,455	1,336	na	na	70	22,861
1983	42,188	4,042	na	na	540	46,770		21,094	1,213	na	na	108	22,415
1984	39,625	4,918	na	na	424	44,967		19,813	1,475	na	na	85	21,373
1985	33,354	4,539	na	na	964	38,857		16,677	1,362	na	na	193	18,232
1986	31,745	4,883	na	na	1,187	37,815		15,873	1,465	na	na	237	17,575
1987	29,050	4,864	na	na	1,056	34,970		14,525	1,459	na	na	211	16,195
1988	28,951	5,132	na	na	876	34,959		14,476	1,540	na	na	175	16,190
1989	28,286	5,360	na	na	1,344	34,990		14,143	1,608	na	na	269	16,020
1990	34,242	6,062	na	na	1,170	41,474		17,121	1,819	na	na	234	19,174
1991	19,322	11,030	32	97	1,350	31,831		9,661	3,309	24	10	270	13,274
1992	32,617	5,953	827	650	1,019	41,066		16,309	1,786	620	65	204	18,983
1993	17,284	9,814	209	44	1,110	28,461		8,642	2,944	157	4	222	11,969
1994	13,908	2,887	723	na	968	18,486		6,954	866	542	na	194	8,556
1995	16,997	6,731	378	na	654	24,760		8,499	2,019	284	na	131	10,932
1996	9,402	3,890	121	na	329	13,742		4,701	1,167	91	na	66	6,025
1997	6,704	2,326	198	na	837	10,065		3,352	698	149	na	167	4,366
1998	5,268	1,965	120	na	610	7,963		2,634	590	90	na	122	3,435
1999	7,685	2,005	41	na	532	10,263		3,843	602	31	na	106	4,581
2000	2,728	4,684	14	na	685	8,111		1,364	1,405	11	na	137	2,917
2001	4,919	7,204	30	na	2,099	14,252		2,460	2,161	23	na	420	5,063
2002	5,540	4,997	58	4,015	1,673	16,283		2,770	1,499	44	402	335	5,049
2003	3,853	5,413	103	2	2,987	12,358		1,927	1,624	77	0	597	4,225
2004	8,299	4,031	53	497	3,490	16,370		4,150	1,209	40	50	698	6,146
2005	7,515	3,338	15	1,175	3,509	15,552		3,758	1,001	11	118	702	5,589
2006	7,773	3,369	14	131	3,840	15,126		3,886	1,011	10	13	768	5,688
2007	8,115	5,133	61	73	4,300	17,681		4,058	1,540	45	7	860	6,510
2008	5,604	4,864	237	260	3,115	14,080		2,802	1,459	178	26	623	5,088
2009	7,010	4,874	364	835	2,869	15,952		3,505	1,462	273	84	574	5,897
2010	5,564	2,385	196	509	1,930	10,584		2,782	716	147	51	386	4,081
2011	6,540	2,831	226	356	2,312	12,264		3,270	849	170	36	462	4,787
2012	6,687	2,959	432	172	1,375	11,626		3,344	888	324	17	275	4,848
2013	6,897	3,107	127	37	2,653	12,820		3,448	932	95	4	531	5,010
2014	8,070	2,388	108	17	4,743	15,327		4,035	716	81	2	949	5,783

Table 4. Total landings, discards and total catch for spiny dogfish, 1989-2014.

Year	Total Discard	Total Dead Discards (mt)	Total Landings (mt)	Dead Discard/ Landings	Total Discard / Landings	Total Catch (mt)
1989	34,990	16,020	5,333	3.00	6.56	21,353
1990	41,474	19,174	16,611	1.15	2.50	35,785
1991	31,831	13,274	13,848	0.96	2.30	27,122
1992	41,066	18,983	18,008	1.05	2.28	36,991
1993	28,461	11,969	22,225	0.54	1.28	34,194
1994	18,486	8,556	20,774	0.41	0.89	29,330
1995	24,760	10,932	23,615	0.46	1.05	34,547
1996	13,742	6,025	27,827	0.22	0.49	33,852
1997	10,065	4,366	19,078	0.23	0.53	23,443
1998	7,963	3,435	22,329	0.15	0.36	25,764
1999	10,263	4,581	17,552	0.26	0.58	22,134
2000	8,111	2,917	12,405	0.24	0.65	15,321
2001	14,252	5,063	6,819	0.74	2.09	11,882
2002	16,283	5,049	6,462	0.78	2.52	11,510
2003	12,358	4,225	3,155	1.34	3.92	7,380
2004	16,370	6,146	3,778	1.63	4.33	9,925
2005	15,552	5,589	3,792	1.47	4.10	9,382
2006	15,126	5,688	4,792	1.19	3.16	10,480
2007	17,681	6,510	6,002	1.08	2.95	12,512
2008	14,080	5,088	6,025	0.84	2.34	11,113
2009	15,952	5,897	5,606	1.05	2.85	11,503
2010	10,584	4,081	5,594	0.73	1.89	9,675
2011	12,264	4,787	9,779	0.49	1.25	14,566
2012	11,626	4,848	10,881	0.45	1.07	15,729
2013	12,820	5,010	7,410	0.68	1.73	12,420
2014	15,327	5,783	10,715	0.54	1.43	16,498

Table 5. Summary of estimated landings of US, Canadian and foreign fisheries by sex, 1982-2014. US recreational landings included. Estimated total weights based on sum of estimated weights from sampled length frequency distributions from port samples. Estimated weights computed for female as W = exp(-15.025)^L^3.606935 and males as W = exp(-13.002)*L^3.097787 with weight in kg and length in cm. "Samples" = number of measured dogfish.

	NMFS Biological Samples from Ports								Prorated Landings by Sex				
Year	Total Samples Males	Est Total Wt (kg) Males	Average Wt (kg) Males	Total Samples Females	Est Total Wt (kg) Females	Average Wt (kg) Females	Fraction Females by Weight	Total Landings (mt)	Est Landings (mt) of Males	Est Landings (mt) of Females	Number of Males Landed (000)	Number of Females Landed (000)	Total Numbers Landed (000)
1982	24	52.0	2.167	680	3015.7	4.435	0.9830	6,234	106	6,128	49	1,382	1,431
1983				610	2513.9	4.121	1.0000	5,428	0	5,428		1,317	1,317
1984	9	15.8	1.760	1499	6626.0	4.420	0.9976	4,935	12	4,923	7	1,114	1,120
1985	21	35.2	1.678	1657	6799.2	4.103	0.9948	5,142	27	5,116	16	1,247	1,263
1986	64	104.1	1.626	1165	4669.0	4.008	0.9782	3,318	72	3,246	44	810	854
1987	31	52.7	1.700	2000	7550.1	3.775	0.9931	3,429	24	3,406	14	902	916
1988	7	14.8	2.114	1764	7560.7	4.286	0.9980	4,112	8	4,104	4	957	961
1989	35	67.5	1.927	1375	5528.0	4.020	0.9879	5,333	64	5,269	33	1,311	1,344
1990	19	33.7	1.772	2230	8916.6	3.998	0.9962	16,611	63	16,549	35	4,139	4,174
1991	161	379.2	2.356	1518	5923.9	3.902	0.9398	13,848	833	13,015	354	3,335	3,689
1992	12	22.3	1.861	3187	12180.6	3.822	0.9982	18,008	33	17,975	18	4,703	4,721
1993	42	78.4	1.866	2773	9927.5	3.580	0.9922	22,225	174	22,051	93	6,159	6,253
1994	47	86.6	1.843	2092	6639.9	3.174	0.9871	20,774	267	20,507	145	6,461	6,606
1995	25	38.9	1.555	2266	6676.6	2.946	0.9942	23,615	137	23,479	88	7,969	8,056
1996	569	886.7	1.558	1662	4397.6	2.646	0.8322	27,827	4,669	23,158	2,996	8,752	11,749
1997	303	449.1	1.482	382	780.9	2.044	0.6349	19,078	6,966	12,112	4,700	5,925	10,625
1998	68	85.4	1.257	683	1434.5	2.100	0.9438	22,329	1,255	21,073	999	10,034	11,033
1999	93	130.3	1.401	311	625.5	2.011	0.8276	17,552	3,026	14,527	2,160	7,223	9,382
2000	345	473.1	1.371	1921	3921.2	2.041	0.8923	12,405	1,335	11,069	974	5,423	6,397
2001	12	17.1	1.422	215	456.5	2.123	0.9640	6,819	246	6,573	173	3,096	3,269
2002	1	1.3	1.279	278	752.5	2.707	0.9983	6,462	11	6,451	9	2,383	2,392
2003	34	48.3	1.421	966	2338.4	2.421	0.9798	3,155	64	3,091	45	1,277	1,322
2004	15	23.9	1.593	1180	3296.9	2.794	0.9928	3,778	27	3,751	17	1,343	1,360
2005	745	1018.7	1.367	2065	5196.0	2.516	0.8361	3,792	622	3,171	455	1,260	1,715
2006	646	924.4	1.431	4211	10382.9	2.466	0.9182	4,792	392	4,400	274	1,785	2,058
2007	507	720.7	1.421	2865	7514.8	2.623	0.9125	6,002	525	5,477	370	2,088	2,458
2008	236	342.0	1.449	2925	7973.8	2.726	0.9589	6,025	248	5,777	171	2,119	2,290
2009	472	696.6	1.476	3378	9161.6	2.712	0.9293	5,606	396	5,210	268	1,921	2,189
2010	821	1213.4	1.478	4963	14217.4	2.865	0.9214	5,594	440	5,154	298	1,799	2,097
2011	868	1109.9	1.279	4800	12786.8	2.664	0.9201	9,779	781	8,998	611	3,378	3,989
2012	213	371.8	1.746	3763	10727.9	2.851	0.9665	10,881	365	10,516	209	3,689	3,898
2013	450	736.7	1.637	5441	16258.3	2.988	0.9567	7,410	321	7,089	196	2,372	2,569
2014	546	830.6	1.521	4505	13198	2.930	0.9408	10,715	634	10,081	417	3,441	3,858
formula	*A*	*B*	*C=B/A*	*D*	*E*	*F=E/D*	*G=E/(E+B)*	*H*	*I=(1-G)*H*	*J=G*H*	*K=I/C*	*L=J/F*	*M=K+L*

Table 6 . Summary of estimated discards of combined US fleets by sex, 1991-2014. Estimated total weights based ib summation of estimated weights from sampled length frequency distributions. Estimated weights computed from length-weight regressions. Female W = exp(-15.025)^L^3.606935. Male W = exp(-13.002)*L^3.097787 with weight in kg and length in cm. "Samples" = number of measured dogfish that were discarded. 2010 estimates based on fishing year rather than calendar year.

	NMFS Biological Samples of Discards from Observers								Prorated Discards by Sex				
Year	Total Samples Males	Est Total Wt (kg) Males	Average Wt (kg) Males	Total Samples Females	Est Total Wt (kg) Females	Average Wt (kg) Females	Fraction Females by Weight	Total Dead Discards (mt)	Est Discards (mt) of Males	Est Discards (mt) of Females	Number of Males Discarded (000)	Number of Females Discarded (000)	Total Numbers Discarded (000)
1991	376	463	1.231	894	2350	2.628	0.8355	13274	2184	11090	1775	4219	5994
1992	449	504	1.123	632	1090	1.724	0.6836	18983	6007	12976	5347	7526	12873
1993	57	62	1.087	130	414	3.184	0.8697	11969	1559	10410	1434	3270	4704
1994	207	207	1.001	747	1397	1.870	0.8708	8556	1105	7451	1104	3985	5090
1995	2191	2342	1.069	2384	3064	1.285	0.5668	10932	4735	6197	4431	4821	9251
1996	1643	1833	1.115	1370	2013	1.469	0.5234	6025	2871	3153	2574	2147	4721
1997	1359	1391	1.024	1427	2070	1.451	0.5980	4366	1755	2611	1714	1800	3514
1998	1289	1320	1.024	1463	1939	1.326	0.5951	3435	1391	2044	1359	1542	2901
1999	447	440	0.984	870	1808	2.078	0.8044	4581	896	3685	911	1773	2684
2000	423	568	1.343	1498	3207	2.141	0.8495	2917	439	2478	327	1157	1484
2001	650	842	1.295	2987	7377	2.470	0.8976	5063	518	4545	400	1840	2241
2002	1293	1819	1.407	5880	13899	2.364	0.8843	5049	584	4464	415	1889	2304
2003	4711	5367	1.139	12826	27210	2.121	0.8353	4225	696	3529	611	1664	2275
2004	10878	14480	1.331	28583	64771	2.266	0.8173	6146	1123	5023	844	2217	3060
2005	7470	9450	1.265	13024	28593	2.195	0.7516	5589	1388	4201	1098	1914	3011
2006	4512	5449	1.208	7041	14559	2.068	0.7277	5688	1549	4139	1283	2002	3284
2007	3955	5183	1.310	9830	24621	2.505	0.8261	6510	1132	5378	864	2147	3011
2008	3096	3969	1.282	6140	14857	2.420	0.7892	5088	1073	4015	837	1659	2496
2009	1719	2088	1.215	3083	6849	2.221	0.7664	5897	1378	4519	1134	2034	3169
2010	1634	2190	1.340	2086	4994	2.394	0.6952	4081	1244	2837	928	1185	2113
2011	2286	2920	1.278	2428	5864	2.415	0.6675	4787	1591	3196	1246	1323	2569
2012	734	1010	1.376	1384	3302	2.386	0.766	4848	1136	3712	825	1556	2381
2013	448	381	0.850	701	1210	1.725	0.761	5010	1200	3810	1411	2208	3620
2014	743	786	1.058	784	1428	1.822	0.645	5783	2053	3730	1940	2047	3987
formula	*A*	*B*	*C=B/A*	*D*	*E*	*F=E/D*	*G=E/(E+B)*	*H*	*I=(1-G)*H*	*J=G*H*	*K=I/C*	*L=J/F*	*M=K+L*

Table 7. Biomass estimates for spiny dogfish (thousands of metric tons) based on area swept by NEFSC trawl during spring surveys, 1968-2015. Estimate for 2014 not included as survey coverage was incomplete.

Year	Lengths >= 80 cm			Lengths 36 to 79 cm			Length <= 35 cm			All Lengths	3-pt Average Female SSB
	Females	Males	Total	Females	Males	Total	Females	Males	Total		
1968			41.4			110.4			1.52	153.3	
1969			27.4			69.3			0.66	97.3	
1970			36.7			33.0			3.19	72.9	
1971			103.8			27.6			2.76	134.2	
1972			126.6			145.9			1.55	274.1	
1973			178.7			165.3			2.58	346.5	
1974			221.9			179.6			2.66	404.1	
1975			105.1			125.0			3.97	234.0	
1976			96.3			120.8			1.20	218.3	
1977			77.3			68.0			0.53	145.9	
1978			87.4			131.2			1.24	219.8	
1979			52.3			18.6			1.82	72.7	
1980	104.7	15.3	168.1	16.8	72.2	123.5	0.32	0.39	0.84	292.4	
1981	266.5	24.4	293.8	25.5	75.1	100.6	2.14	2.80	5.06	399.5	
1982	454.0	34.6	488.6	61.6	143.3	204.9	0.48	0.69	1.17	694.6	275.1
1983	77.7	30.1	107.8	36.7	98.5	135.3	3.09	3.95	7.03	250.1	266.1
1984	115.6	27.5	143.1	33.4	88.0	121.4	0.14	0.21	0.35	264.9	215.8
1985	317.0	125.5	442.6	102.5	502.5	605.0	4.01	5.10	9.10	1056.7	170.1
1986	191.3	3.5	194.8	51.9	29.6	81.5	0.84	1.11	1.96	278.2	208.0
1987	219.1	90.5	309.6	61.5	171.7	233.1	2.46	4.76	7.22	550.0	242.5
1988	433.1	26.2	459.4	93.3	153.6	247.0	0.89	1.09	1.98	708.4	281.2
1989	162.1	40.5	202.6	100.4	158.2	258.6	1.14	1.54	2.68	463.9	271.5
1990	400.3	70.7	471.0	163.5	303.1	466.6	0.68	1.03	1.71	939.3	331.8
1991	220.4	30.0	250.3	108.4	186.3	294.7	0.98	1.43	2.41	547.4	260.9
1992	280.5	41.9	322.4	179.9	231.9	411.8	0.73	1.00	1.73	735.9	300.4
1993	234.6	27.8	262.5	104.1	198.5	302.6	0.55	0.65	1.21	566.3	245.2
1994	105.3	37.1	142.4	108.3	254.2	362.5	4.28	5.54	9.82	514.8	206.8
1995	102.4	29.5	131.9	154.0	174.5	328.5	0.25	0.35	0.59	460.9	147.5
1996	196.5	33.4	229.9	201.7	334.8	536.4	0.98	1.14	2.12	768.5	134.7
1997	83.7	17.5	101.2	205.2	209.1	414.3	0.05	0.05	0.10	515.5	127.5
1998	26.7	22.9	49.7	69.0	236.4	305.4	0.05	0.08	0.13	355.2	102.3
1999	62.7	20.4	83.1	140.8	256.4	397.2	0.02	0.03	0.05	480.4	57.7
2000	85.8	11.7	97.5	91.5	166.2	257.7	0.07	0.09	0.16	355.4	58.4
2001	56.7	16.7	73.4	71.4	160.5	231.9	0.04	0.03	0.07	305.4	68.4
2002	75.2	19.0	94.2	131.5	246.3	377.8	0.06	0.06	0.12	472.1	72.5
2003	64.5	22.5	87.1	125.5	256.3	381.8	0.13	0.14	0.27	469.1	65.5
2004	40.4	10.0	50.3	46.9	126.2	173.1	0.66	0.91	1.56	225.0	60.0
2005	55.8	30.8	86.6	59.8	294.7	354.5	0.28	0.42	0.69	441.9	53.6
2006	253.4	29.0	282.5	141.6	406.5	548.1	0.10	0.17	0.27	830.8	116.6
2007	158.0	18.9	176.9	73.6	227.6	301.1	0.23	0.32	0.56	478.6	155.8
2008	241.7	29.6	271.4	91.2	293.7	385.0	0.47	0.59	1.05	657.4	217.7

Notes: Total equals sum of males and females plus unsexed dogfish. Data for dogfish prior to 1980 are currently not available by sex.

Estimated derived from the FSV Bigelow using a weight specific calibration to convert to Albatross equivalents.

Year	Lengths >= 80 cm			Lengths 36 to 79 cm			Length <= 35 cm			All Lengths	3-pt Average Female SSB
	Females	Males	Total	Females	Males	Total	Females	Males	Total		
2009	148.3	21.9	170.2	54.9	326.1	381.0	2.95	3.76	6.71	557.9	182.7
2010	160.6	18.3	178.8	64.0	287.3	351.3	1.15	1.44	2.59	532.7	183.5
2011	213.9	26.7	240.6	60.0	408.6	468.6	0.99	2.48	3.47	712.6	174.2
2012	348.4	44.5	399.0	72.6	584.7	723.0	4.06	5.04	9.16	1131.1	241.0
2013	145.6	57.2	202.7	133.1	444.3	577.4	5.25	6.48	11.73	791.8	235.9
2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015	125.4	22.3	147.7	40.5	280.2	320.6	1.07	1.35	2.42	470.8	135.5

Data have been adjusted to AL IV equivalents using HB Bigelow calibration coefficients. 3-pt Ave SSB for 2015 is 2013 and 2015 only.

Table 8. Summary of mean swept area biomass estimates (mt) based on stochastic population estimator, 1991-2015. Swept area estimates not available for 2014. Exploitable biomasses are based on year-specific selectivity functions based on 3 year moving averages. Female spawning stock biomass is base on sum of female spiny dogfish above 80 cm TL. The target spawning stock biomass is 30.343 kg/tow or 159,288 mt (using the 0.0119 nm^2 trawl footprint). The threshold spawning stock biomass is 79,644 mt.

Terminal Year	Mid Year	Total Exploitable Biomass	Exploitable Female Biomass	Exploitable Male Biomass	Tot Biomass	Female Spawning Stock Biomass
1991	1990	570,113	339,405	230,208	582,274	234,229
1992	1991	532,641	278,419	253,722	664,850	269,624
1993	1992	379,501	169,227	209,773	553,731	220,002
1994	1993	322,345	93,716	228,128	544,415	186,132
1995	1994	261,387	55,102	205,785	460,932	133,264
1996	1995	329,048	77,600	250,948	519,920	120,664
1997	1996	316,075	81,413	234,162	520,782	114,091
1998	1997	319,828	69,005	250,323	489,233	91,458
1999	1998	185,468	77,142	107,825	406,287	51,821
2000	1999	167,483	66,023	100,960	358,185	52,562
2001	2000	286,458	96,233	189,725	343,602	61,552
2002	2001	291,695	107,026	184,169	337,686	64,844
2003	2002	278,283	63,794	213,989	371,200	58,376
2004	2003	241,697	39,745	201,452	347,176	53,625
2005	2004	237,536	17,432	219,604	338,170	47,719
2006	2005	327,077	54,587	271,991	453,881	106,180
2007	2006	233,662	90,651	142,511	524,205	141,351
2008	2007	423,273	123,742	299,031	586,413	194,616
2009	2008	361,040	89,151	271,390	505,116	163,256
2010	2009	377,034	87,984	288,549	521,494	164,066
2011	2010	410,490	88,702	321,288	557,059	169,415
2012	2011	518,504	111,692	406,311	688,632	215,744
2013	2012	567,696	110,296	456,899	766,064	211,372
2014	2013	NA	NA	NA	NA	NA
2015	2014	473,278	75,061	397,717	648,989	138,997

Table 9. Summary of stochastic fishing mortality rates expressed as the mean of full F on the exploitable biomass of female and male spiny dogfish, 1990-2014. Estimates for 2013 are not available. Year represents the year of the catch (landings plus dead discards). Sampling distribution of F estimates for females are given in Figure 11a,b. Fthreshold for females is 0.2439.

Year	F1: Female Catch on exploitable female biomass	F2: Male Catch on exploitable male biomass
1990	0.088	0.044
1991	0.082	0.026
1992	0.177	0.040
1993	0.327	0.021
1994	0.465	0.018
1995	0.418	0.014
1996	0.355	0.031
1997	0.234	0.038
1998	0.306	0.025
1999	0.289	0.043
2000	0.152	0.007
2001	0.109	0.005
2002	0.165	0.003
2003	0.168	0.004
2004	0.474	0.008
2005	0.128	0.007
2006	0.088	0.012
2007	0.090	0.005
2008	0.110	0.004
2009	0.113	0.006
2010	0.093	0.005
2011	0.114	0.006
2012	0.149	0.003
2013	NA	NA
2014	0.214	0.007

Table 10. Projected percentiles of fishing mortality rate on females, total catch , landings , discards, female spawning stock and exploitable biomass in 2015. Catches in 2015 are assumed to be equal to catches in 2014=16,542 mt.

	2015					
Percentile	***F***	***Catch (mt)***	***Landings (mt)***	***Discards (mt)***	***Female SSB (mt)***	***Exploitable Female Biomass (mt)***
1	0.845	16,541	10,725	5,816	42,452	20,309
2	0.723	16,538	10,723	5,815	48,412	23,160
3	0.646	16,539	10,723	5,815	53,410	25,551
4	0.591	16,540	10,724	5,816	57,746	27,626
5	0.549	16,535	10,721	5,814	61,600	29,469
10	0.431	16,531	10,717	5,813	76,580	36,636
15	0.372	16,535	10,721	5,815	87,767	41,987
20	0.334	16,538	10,723	5,815	97,044	46,425
25	0.306	16,527	10,715	5,812	105,187	50,321
30	0.285	16,534	10,720	5,814	112,603	53,869
35	0.267	16,529	10,716	5,813	119,536	57,186
40	0.252	16,536	10,721	5,815	126,151	60,350
45	0.240	16,558	10,738	5,821	132,574	63,423
50	0.228	16,544	10,728	5,817	138,904	66,451
55	0.218	16,554	10,735	5,820	145,234	69,480
60	0.208	16,563	10,741	5,822	151,657	72,552
65	0.199	16,534	10,720	5,814	158,272	75,717
70	0.190	16,527	10,715	5,812	165,205	79,033
80	0.173	16,537	10,722	5,815	180,764	86,477
95	0.144	16,537	10,722	5,815	216,208	103,433
96	0.142	16,575	10,750	5,825	220,062	105,277
97	0.139	16,565	10,742	5,822	224,398	107,351
98	0.135	16,511	10,703	5,808	229,396	109,742
99	0.132	16,571	10,747	5,824	235,356	112,594

Table 11. Summary of stochastic projections of F, SSB, catch (=OFL), landings and discards by sex, and comparisons with biomass reference points for spiny dogfish under a constant F harvest strategy equal to the target F=Fmsy proxy = 0.2439 for 2016 to 2039. The estimated F in 2015 is estimated by assuming that the catch in 2015 is equal to catch in 2014 =16,498 mt. Table entries are means of predicted values.

	Average											Probability			
Year	F on females	F on males	SSB (mt)	Total Catch (mt)	Total Landing (mt)	Female Landings (mt)	Male Landings (mt)	Total Discards (mt)	Female Discards (mt)	Male Discards (mt)	SSB(t)/ SSB_target	SSB>SSB_target	SSB> SSB_thresh	F>=Fthresh	F>=Ftarget
2015	0.26879	0.00413	139,112	16,542	10,726	10,082	644	5,816	3,731	2,086	0.873	0.344	0.888	0.538	0.844
2016	0.2439	0.01258	132,790	24,277	13,513	11,503	2,010	10,763	4,257	6,506	0.834	0.310	0.844	1.000	1.000
2017	0.2439	0.01258	120,443	25,120	14,078	12,044	2,034	11,042	4,457	6,585	0.756	0.208	0.802	1.000	1.000
2018	0.2439	0.01258	112,307	25,805	14,626	12,614	2,011	11,180	4,668	6,512	0.705	0.142	0.768	1.000	1.000
2019	0.2439	0.01258	108,978	26,660	15,332	13,360	1,972	11,328	4,944	6,384	0.684	0.116	0.752	1.000	1.000
2020	0.2439	0.01258	130,452	27,761	16,244	14,324	1,920	11,517	5,301	6,216	0.819	0.282	0.848	1.000	1.000
2021	0.2439	0.01258	154,933	28,884	17,196	15,339	1,857	11,688	5,676	6,012	0.973	0.470	0.908	1.000	1.000
2022	0.2439	0.01258	178,947	29,979	18,147	16,362	1,785	11,832	6,055	5,777	1.123	0.614	0.942	1.000	1.000
2023	0.2439	0.01258	212,829	30,732	18,871	17,169	1,701	11,861	6,353	5,508	1.336	0.752	0.968	1.000	1.000
2024	0.2439	0.01258	206,369	31,059	19,282	17,663	1,619	11,777	6,536	5,241	1.296	0.732	0.966	1.000	1.000
2025	0.2439	0.01258	200,987	31,085	19,464	17,923	1,541	11,621	6,633	4,988	1.262	0.714	0.964	1.000	1.000
2026	0.2439	0.01258	193,967	30,639	19,288	17,818	1,470	11,351	6,594	4,758	1.218	0.684	0.958	1.000	1.000
2027	0.2439	0.01258	185,125	29,938	18,905	17,497	1,408	11,034	6,475	4,559	1.162	0.644	0.948	1.000	1.000
2028	0.2439	0.01258	175,129	29,140	18,432	17,076	1,356	10,708	6,319	4,389	1.099	0.594	0.936	1.000	1.000
2029	0.2439	0.01258	164,710	28,330	17,936	16,626	1,310	10,393	6,153	4,241	1.034	0.534	0.922	1.000	1.000
2030	0.2439	0.01258	156,734	27,600	17,492	16,224	1,268	10,108	6,004	4,105	0.984	0.482	0.910	1.000	1.000
2031	0.2439	0.01258	152,417	27,012	17,145	15,916	1,229	9,868	5,890	3,978	0.957	0.452	0.902	1.000	1.000
2032	0.2439	0.01258	152,870	26,744	17,030	15,840	1,190	9,713	5,862	3,852	0.960	0.456	0.904	1.000	1.000
2033	0.2439	0.01258	158,464	26,717	17,091	15,939	1,152	9,627	5,898	3,729	0.995	0.494	0.914	1.000	1.000
2034	0.2439	0.01258	165,586	26,856	17,267	16,151	1,116	9,589	5,977	3,613	1.040	0.540	0.924	1.000	1.000
2035	0.2439	0.01258	172,349	27,071	17,495	16,412	1,082	9,577	6,073	3,503	1.082	0.578	0.934	1.000	1.000
2036	0.2439	0.01258	177,192	27,280	17,713	16,662	1,051	9,567	6,166	3,401	1.112	0.606	0.940	1.000	1.000
2037	0.2439	0.01258	180,421	27,417	17,873	16,852	1,022	9,544	6,236	3,308	1.133	0.622	0.944	1.000	1.000
2038	0.2439	0.01258	181,287	27,451	17,952	16,956	996	9,500	6,274	3,225	1.138	0.626	0.944	1.000	1.000
2039	0.2439	0.01258	180,301	27,378	17,945	16,971	974	9,434	6,280	3,153	1.132	0.622	0.944	1.000	1.000
2040	0.2439	0.01258	177,640	27,208	17,860	16,905	955	9,348	6,256	3,093	1.115	0.608	0.940	1.000	1.000
2261	0.2439	0.01258	171,725	26,114	17,400	16,607	793	8,713	6,146	2,568	1.078	0.576	0.934	1.000	1.000
2262	0.2439	0.01258	171,726	26,114	17,400	16,607	793	8,713	6,146	2,568	1.078	0.576	0.934	1.000	1.000
2263	0.2439	0.01258	171,727	26,114	17,401	16,607	793	8,713	6,146	2,568	1.078	0.576	0.934	1.000	1.000
2264	0.2439	0.01258	171,728	26,114	17,401	16,608	793	8,713	6,146	2,568	1.078	0.576	0.934	1.000	1.000
Grand Total	0.24473	0.012298	165,308	27,305	17,150	15,822	1,328	10,155	5,855	4,300	1.038	0.518	0.912	0.985	0.995
Ave '13-22	0.246	0.012	149,716	26,682	15,801	14,046	1,755	10,880	5,198	5,683	0.940	0.397	0.869	0.954	0.984
Ave '23-32	0.244	0.013	170,599	28,406	18,005	16,701	1,304	10,401	6,180	4,221	1.071	0.559	0.928	1.000	1.000
Ave '32-40	0.244	0.013	176,580	27,004	17,705	16,747	958	9,299	6,197	3,102	1.109	0.602	0.939	1.000	1.000
Formula	*A*	*B*	*C*	*D=E+H*	*E=F+G*	*F*	*G*	*H=I+J*	*I*	*J*	*K*	*L*	*M*	*N*	*O*

Table 12. Projected percentiles of total catch , landings , discards and female spawning stock biomass in 2016-2018 with an fishing mortality rate equal to the Fmsy proxy of 0.2439. Catches in 2015 are assumed to be equal to catches in 2014= 16,542 mt.

	2016				2017				2018			
Percentile	***Catch***	***Landings***	***Discards***	***Female SSB***	***Catch***	***Landings***	***Discards***	***Female SSB***	***Catch***	***Landings***	***Discards***	***Female SSB***
1	12,163	4,671	7,491	30,149	12,528	4,888	7,641	27,555	12,721	5,084	7,636	26,156
2	12,904	5,213	7,692	36,435	13,301	5,451	7,849	33,248	13,524	5,670	7,854	31,444
3	13,527	5,668	7,860	41,714	13,949	5,925	8,024	38,029	14,199	6,162	8,037	35,882
4	14,069	6,063	8,006	46,302	14,512	6,336	8,176	42,182	14,785	6,589	8,195	39,737
5	14,551	6,415	8,136	50,388	15,013	6,702	8,312	45,882	15,306	6,969	8,336	43,169
10	16,427	7,784	8,643	66,285	16,964	8,125	8,839	60,269	17,333	8,448	8,885	56,516
15	17,829	8,807	9,022	78,161	18,421	9,189	9,232	71,017	18,847	9,552	9,295	66,484
20	18,992	9,656	9,336	88,019	19,630	10,071	9,559	79,937	20,103	10,468	9,636	74,756
25	20,016	10,403	9,612	96,690	20,693	10,847	9,846	87,783	21,208	11,273	9,935	82,030
30	20,946	11,082	9,864	104,570	21,660	11,552	10,107	94,913	22,212	12,005	10,207	88,641
35	21,817	11,718	10,099	111,950	22,565	12,213	10,352	101,591	23,152	12,691	10,461	94,832
40	22,647	12,324	10,323	118,982	23,427	12,842	10,584	107,953	24,048	13,344	10,704	100,731
45	23,451	12,910	10,540	125,791	24,262	13,452	10,810	114,114	24,916	13,977	10,939	106,444
50	24,247	13,492	10,755	132,543	25,090	14,056	11,034	120,222	25,775	14,604	11,172	112,106
55	25,041	14,072	10,970	139,269	25,915	14,658	11,256	126,308	26,632	15,229	11,404	117,749
60	25,847	14,660	11,188	146,096	26,752	15,269	11,483	132,485	27,502	15,863	11,639	123,475
65	26,682	15,269	11,413	153,170	27,619	15,902	11,717	138,884	28,402	16,519	11,883	129,406
70	27,554	15,905	11,648	160,557	28,525	16,563	11,961	145,568	29,342	17,205	12,138	135,601
80	29,508	17,331	12,176	177,111	30,554	18,045	12,510	160,544	31,451	18,742	12,708	149,485
95	33,962	20,583	13,379	214,851	35,182	21,422	13,760	194,688	36,257	22,247	14,010	181,135
96	34,442	20,933	13,509	218,912	35,680	21,786	13,894	198,362	36,775	22,625	14,150	184,544
97	34,988	21,332	13,656	223,542	36,248	22,200	14,048	202,550	37,364	23,054	14,310	188,425
98	35,623	21,795	13,828	228,924	36,907	22,681	14,226	207,418	38,048	23,553	14,495	192,935
99	36,365	22,336	14,028	235,205	37,678	23,244	14,434	213,101	38,849	24,137	14,712	198,206

Table 13. Summary of stochastic projections of F, SSB, catch, landings and discards by sex, and comparisons with biomass reference points for spiny dogfish under a constant Pstar harvest strategy for 2016 to 2018. The estimated F in 2015 is estimated by assuming that the catch in 2015 is equal to the estimated catch in 2014. Table entries are means of predicted values. Pstar was adjusted for the ratio of SSB(t)/SSB_target. The sequence of ABC estimates was derived iteratively by estimating the OFL in year t under Fmsy, computing the ABC under Pstar, and then replacing the estimate of OFL in year t with the ABC(t).

	Average											Probability			
Year	F on females	F on males	SSB (mt)	Total Catch (mt)	Total Landing (mt)	Female Landings (mt)	Male Landings (mt)	Total Discards (mt)	Female Discards (mt)	Male Discards (mt)	SSB(t)/ SSB_target	SSB>SSB_target	SSB>SSB_thresh	F>=Fthresh	F>=Ftarget
2015	0.2687899	0.00413	139,112	16,542	10,726	10,082	644	5,816	3,731	2,086	0.873	0.344	0.888	0.432	0.742
2016	0.26978296	0.00413	132,790	16,775	10,858	10,196	662	5,917	3,773	2,144	0.834	0.310	0.844	0.388	0.660
2017	0.27183262	0.00413	122,352	16,518	10,642	9,966	676	5,876	3,688	2,188	0.768	0.248	0.784	0.338	0.566
2018	0.2853246	0.00413	117,099	16,608	10,712	10,038	674	5,897	3,714	2,182	0.735	0.230	0.742	0.314	0.510
2019	0.2439	0.01258	117,214	28,008	16,211	14,189	2,022	11,797	5,251	6,546	0.736	0.246	0.726	1.000	1.000
2020	0.2439	0.01258	138,038	28,999	17,047	15,079	1,968	11,952	5,580	6,372	0.867	0.378	0.804	1.000	1.000
2021	0.2439	0.01258	161,772	30,005	17,917	16,013	1,904	12,088	5,926	6,162	1.016	0.514	0.866	1.000	1.000
2022	0.2439	0.01258	184,960	30,986	18,788	16,958	1,829	12,198	6,275	5,922	1.161	0.624	0.906	1.000	1.000
2023	0.2439	0.01258	218,070	31,635	19,439	17,694	1,745	12,196	6,548	5,648	1.369	0.740	0.942	1.000	1.000
2024	0.2439	0.01258	210,753	31,873	19,788	18,127	1,661	12,085	6,708	5,377	1.323	0.722	0.942	1.000	1.000

Table 14. Projected percentiles of total catch , landings , discards and female spawning stock biomass in 2014-2016 with an fishing mortality rate equal to the Pstar based harvest strategy. Catches in 2015 are assumed to be equal to catches in 2014 = 16,542 mt. (see Table 10).

	2016						2017						2018					
Percentile	F	Catch (mt)	Landings (mt)	Discards (mt)	Female SSB (mt)	Exploitable Female Biomass (mt)	F	Catch (mt)	Landings (mt)	Discards (mt)	Female SSB (mt)	Exploitable Female Biomass (mt)	F	Catch (mt)	Landings (mt)	Discards (mt)	Female SSB (mt)	Exploitable Female Biomass (mt)
1	1.114	16,775	10,858	5,917	30,149	16,493	1.595	16,517	10,641	5,876	17,605	12,083	2.524	16,619	10,723	5,896	8,531	8,178
2	0.887	16,776	10,859	5,917	36,435	19,855	1.124	16,516	10,640	5,875	23,853	15,912	1.514	16,619	10,723	5,897	14,473	12,322
3	0.757	16,779	10,861	5,918	41,714	22,680	0.898	16,517	10,641	5,876	29,154	19,154	1.112	16,623	10,725	5,898	19,736	15,929
4	0.671	16,775	10,858	5,917	46,302	25,134	0.763	16,515	10,640	5,875	33,793	21,988	0.897	16,621	10,723	5,897	24,430	19,121
5	0.610	16,770	10,855	5,916	50,388	27,320	0.673	16,519	10,643	5,876	37,940	24,519	0.764	16,622	10,724	5,898	28,664	21,988
10	0.450	16,774	10,857	5,917	66,285	35,825	0.460	16,513	10,638	5,875	54,127	34,394	0.480	16,627	10,728	5,900	45,420	33,284
15	0.376	16,764	10,850	5,914	78,161	42,179	0.372	16,527	10,648	5,878	66,279	41,802	0.375	16,628	10,728	5,900	58,089	41,799
20	0.332	16,777	10,859	5,917	88,019	47,454	0.321	16,522	10,645	5,877	76,361	47,947	0.316	16,605	10,710	5,894	68,651	48,889
25	0.300	16,779	10,861	5,918	96,690	52,093	0.286	16,532	10,652	5,880	85,245	53,361	0.279	16,639	10,735	5,904	77,960	55,133
30	0.276	16,766	10,852	5,915	104,570	56,309	0.260	16,533	10,653	5,880	93,340	58,294	0.251	16,626	10,726	5,901	86,459	60,832
35	0.257	16,771	10,855	5,916	111,950	60,258	0.240	16,514	10,639	5,875	100,907	62,905	0.230	16,630	10,728	5,902	94,429	66,174
40	0.241	16,761	10,848	5,913	118,982	64,021	0.224	16,537	10,656	5,881	108,134	67,308	0.212	16,605	10,710	5,895	102,006	71,254
45	0.228	16,787	10,867	5,920	125,791	67,664	0.210	16,538	10,656	5,881	115,097	71,553	0.198	16,631	10,729	5,903	109,333	76,167
50	0.215	16,765	10,851	5,914	132,543	71,277	0.197	16,526	10,648	5,878	122,053	75,789	0.186	16,636	10,732	5,904	116,662	81,075
55	0.204	16,755	10,843	5,911	139,269	74,876	0.187	16,517	10,641	5,876	128,972	80,005	0.175	16,636	10,731	5,904	123,954	85,960
60	0.195	16,782	10,863	5,919	146,096	78,530	0.177	16,538	10,657	5,882	135,957	84,262	0.165	16,601	10,706	5,895	131,289	90,878
65	0.185	16,767	10,853	5,915	153,170	82,314	0.167	16,513	10,638	5,875	143,238	88,695	0.156	16,631	10,728	5,903	138,979	96,025
70	0.176	16,770	10,854	5,916	160,557	86,267	0.159	16,497	10,627	5,871	150,825	93,318	0.147	16,607	10,710	5,897	146,986	101,387
80	0.159	16,784	10,864	5,919	177,111	95,124	0.143	16,522	10,645	5,877	167,821	103,673	0.131	16,597	10,702	5,895	164,871	113,369
95	0.131	16,803	10,878	5,924	214,851	115,319	0.115	16,530	10,651	5,879	206,594	127,295	0.105	16,655	10,743	5,912	205,730	140,736
96	0.128	16,756	10,844	5,912	218,912	117,493	0.113	16,548	10,664	5,884	210,819	129,868	0.103	16,659	10,746	5,913	210,166	143,707
97	0.126	16,812	10,885	5,927	223,542	119,970	0.110	16,497	10,627	5,871	215,519	132,733	0.100	16,589	10,695	5,894	215,174	147,060
98	0.122	16,742	10,834	5,908	228,924	122,848	0.107	16,485	10,618	5,867	221,125	136,142	0.098	16,656	10,744	5,912	221,090	151,012
99	0.119	16,789	10,868	5,921	235,205	126,211	0.104	16,503	10,631	5,872	227,534	140,052	0.095	16,654	10,742	5,912	227,835	155,539

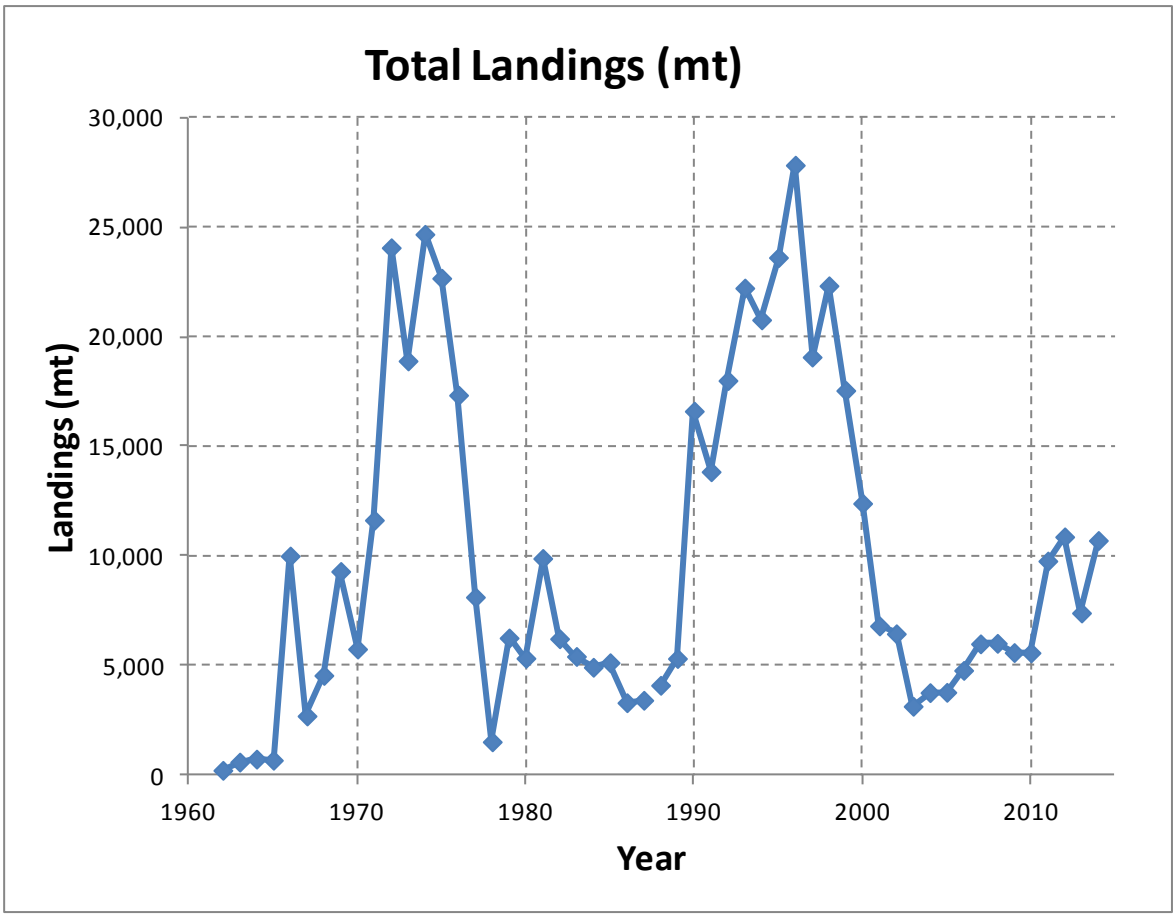


Figure 1. Estimated total landings (mt, live) of spiny dogfish in NAFO Areas 2 to 6, 1962-2014.

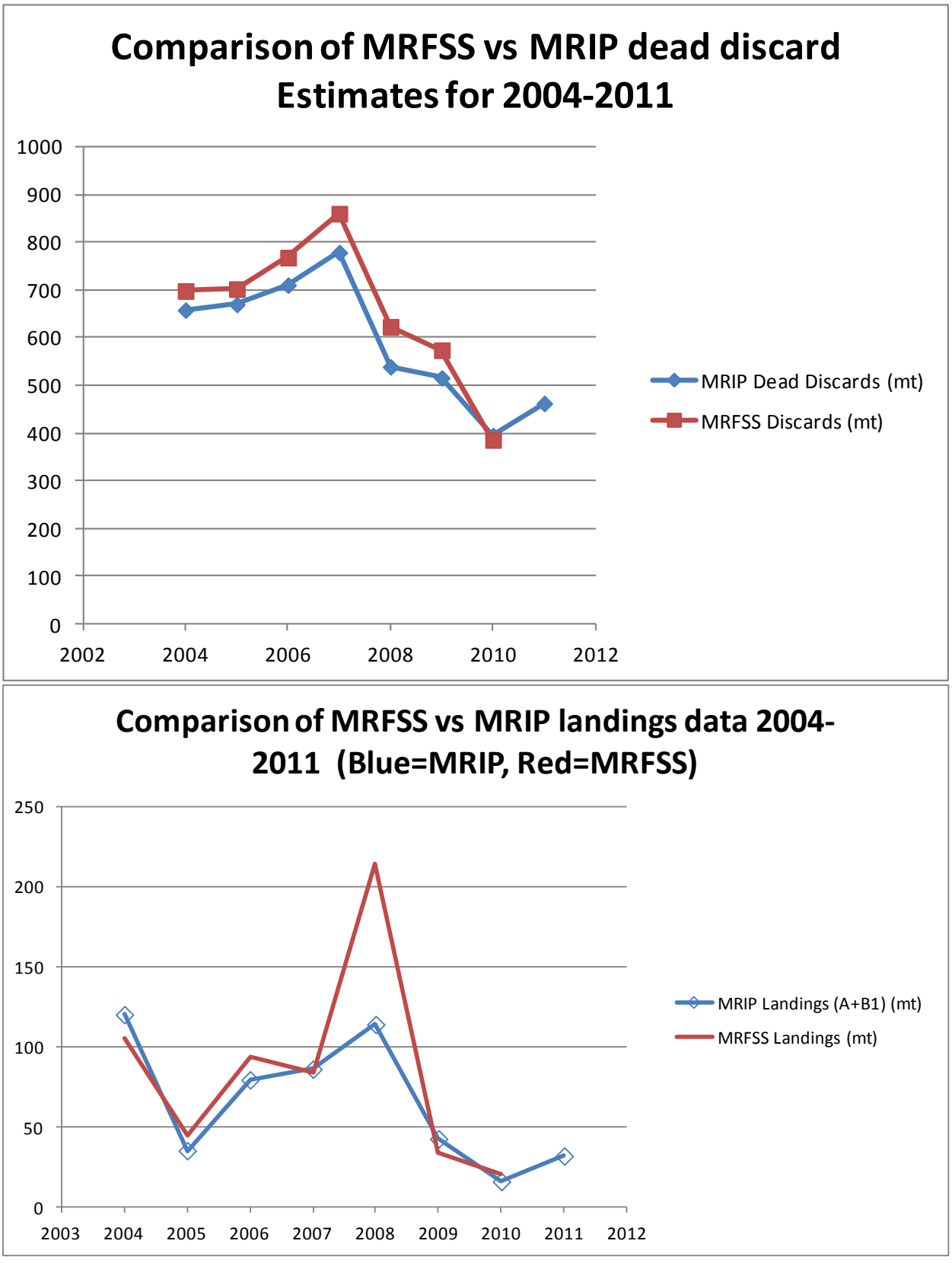


Figure 2. Comparison of MRFSS and MRIP estimates of total recreational landings and dead discards, 2004-2011.

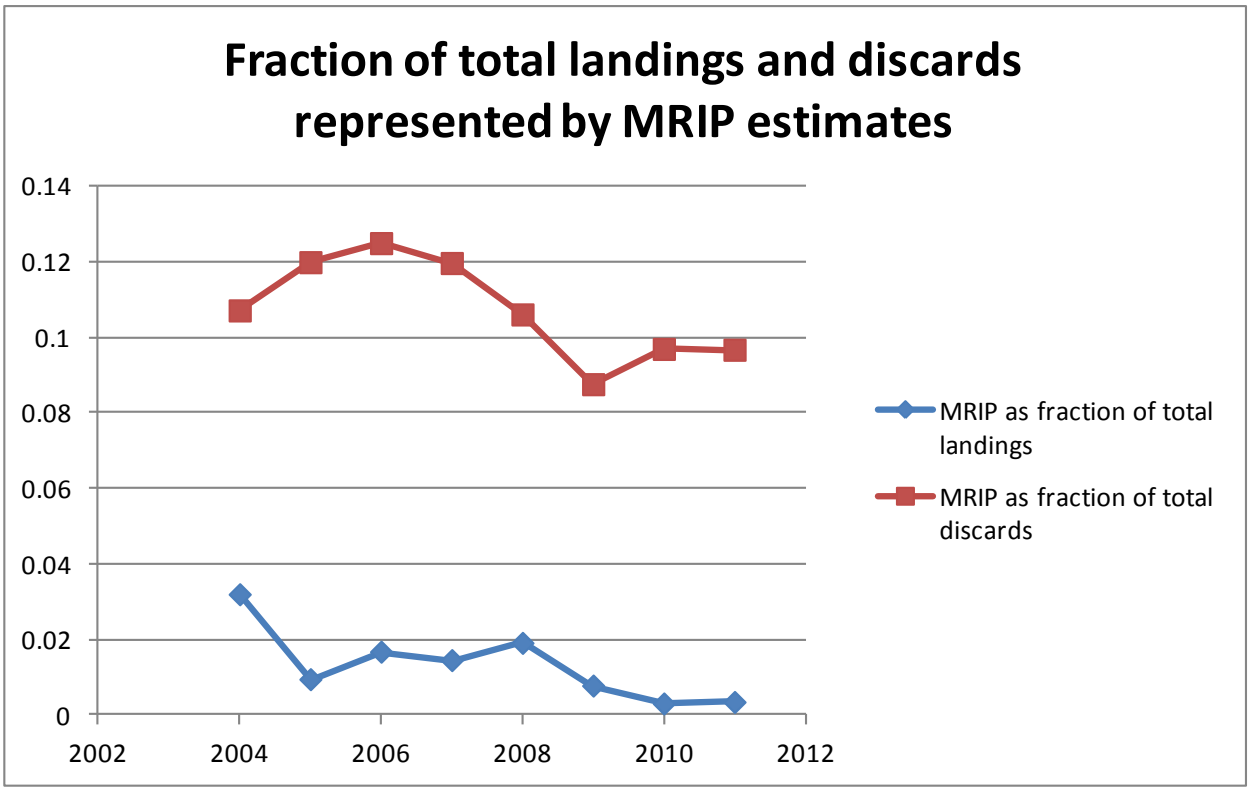


Figure 3. Estimated fraction of landings and discards in recreational fisheries relative to total landings and total discards respectively.

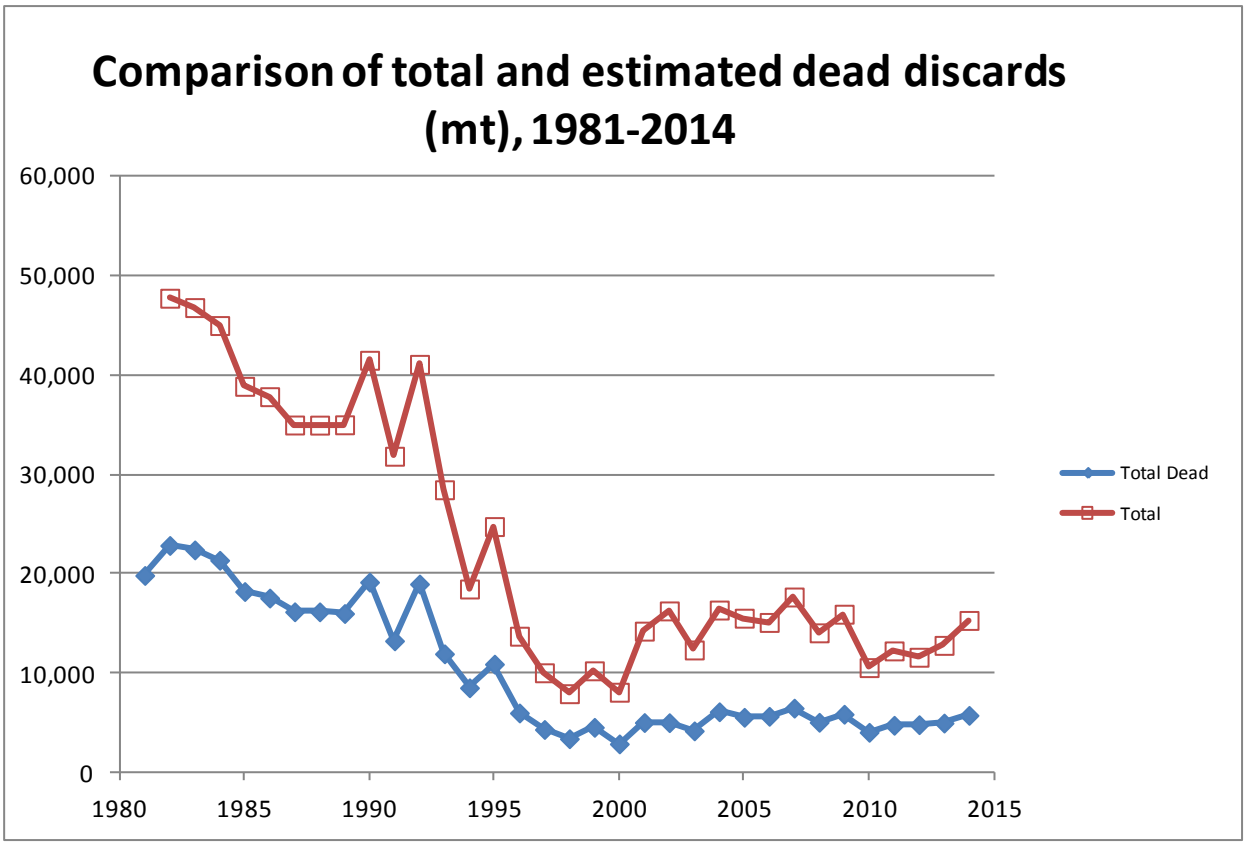


Figure 4. Estimated total and total dead discards in US, 1981-2014. Estimates for 1981 to 1989 are hindcast estimates rather than direct observations.

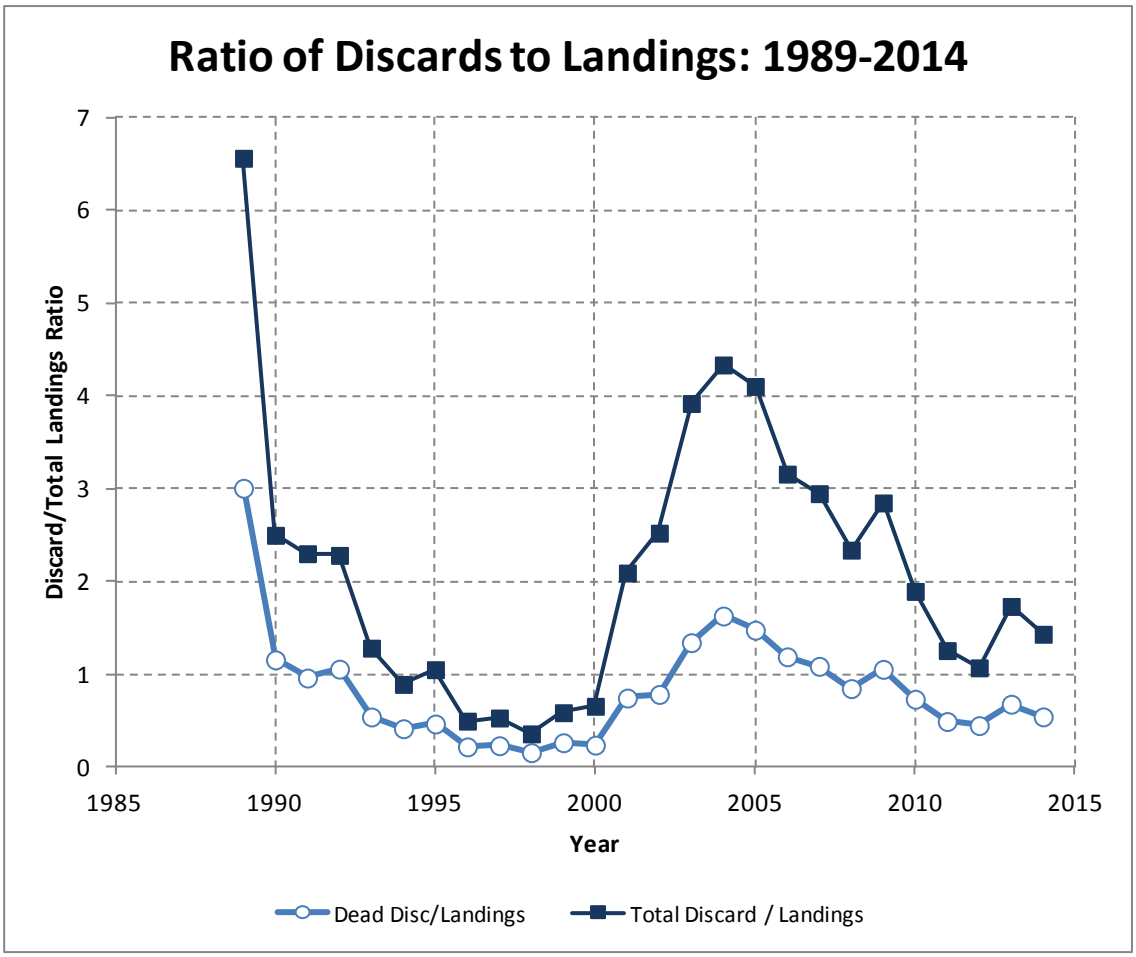
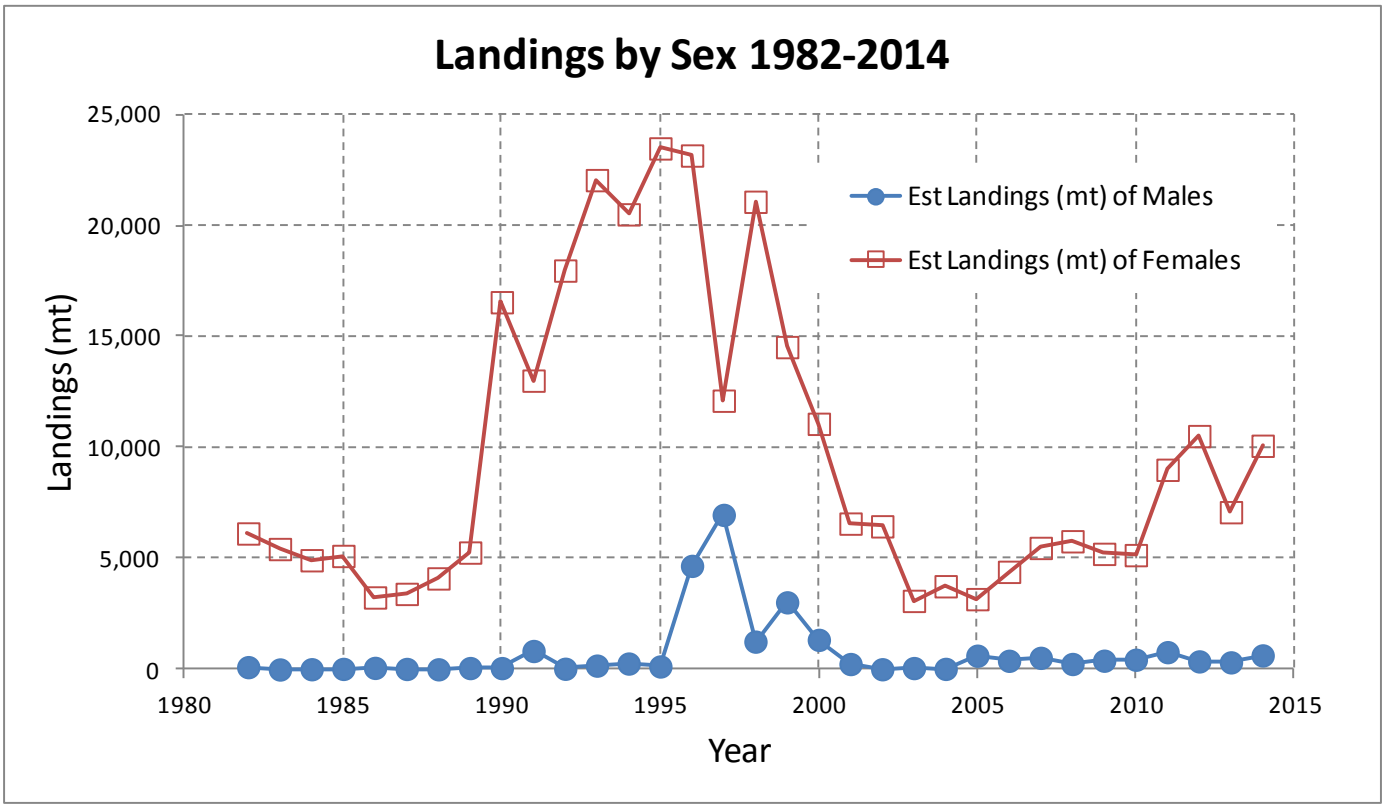


Figure 5. Trends in the ratio of total discards to landings and total dead discards to landings for spiny dogfish, 1989-2014.



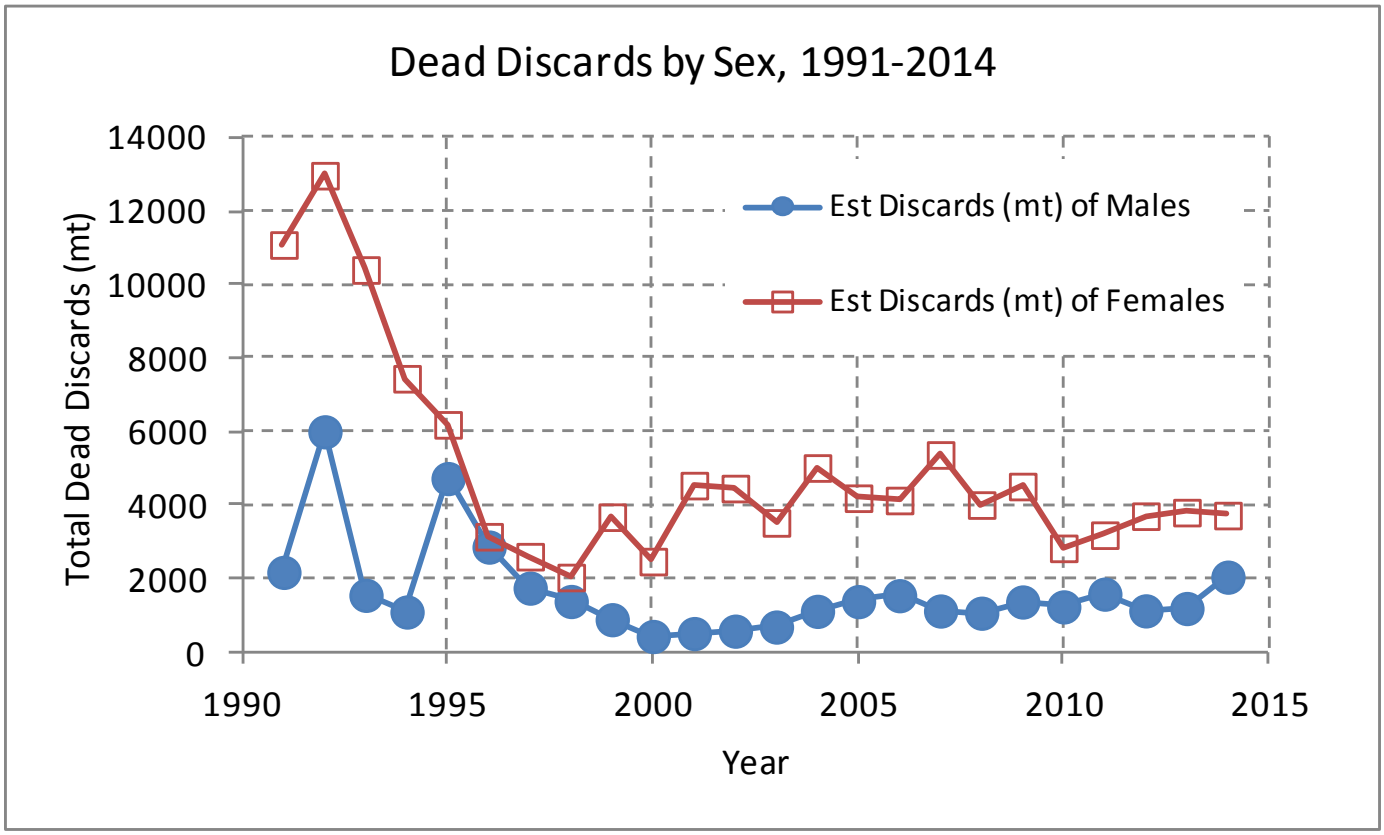


Figure 6. Estimated total landings, 1982-2014(top) and total dead discards (bottom) by sex, 1991-2014.

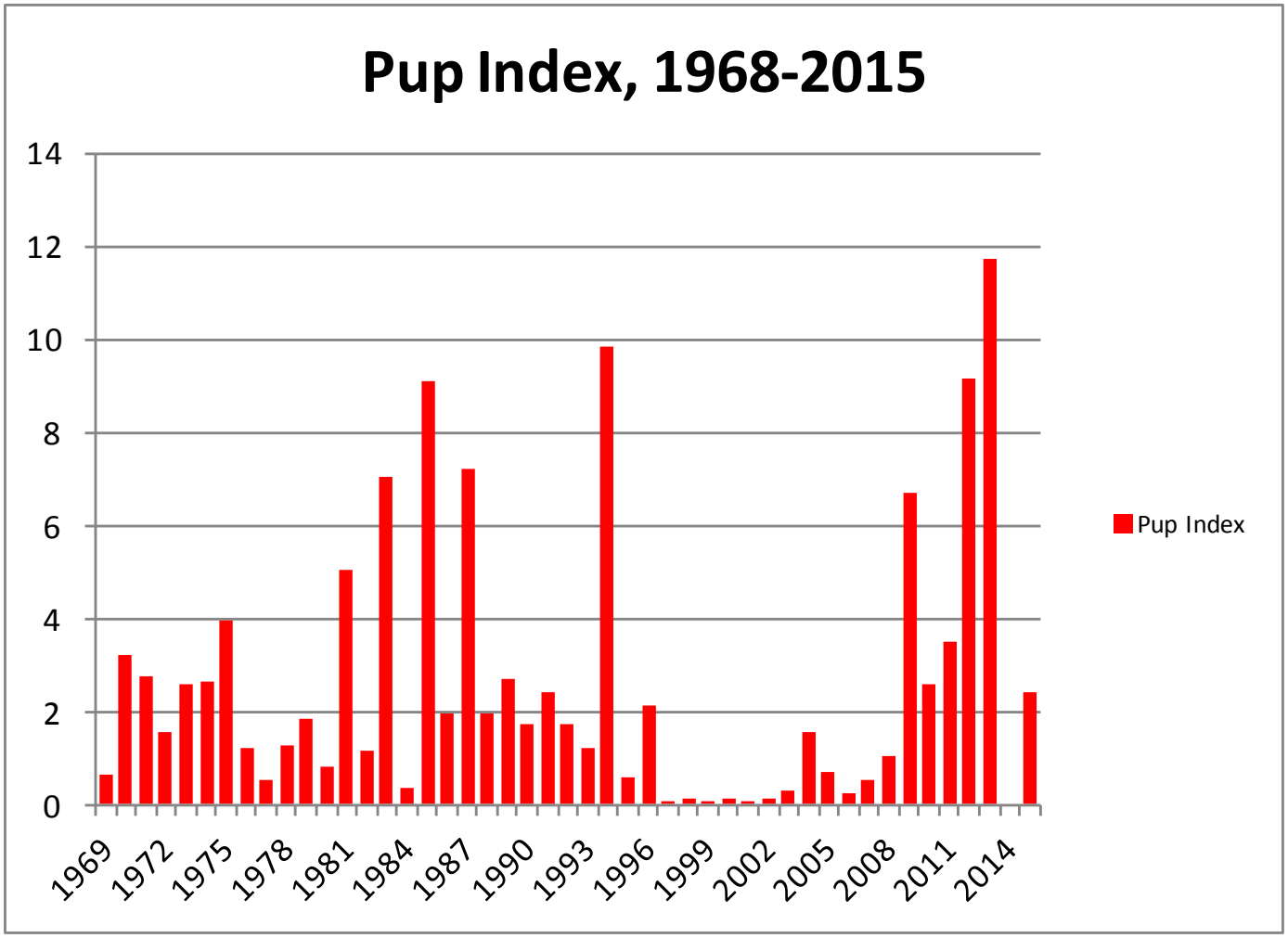


Figure 7. Estimated swept area biomass (mt) of total pups (spiny dogfish<36 cm) captured in the NEFSC spring bottom trawl survey, 1968-2015. No survey data available for 2014.

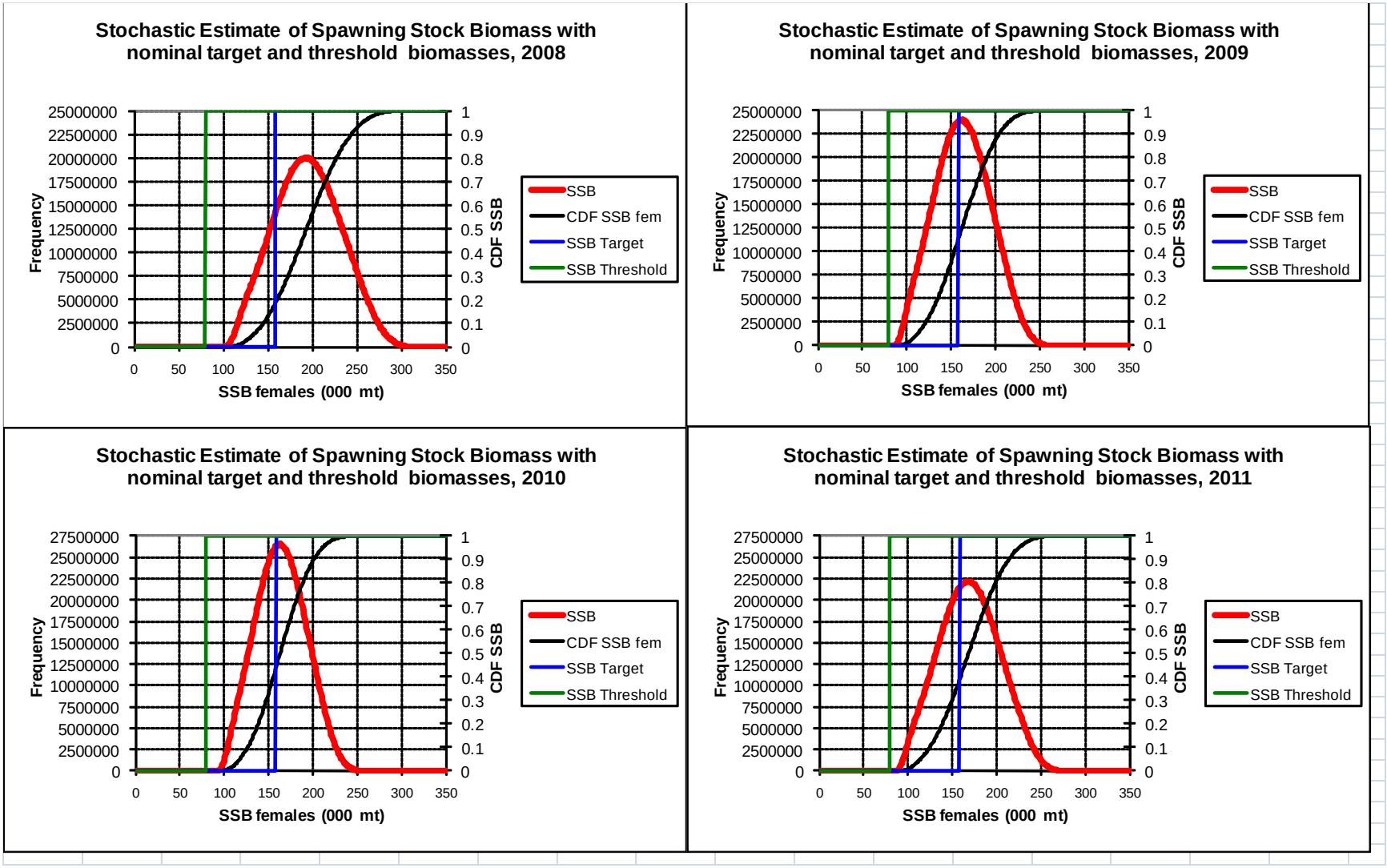
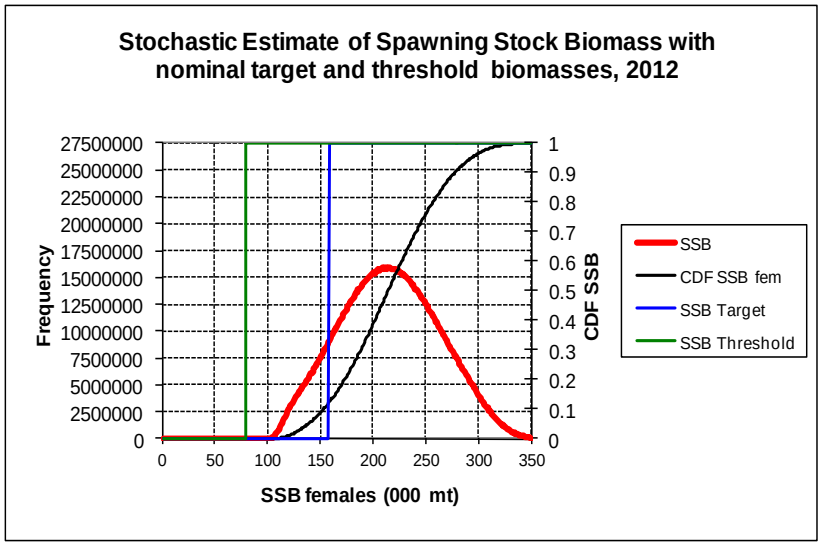
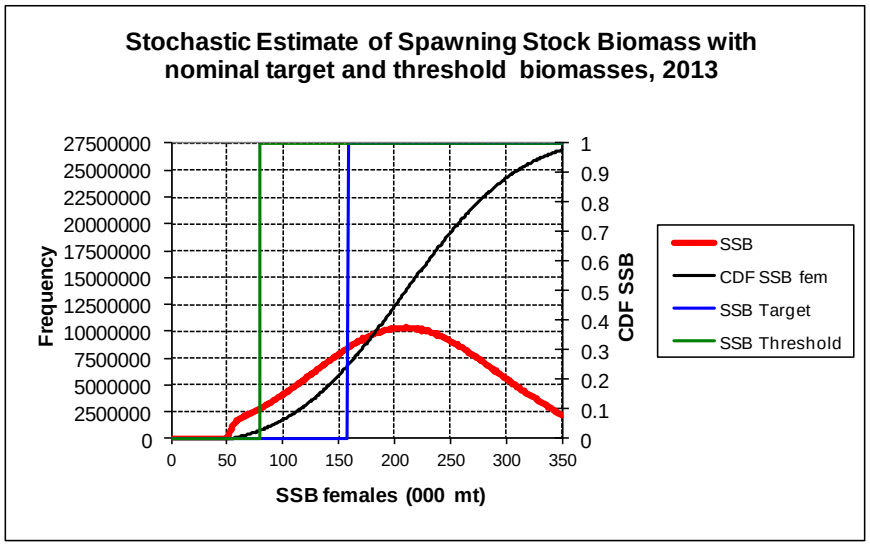


Figure 8a. Stochastic estimates of female spiny dogfish spawning stock biomass , 2008 to 2011, and comparison with target and threshold biomass reference points. Year refers to terminal year of 3 point moving average of swept area estimate.





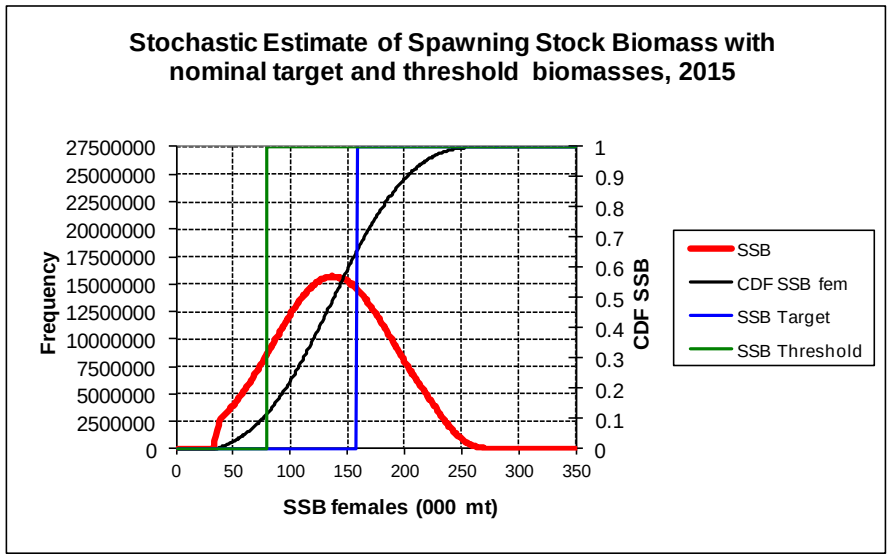


Figure 8b. Stochastic estimates of female spiny dogfish spawning stock biomass , 2012, 2013 and 2015, and comparison with target and threshold biomass reference points. Year refers to terminal year of 3 point moving average of swept area estimate. Estimates for 2014 are not available.

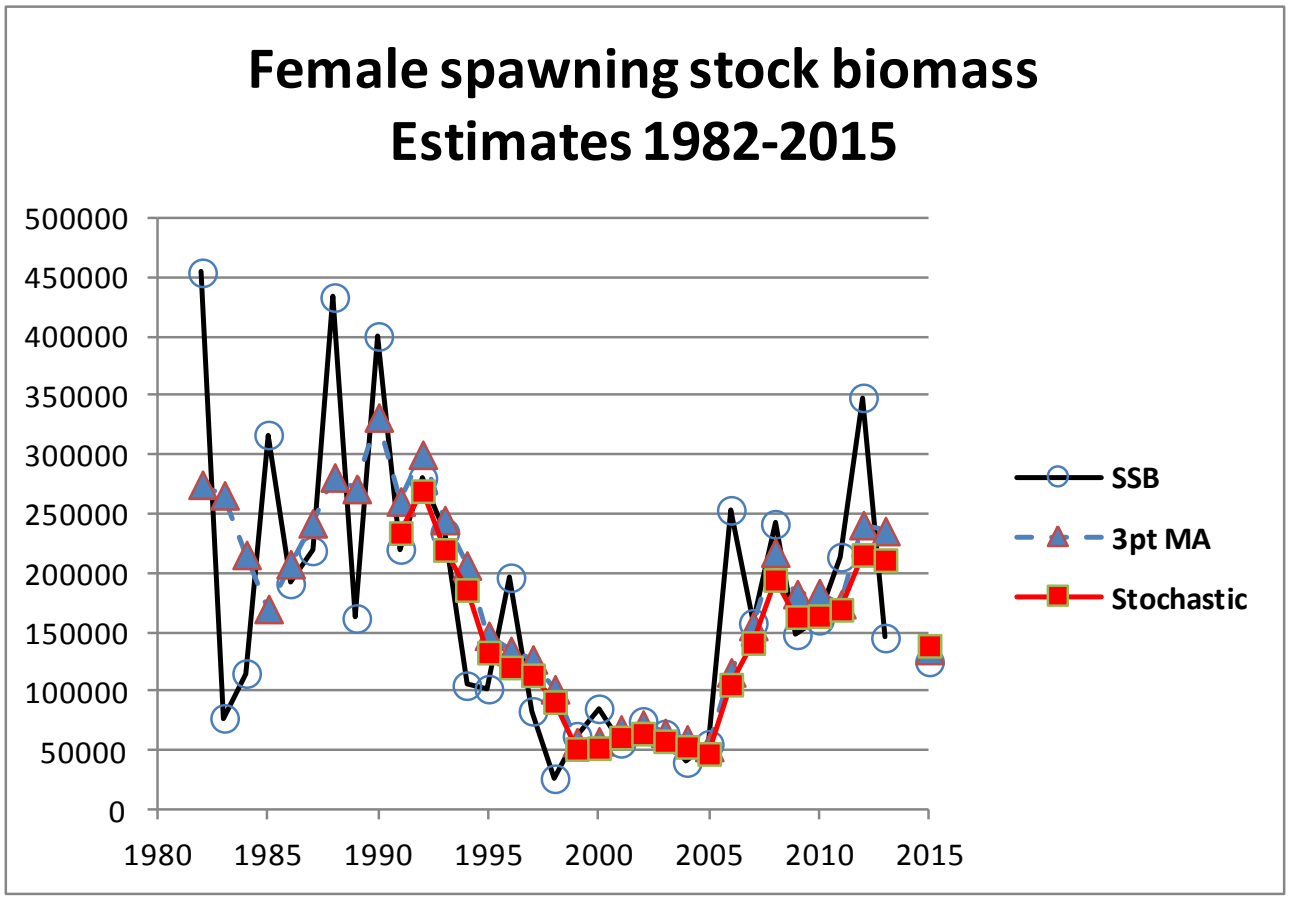


Figure 9. Comparison of alterative swept area estimates of female spawning stock biomass, 1982-2015. Stochastic SSB estimates are available for 1991 to 2015, except 2014. Year refers to the terminal year in a 3 point moving average.

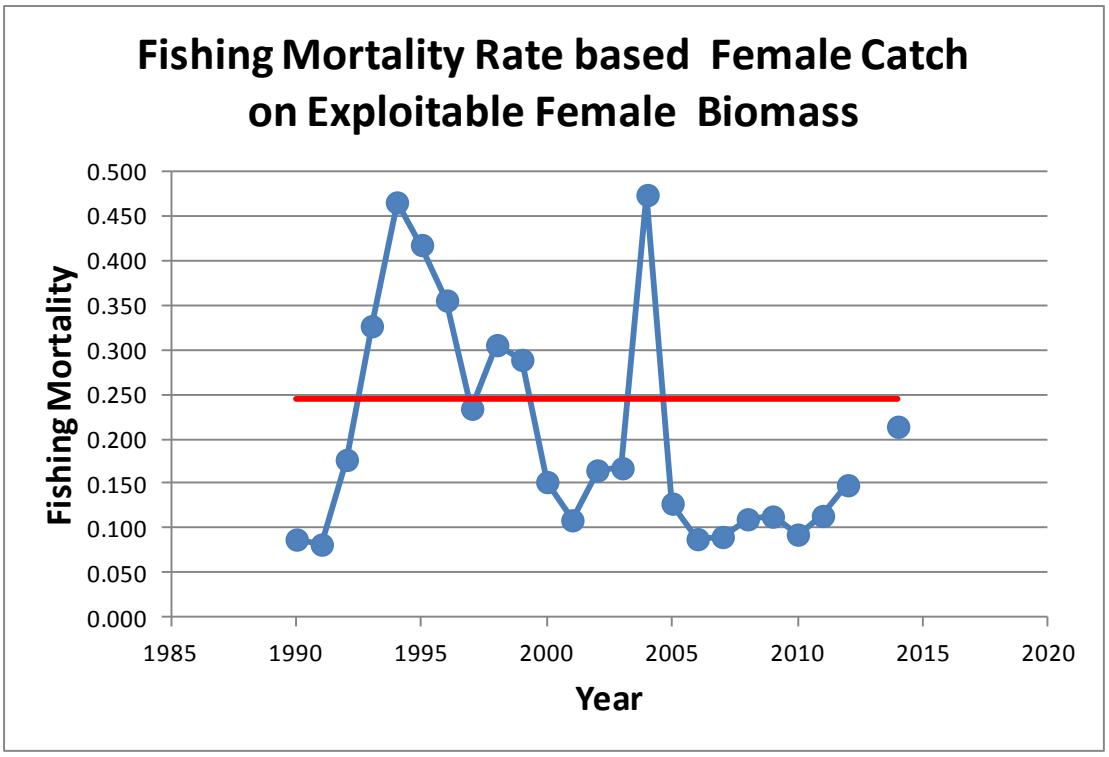


Figure 10a. Estimated stochastic fishing mortality rates for female catch from the exploitable female stock biomass, 1990-2014. Estimate for 2013 not available. F threshold is defined as 0.2439.

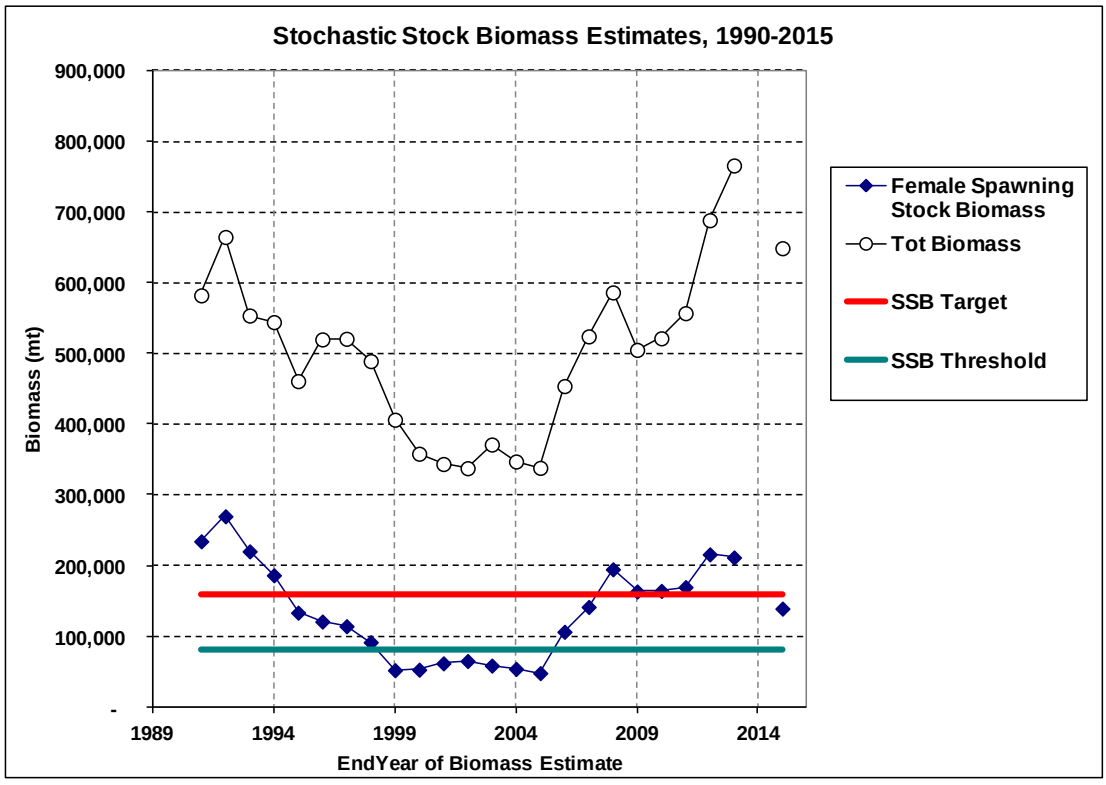


Fig 10b. Comparison of stochastic female SSB with target and threshold biomass values for 1991-2015. Estimate for 2014 not available. SSB target is defined as 159,288 mt. SSB threshold is 79,644 mt.

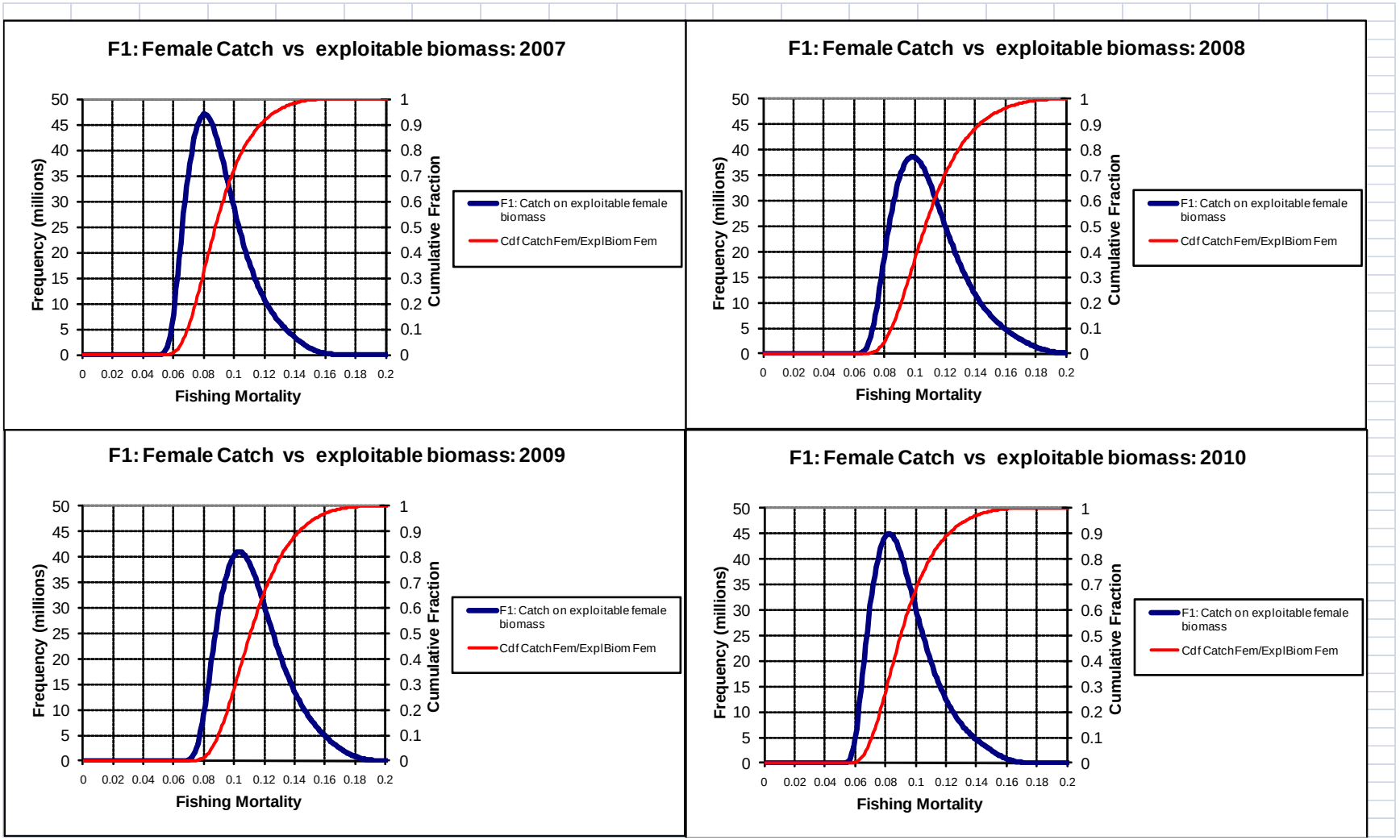
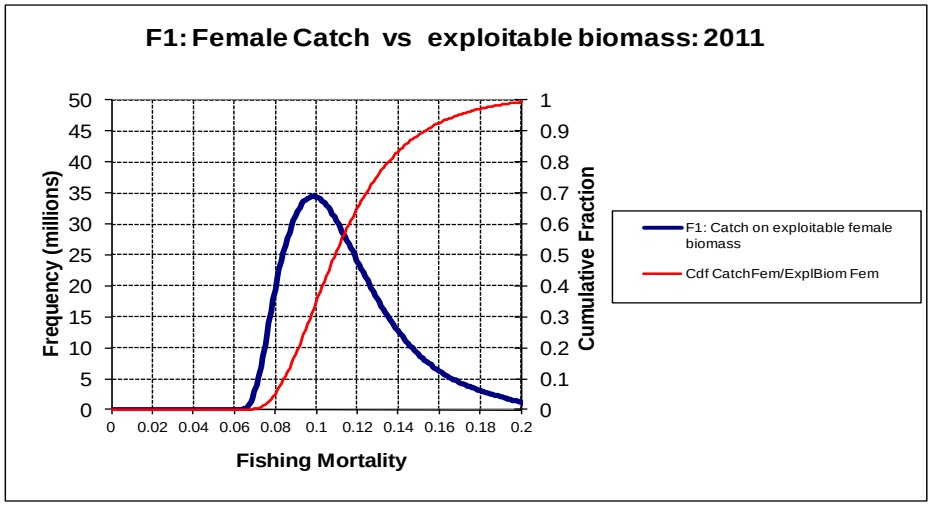
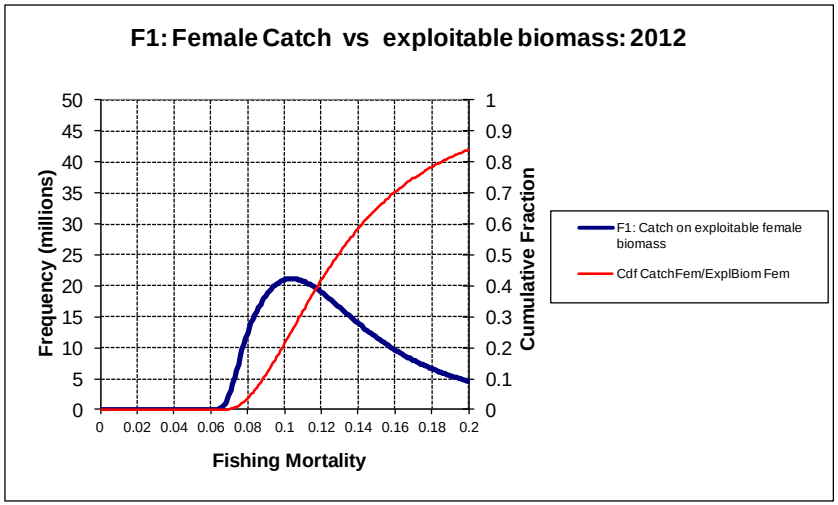


Figure 11a. Stochastic estimates of fishing mortality rates on female spiny dogfish, 2007 to 2010. Year refers to the calendar year in which catches occurred. Fishing mortality rates are based on the ratio for total catch in year to the 3 point moving average from year t-1 to t+1.





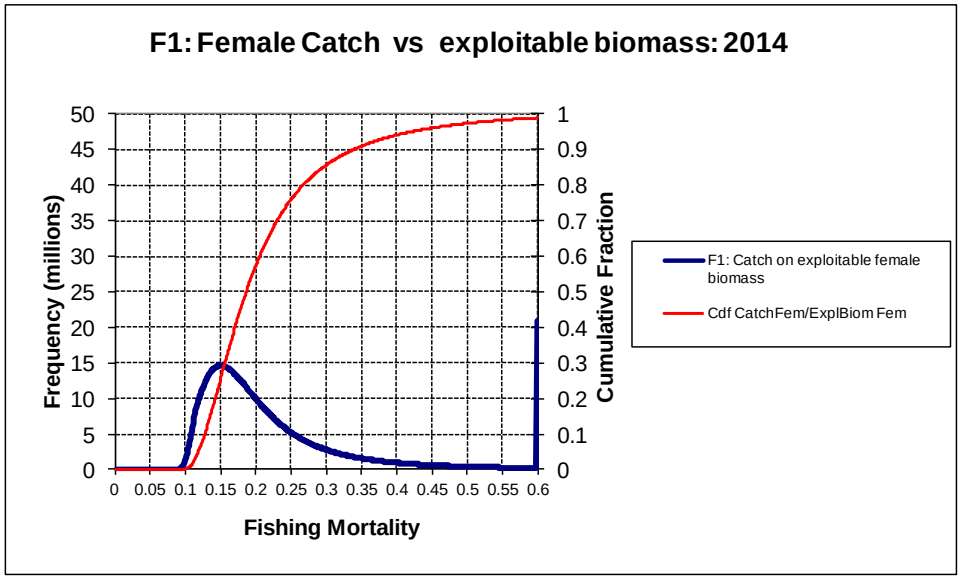


Figure 11b. Stochastic estimates of fishing mortality rates on exploitable female spiny dogfish, 2011, 2102 and 2014. Estimates for 2013 not available. Note change in scale for X axis in 2014. Year refers to the calendar year in which catches occurred. Fishing mortality rates are based on the ratio for total catch in year to the 3 point moving average from year t-1 to t+1.

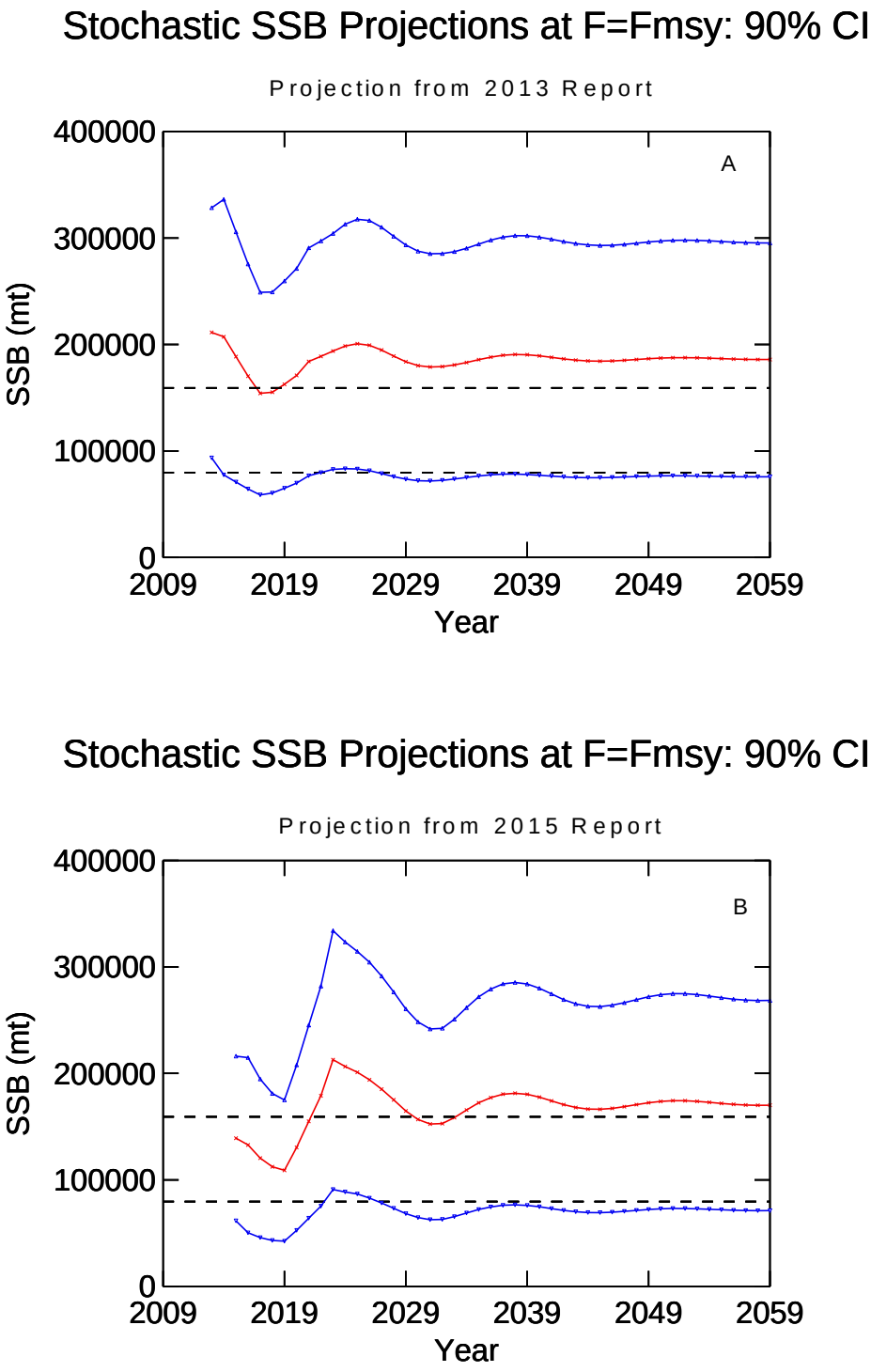


Figure 12. Comparison of Stochastic projections of SSB at current fishing mortality MSY proxy (F=0.2439) for 2013 (A) and 2015 (B). Fmsy proxies are based on results in Rago(2011). Horizontal dashed lines represent biomass target and threshold values of 159,288 mt and 79,644 mt, respectively. Projections depict 5%, 50% and 95% iles for each scenario. The expected finite rate of population increase at F=0.2439 is 1.000 or 0% change per year. The finite rate of population increase at F=0.19235 is 1.01283 or about a 1.28% increase per year.

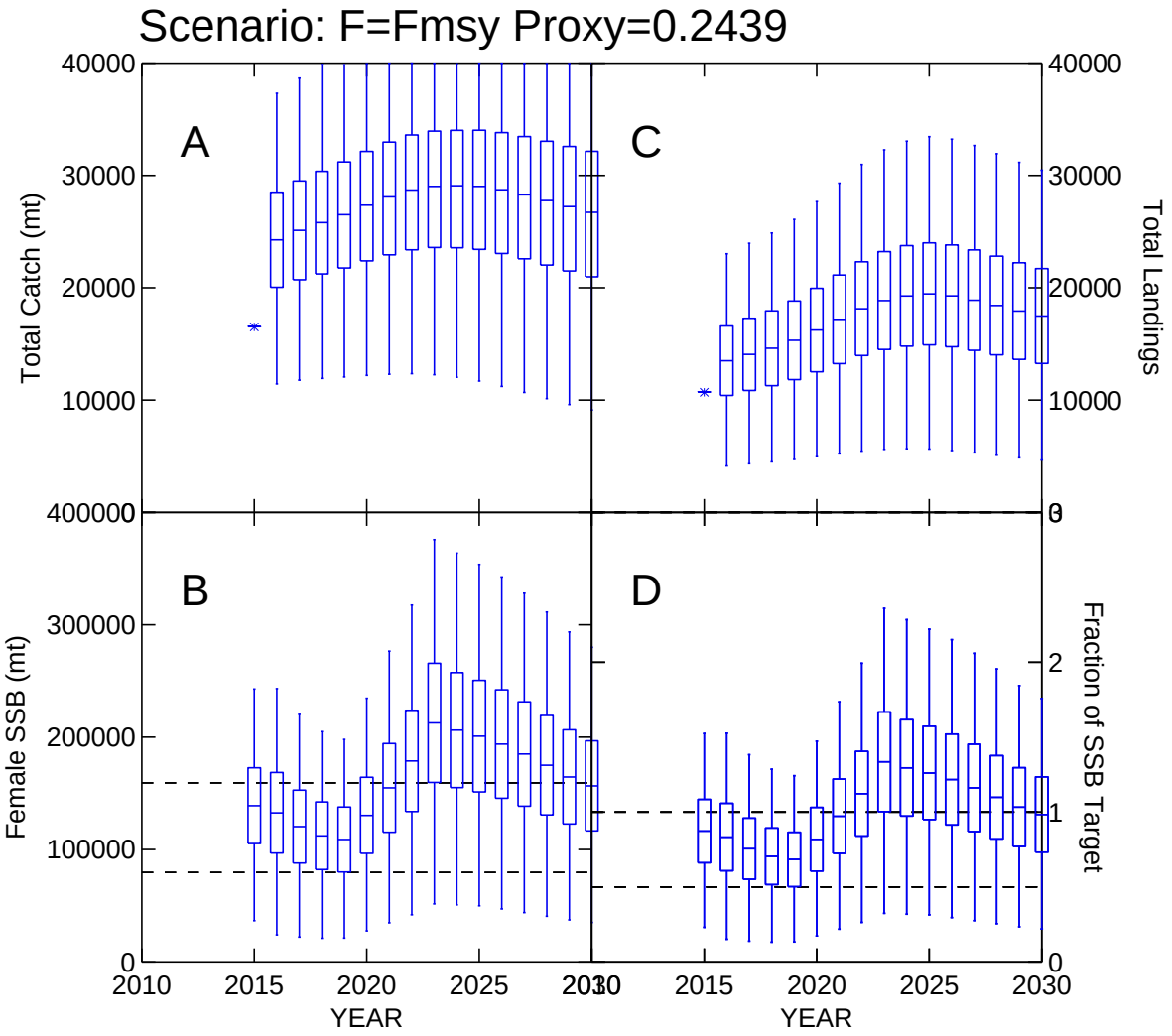


Figure 13a. Projection model estimates of (A) Total catch (mt), (B) Female spawning stock biomass (mt), (C) Total Landings(mt), and (D) fraction of target SSB, 2015-2030 for a harvest scenario based on a constant fishing mortality rate equal to the target F = 0.2439. Panel D reflects the probability of being overfished.

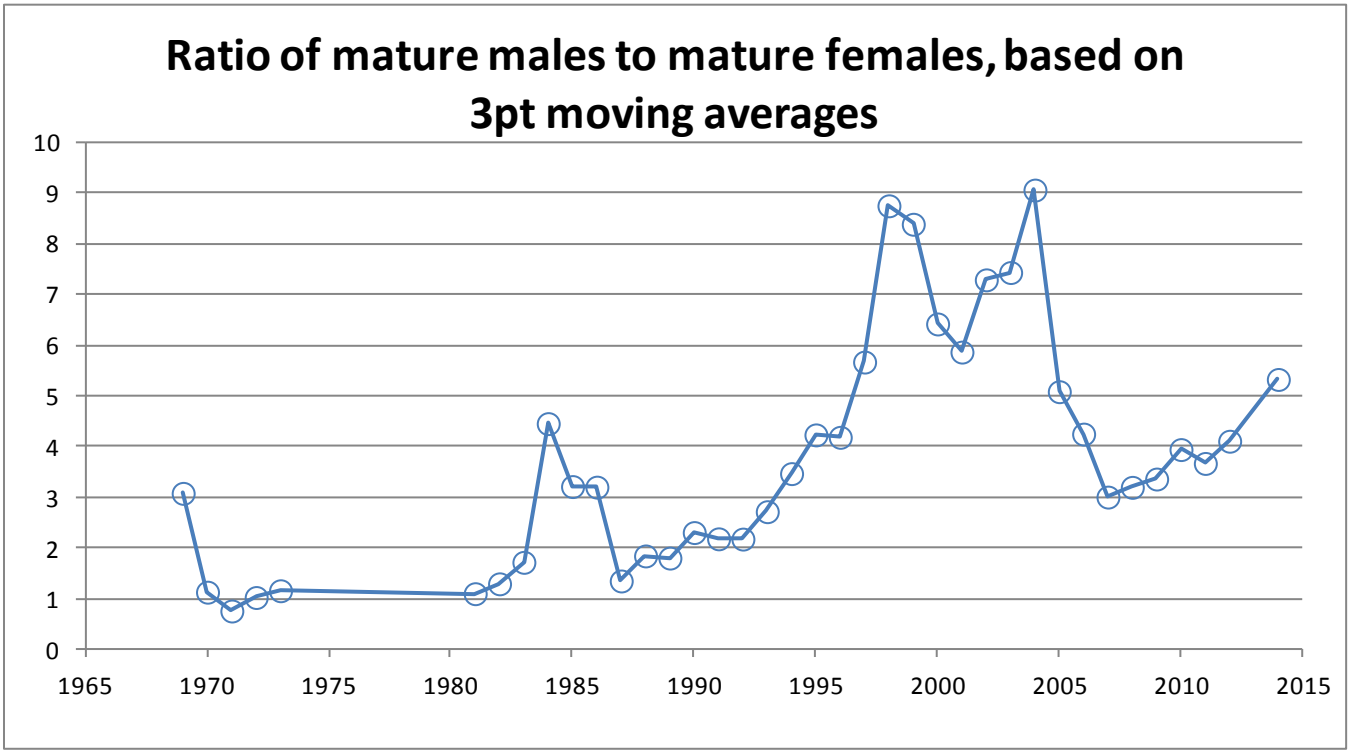


Figure 14. Ratio of mature males (>60 cm) to mature females (>80 cm) in NEFSC spring bottom trawl survey, 1968-1972, and 1980-2015. The 2014 survey was incomplete and no estimates were generated. Year represents the mid-point of 3 year average except for 2015 which is average of 2013 and 2015. Spiny dogfish sex was not recorded in the NEFSC database for 1973 to 1979.

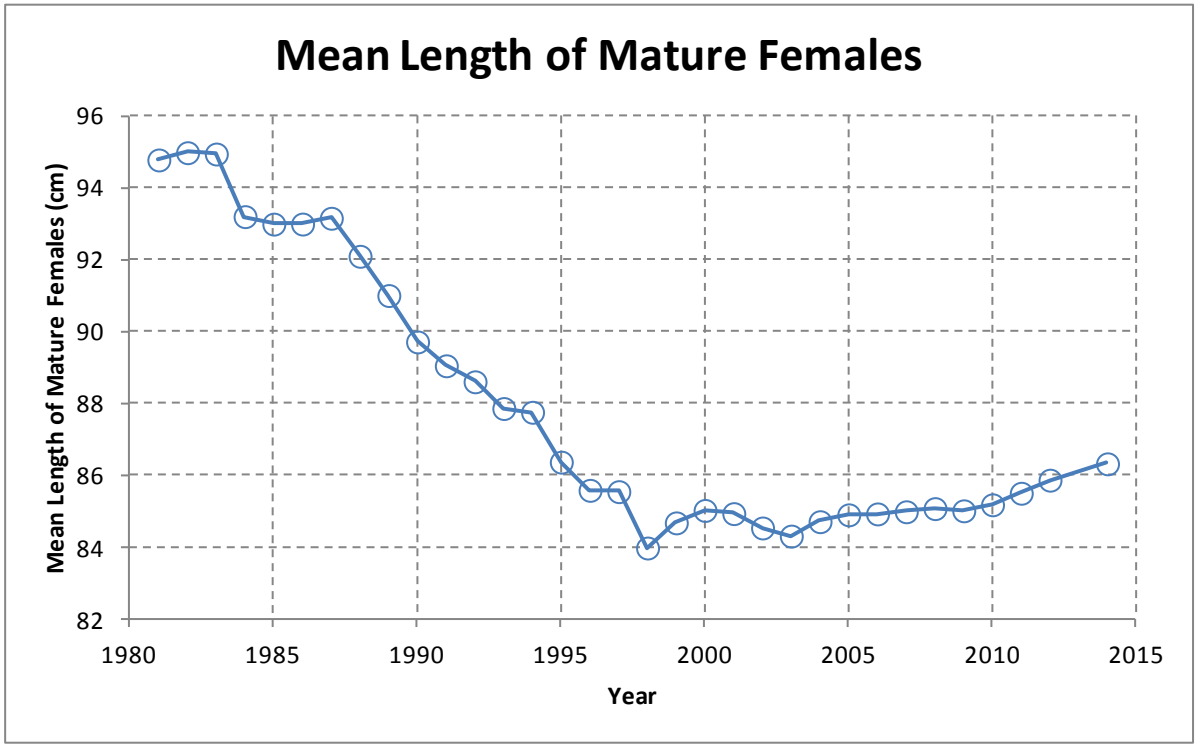


Figure 15. Mean Length of mature female spiny dogfish in NEFSC Spring bottom trawl survey, 1980-2015. Survey in 2014 was incomplete.

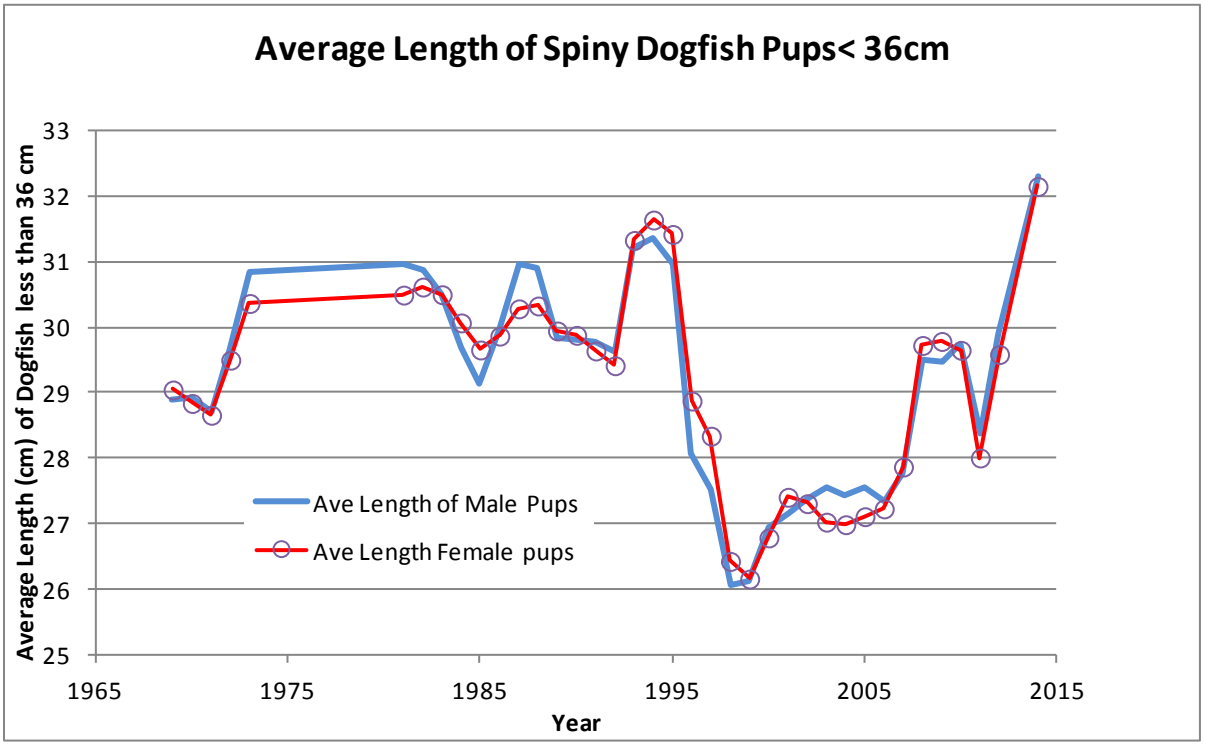


Figure 16. Three year moving average of mean length of male and female spiny dogfish pups (<36 cm) in spring bottom trawl survey 1968-2015. Sex data unavailable for 1973 to 1979, and survey in 2014 was incomplete.

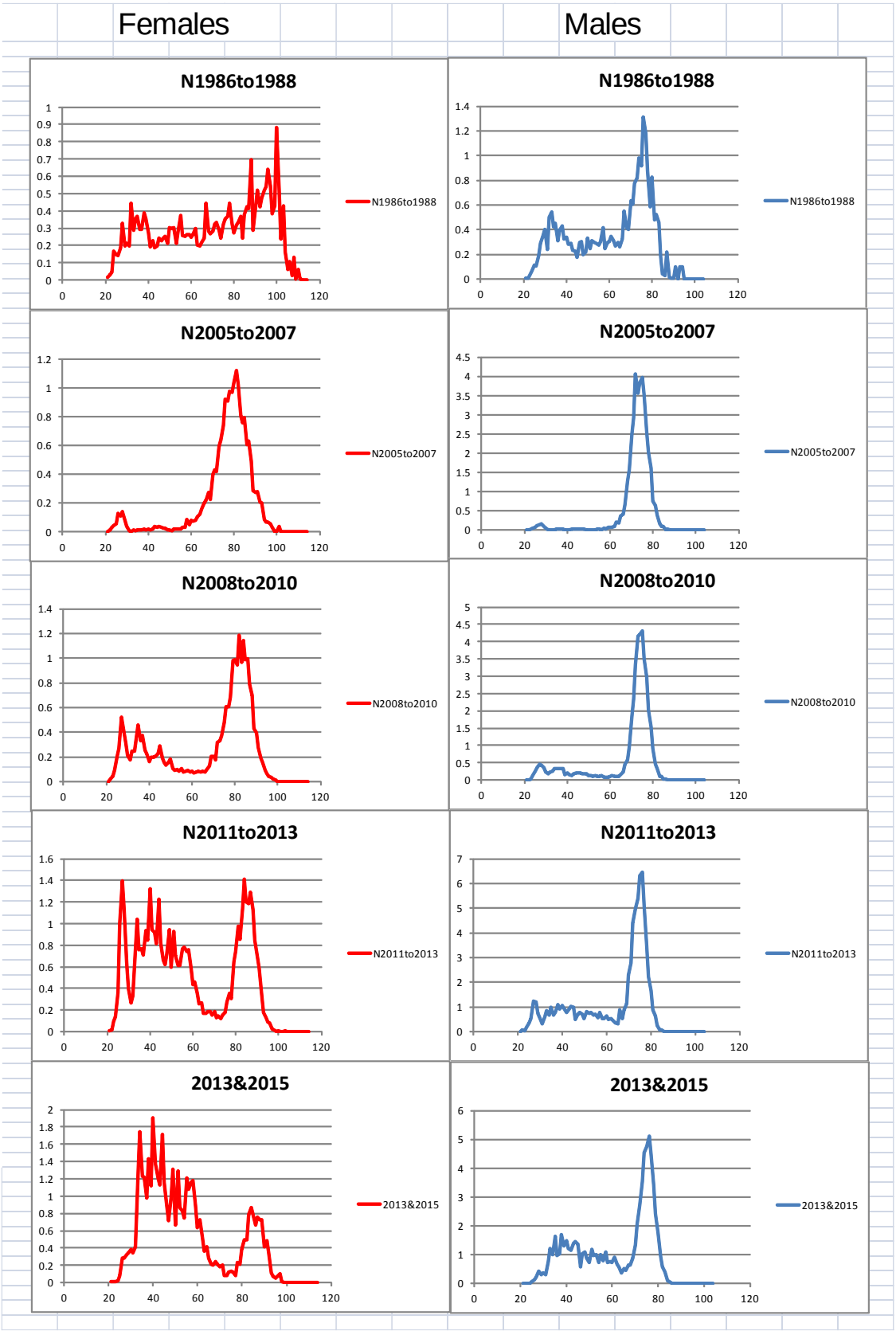


Figure 17. Composite size frequencies for female and male spiny dogfish in NEFSC spring bottom trawl survey. Y axis is average number per tow. Note scale differences among years.

Appendix 1. Approximate upper bound on efficiency of R/V Albatross for capturing spiny dogfish derived from comparison of capture rates with the FSV Bigelow.

An inter-vessel calibration experiment attempts to relate the average catchability of vessel A to vessel B by comparing paired tow catch rates over a variety of habitats, bottom types and species densities. If we conveniently let subscript A refer to the Albatross and B refer to the Bigelow, then the expected index catch rate I can be expressed as

$$I_A = e_A a_A D$$
$$I_B = e_B a_B D$$

Where ***e*** represents efficiency, ***a*** is the average area swept and D is the true density. The ratio of the index catches can be used to compute a calibration coefficient γ expressed as the ratio of I_B to I_A.

$$\frac{I_B}{I_A} = \gamma = \frac{e_B a_B D}{e_A a_A D} = \frac{e_B a_B}{e_A a_A}$$

The estimate area swept per tow can be expressed as a function of the distance between the wings of the new or as a function of the distance between the doors. The latter distance is important for schooling species like dogfish that herd between the sand clouds created by the trawl doors. The nominal areas swept by the Bigelow and Albatross nets are provided below.

Parameter	***Albatross***	***Bigelow***
Tow speeds(knots)	3.8	3
Tow duration (min)	33	20
Door width (ft)	68.6	104.9867
Wing width(ft)	35.93	39.37
Door Swept area ft ^2	871140.4	637899
Wing Swept area ft^2	456269.3	239212.1

Plugging the swept areas into the equation for γ gives:

$$\gamma = 1.1468 = \frac{e_B a_B}{e_A a_A} = \frac{e_B \, 637{,}899}{e_A \, 871{,}140}$$
$$\frac{e_A}{e_B} = 0.6385$$

If the Bigelow net were 100% efficient for spiny dogfish between the doors then the maximum possible Albatross efficiency would be 64%.

Appendix 2

Table 1. Summary of average and precision of female and male spiny dogfish numbers per tow in NEFSC spring bottom trawl survey, 1991-2015. Survey in 2014 incomplete; 2015 is average of 2013 and 2015.

	Female Number per Tow				Male Number per Tow			
year	***3-yrMean***	***3-yrVar***	***3-yr SE***	***3-yrCV***	***3-yrMean***	***3-yrVar***	***3-yr SE***	***3-yrCV***
1991	33.706	83.772	9.153	27.155	36.553	264.203	16.254	44.468
1992	38.436	108.291	10.406	27.075	39.436	260.409	16.137	40.920
1993	33.210	51.384	7.168	21.585	34.362	124.089	11.140	32.418
1994	35.917	55.805	7.470	20.799	41.395	122.204	11.055	26.705
1995	30.492	33.013	5.746	18.843	37.238	108.926	10.437	28.027
1996	35.924	121.007	11.000	30.621	43.926	99.099	9.955	22.663
1997	32.905	113.778	10.667	32.417	35.994	82.357	9.075	25.213
1998	28.275	104.634	10.229	36.177	38.193	96.530	9.825	25.724
1999	20.517	12.907	3.593	17.510	32.466	45.638	6.756	20.808
2000	15.972	13.574	3.684	23.068	30.015	47.662	6.904	23.001
2001	15.885	16.390	4.048	25.485	26.012	35.641	5.970	22.951
2002	15.025	17.836	4.223	28.109	24.920	34.523	5.876	23.578
2003	15.709	11.709	3.422	21.783	28.323	31.235	5.589	19.732
2004	15.417	9.718	3.117	20.221	27.647	29.073	5.392	19.503
2005	12.610	8.016	2.831	22.453	29.580	131.932	11.486	38.831
2006	16.287	19.015	4.361	26.773	35.521	194.964	13.963	39.309
2007	18.618	22.879	4.783	25.691	38.873	194.480	13.946	35.875
2008	23.214	23.687	4.867	20.965	38.628	87.551	9.357	24.223
2009	22.528	21.958	4.686	20.801	38.805	42.131	6.491	16.727
2010	23.933	19.818	4.452	18.601	42.684	56.562	7.521	17.620
2011	24.233	27.798	5.272	21.758	49.269	74.682	8.642	17.540
2012	30.915	54.960	7.414	23.981	65.949	584.183	24.170	36.649
2013	47.612	330.553	18.181	38.186	82.130	718.985	26.814	32.648
2014	NA	NA	NA	NA	NA	NA	NA	NA
2015	41.294	422.861	20.564	49.798	66.743	443.670	21.063	31.559

Appendix 2

Table 2. Summary of total dead discards and standard errors for trawl, gill net and recreational discards for spiny dogfish by sex for 1990 to 2014.

	Trawl Discards (mt)				*Gill Net Discards (mt)*				*Recreational Discards (mt)*				*Landings (mt)*	
	Male		*Female*		*Male*		*Female*		*Male*		*Female*			
Year	*Total*	*SE*	*Total*	*SE*	*Total*	*SE*	*Total*	*SE*	*Total*	*SE*	*Total*	*SE*	*Males*	*Females.*
1990	7636.00	1918.55	9485.0	2382.9	256.00	65.12	1563.00	397.55	58.068	8.478	354.497	51.757	61.9	16,378.1
1991	4309.00	843.49	5352.0	1047.6	466.00	54.53	2843.00	332.91	56.413	7.616	344.394	46.493	824.4	12,878.6
1992	7274.00	1971.88	9034.0	2449.1	251.00	24.09	1535.00	147.10	58.890	6.242	359.514	38.108	32.5	17,721.5
1993	3855.00	993.13	4788.0	1233.5	414.00	78.23	2530.00	477.57	48.101	7.456	293.651	45.516	173.0	21,908.0
1994	3102.00	786.56	3852.0	976.9	122.00	36.74	744.00	224.31	48.975	7.444	298.982	45.445	266.3	20,354.7
1995	2275.00	444.94	6224.0	1217.3	957.00	314.93	1062.00	349.68	90.048	10.356	99.983	11.498	137.0	23,536.0
1996	1683.00	465.96	3018.0	835.9	599.00	181.61	568.00	172.39	53.432	6.839	50.719	6.492	4,679.8	23,213.2
1997	1716.00	566.41	1637.0	540.4	220.00	54.14	478.00	117.73	67.339	8.215	146.416	17.863	6,941.6	12,070.4
1998	1077.00	363.50	1558.0	525.9	239.00	69.66	351.00	102.48	65.098	8.593	95.770	12.642	1,254.4	21,059.6
1999	982.00	340.73	2860.0	992.3	117.00	31.19	485.00	129.44	30.914	3.586	128.314	14.884	3,082.3	14,798.7
2000	644.00	156.37	720.0	174.7	149.00	43.50	1256.00	367.38	13.277	2.191	112.138	18.503	543.8	11,792.2
2001	428.00	68.78	2031.0	326.2	185.00	55.76	1977.00	596.91	38.062	3.464	407.459	37.079	242.3	6,483.7
2002	533.00	168.91	2237.0	708.6	107.00	23.23	1392.00	301.06	40.479	4.291	524.542	55.601	114.7	5,954.3
2003	524.00	101.64	1402.0	272.0	172.00	22.41	1452.00	189.62	67.346	5.455	569.759	46.150	63.1	3,053.9
2004	1261.00	201.44	2888.0	461.3	127.00	11.85	1083.00	101.38	81.937	7.374	700.708	63.064	26.3	3,623.7
2005	994.46	111.79	2762.9	310.6	192.57	24.29	808.89	102.03	125.441	15.053	526.908	63.229	488.4	2,491.6
2006	790.81	88.89	2123.0	238.6	244.21	29.30	655.59	78.67	177.048	21.246	475.301	57.036	385.6	4,330.3
2007	704.25	84.51	3353.0	376.9	290.54	34.86	1383.29	166.00	155.874	18.705	742.126	89.055	512.5	5,339.9
2008	589.80	97.20	2212.2	364.6	307.15	55.13	1152.02	206.79	131.127	12.510	491.818	46.919	242.0	5,652.1
2009	883.00	90.36	2895.0	296.4	361.00	52.52	1185.00	172.28	134.000	16.490	439.745	54.100	396.0	5,201.0
2010	893.00	70.86	2036.0	161.6	234.00	23.19	533.00	52.89	118.000	13.130	268.687	29.950	440.0	5,154.0
2011	1143.00	110.49	2296.0	222.0	294.00	15.27	591.00	30.67	154.000	22.440	309.000	45.070	781.0	8,998.0
2012	859.00	77.80	2808.0	254.3	212.00	13.35	693.00	43.64	64.000	11.400	210.000	37.260	364.0	10,516.5
2013	825.87	59.21	2622.13	188.01	223.23	21.90	708.77	69.53	127.19	15.14	403.81	48.05	321.0	7,089.0
2014	1432.85	105.74	2602.30	192.05	254.41	23.99	462.05	43.57	336.84	176.84	611.76	321.17	634.0	10,081.0

Appendix 2.

Table 3. Summary of selectivity parameters used to estimate length-specific fishing mortality for spiny dogfish, 1991-2014.

	Females			*Males*					
	a	***b***	***L50***	***a***	***b***	***L50***	***Comment***		
1991	2.777	-0.025	111.1	20.25	-0.45	45.0			
1992	4.762	-0.043	110.7	20.25	-0.45	45.0			
1993	7.397	-0.067	110.4	28.32	-0.593	47.8			
1994	8.831	-0.08	110.4	43.75	-0.879	49.8			
1995	11.99	-0.137	87.5	24.67	-0.533	46.3			
1996	11.85	-0.137	86.5	41.27	-0.829	49.8			
1997	11.59	-0.135	85.9	41.27	-0.812	50.8			
1998	10.69	-0.138	77.5	7.626	-0.076	100.3	Lack of fit for male data		
1999	9.083	-0.116	78.3	7.699	-0.077	100.0	Lack of fit for male data		
2000	11.27	-0.155	72.7	760.7	-16.9	45.0			
2001	15.72	-0.218	72.1	549.4	-12.21	45.0			
2002	17.34	-0.217	79.9	549.4	-12.21	45.0			
2003	14.83	-0.175	84.7	547.4	-12.16	45.0			
2004	15.57	-0.17	91.6	548	-12.18	45.0			
2005	12.45	-0.14	88.9	28.23	-0.627	45.0			
2006	10.35	-0.12	86.3	8.513	-0.085	100.2	Lack of fit for male data		
2007	9.722	-0.113	86.0	32.97	-0.733	45.0			
2008	8.867	-0.099	89.6	32.99	-0.733	45.0			
2009	8.867	-0.099	89.6	32.99	-0.733	45.0			
2010	8.867	-0.099	89.6	32.99	-0.733	45.0			
2011	8.867	-0.099	89.6	32.99	-0.733	45.0			
2012	8.867	-0.099	89.6	32.99	-0.733	45.0			
2013	8.867	-0.099	89.6	32.99	-0.733	45.0			
2014	8.867	-0.099	89.6	32.99	-0.733	45.0			

Appendix 3.

Comparison of ratio of full survey mean catch weight per tow in the complete survey to mean weight per tow in the truncated survey for 2014.

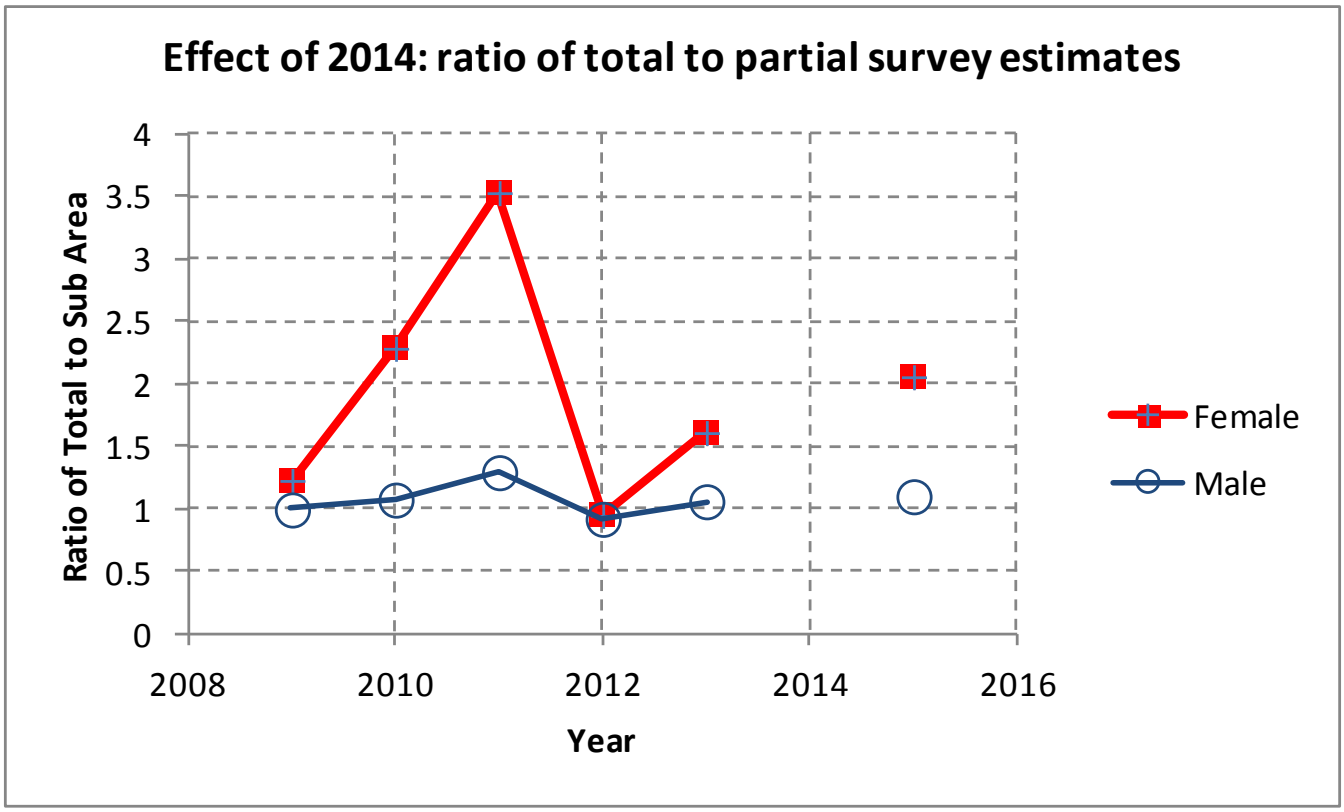


Fig 1. Effect of missing 2014 survey. Ratio of survey abundance estimate for mature female spiny dogfish in the complete survey strata to the biomass estimate for the truncated survey area. For male dogfish, which are primarily offshore of the survey area missed in 2014, the effect was minimal. For females, the ratio was far more variable suggesting caution when extrapolating for 2014. Results suggest that an extrapolation of biomass in 2014 was not warranted .

Appendix 4. Distribution of Commercial landings and survey catches by 10 minute square.

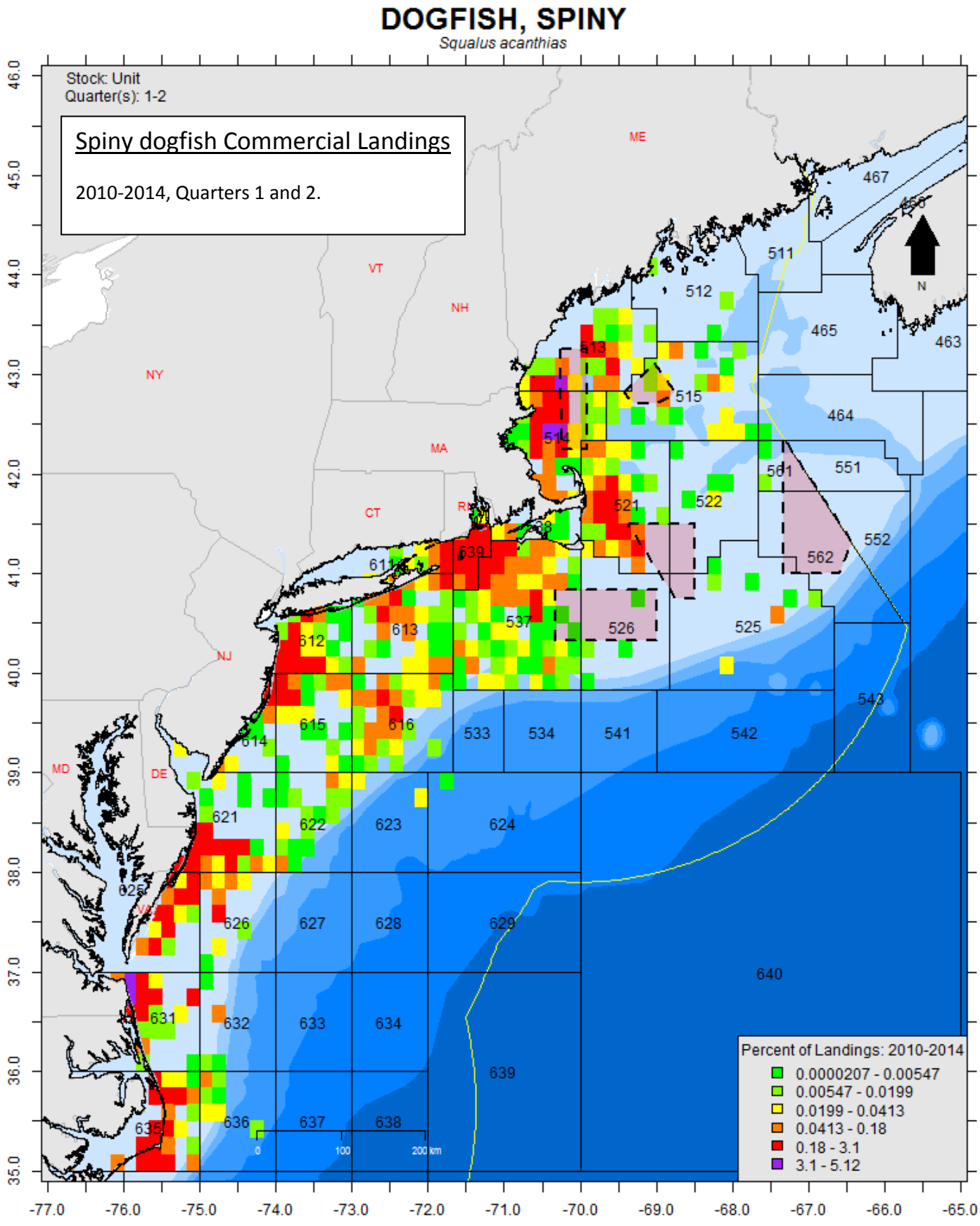

DOGFISH, SPINY
Squalus acanthias
Stock: Unit
Quarter(s): 1-2
Spiny dogfish Commercial Landings
2010-2014, Quarters 1 and 2.
ME
VT
NH
NY
MA
CT
RI
NJ
MD
DE
VA
N
467
466
511
512
465
463
513
515
464
514
551
561
521
522
552
562
539
611
537
526
525
612
613
543
615
616
614
533
534
541
542
621
622
623
624
625
626
627
628
629
640
631
632
633
634
639
635
636
637
638
0
100
200 km
Percent of Landings: 2010-2014
0.0000207 - 0.00547
0.00547 - 0.0199
0.0199 - 0.0413
0.0413 - 0.18
0.18 - 3.1
3.1 - 5.12
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
-77.0
-76.0
-75.0
-74.0
-73.0
-72.0
-71.0
-70.0
-69.0
-68.0
-67.0
-66.0
-65.0

Fig. 1. This map represents commercial landings for DOGFISH, SPINY, Squalus acanthias. Landings were reported via Dealer reports. Data have been restricted to dealer trips matched to a Vessel Trip Report (VTR) (ALEVEL=A) to ensure gear and area information is as accurate as possible.

Landings from quarters 1 and 2 are displayed. Due to incomplete location data, the map depicts 48% of the total catch reported for the species and time frame noted.

Northeast Fisheries Science Center statistical areas are represented by numbered polygons and bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid for your reference.

Data queried on August 25, 2015

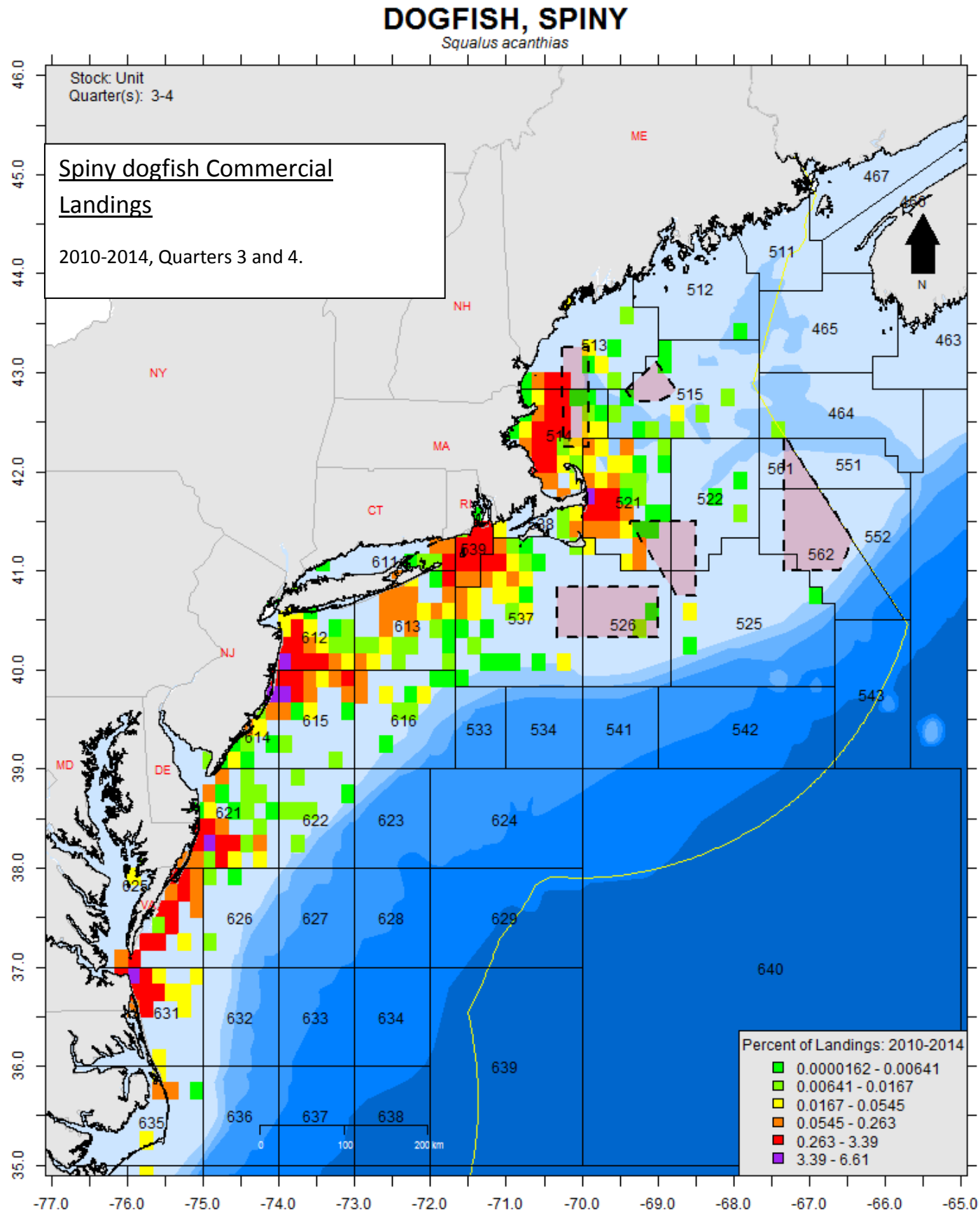

DOGFISH, SPINY
Squalus acanthias
Stock: Unit
Quarter(s): 3-4
Spiny dogfish Commercial Landings
2010-2014, Quarters 3 and 4.
ME
NH
NY
MA
CT
RI
NJ
MD
DE
VA
N
Percent of Landings: 2010-2014
0.0000162 - 0.00641
0.00641 - 0.0167
0.0167 - 0.0545
0.0545 - 0.263
0.263 - 3.39
3.39 - 6.61
0
100
200 km

Fig 2. This map represents commercial landings for DOGFISH, SPINY, Squalus acanthias. Landings were reported via Dealer reports. Data have been restricted to dealer trips matched to a Vessel Trip Report (VTR) (ALEVEL=A) to ensure gear and area information is as accurate as possible.

Landings from quarters 3 and 4 are displayed. Due to incomplete location data, the map depicts 72.44% of the total catch reported for the species and time frame noted.

Northeast Fisheries Science Center statistical areas are represented by numbered polygons and bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid for your reference.

Data queried on August 25, 2015

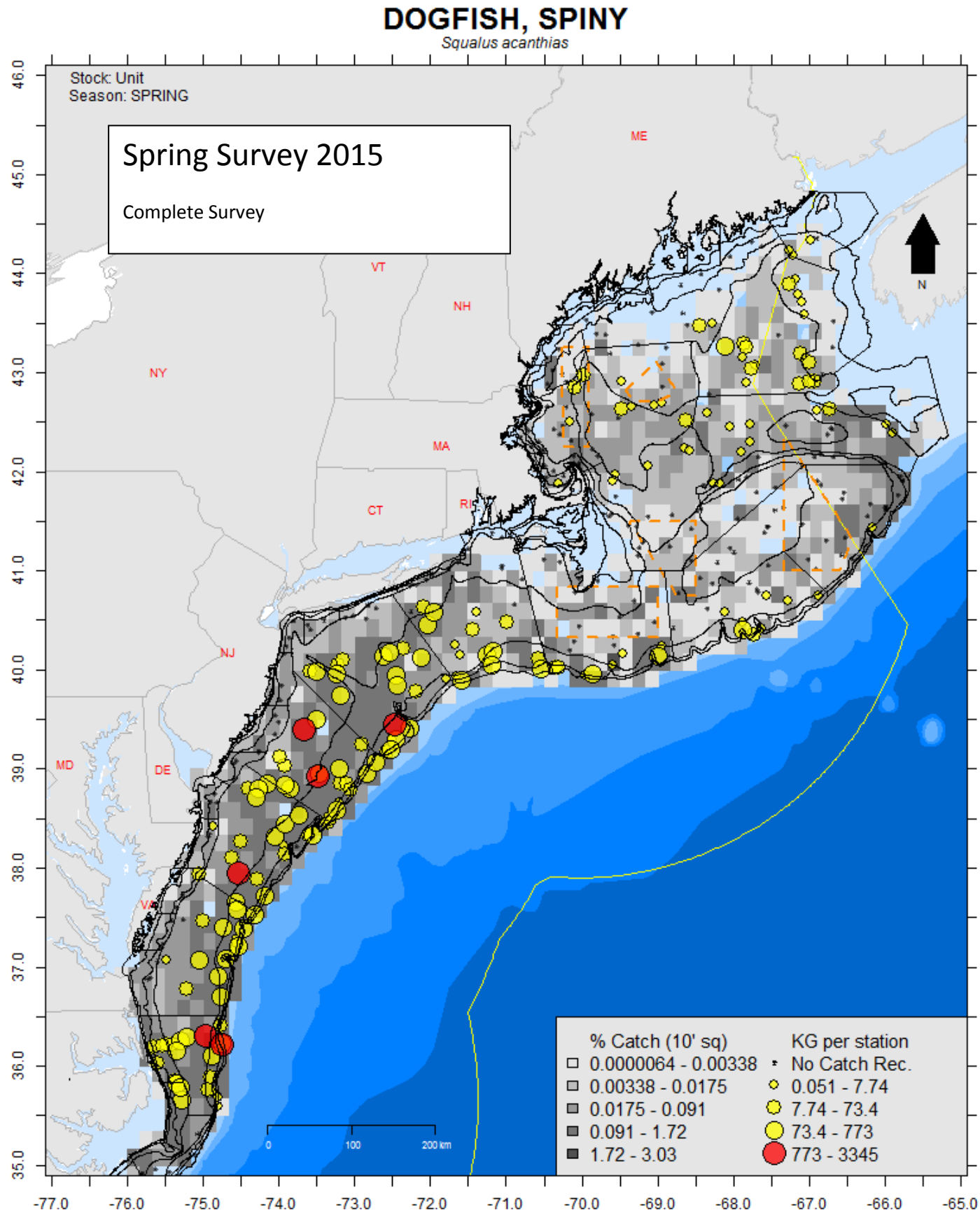

DOGFISH, SPINY
Squalus acanthias
Stock: Unit
Season: SPRING
Spring Survey 2015
Complete Survey
ME
VT
NH
NY
MA
CT
RI
NJ
MD
DE
VA
N
% Catch (10' sq)
0.0000064 - 0.00338
0.00338 - 0.0175
0.0175 - 0.091
0.091 - 1.72
1.72 - 3.03
KG per station
No Catch Rec.
0.051 - 7.74
7.74 - 73.4
73.4 - 773
773 - 3345
0
100
200 km
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
-77.0
-76.0
-75.0
-74.0
-73.0
-72.0
-71.0
-70.0
-69.0
-68.0
-67.0
-66.0
-65.0

Fig 3. This map represents survey catches for DOGFISH, SPINY, Squalus acanthias.

The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2015.

The points represent catch weights for year(s): **2015 - 2015**
Of the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series. The RED points show the locations of the 6 largest tows in the set.

Weights have not been calibrated.

Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid for your reference.

Data queried on August 21, 2015

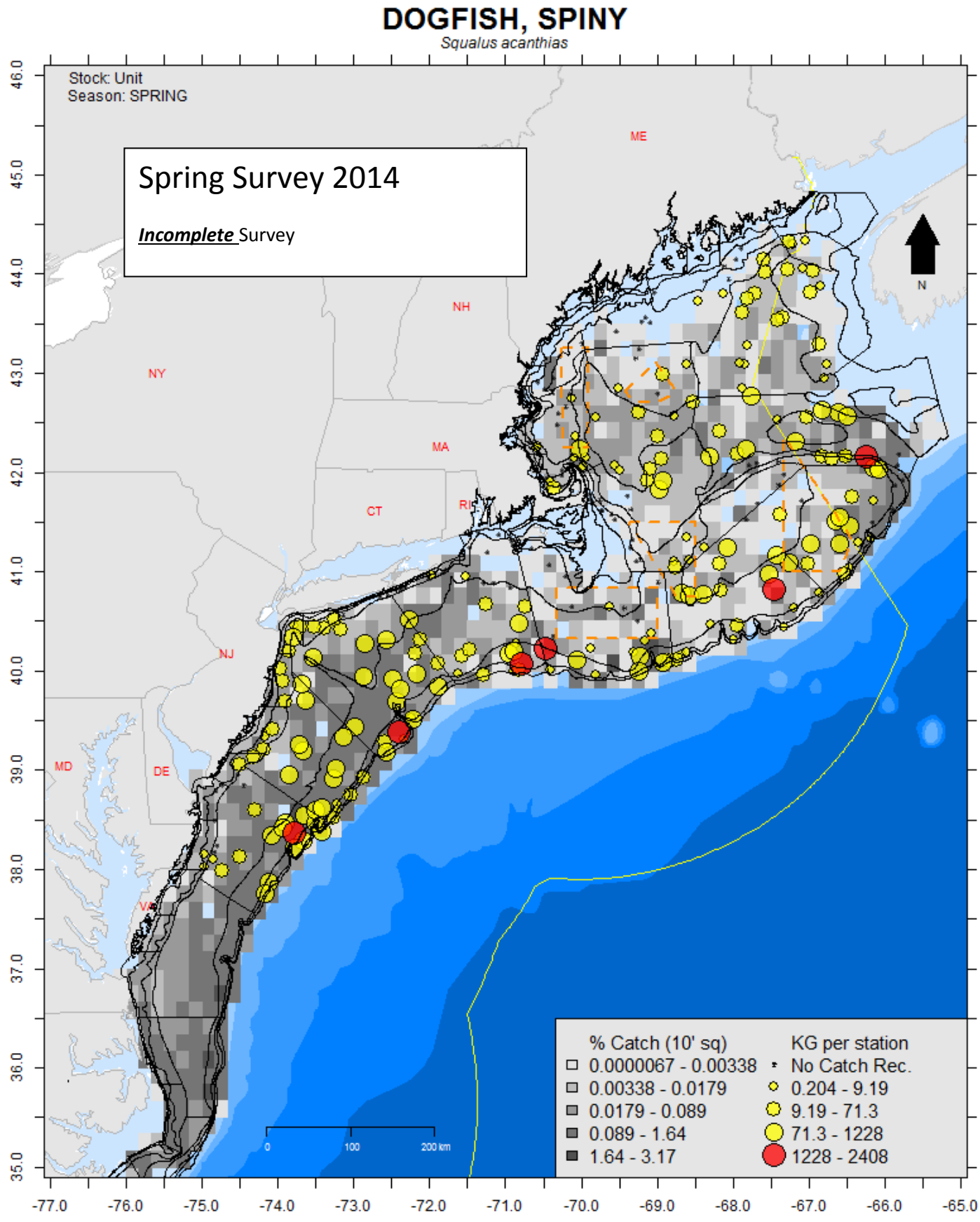

DOGFISH, SPINY
Squalus acanthias
Stock: Unit
Season: SPRING
Spring Survey 2014
Incomplete Survey
ME
NH
NY
MA
CT
RI
NJ
MD
DE
VA
N
% Catch (10' sq)
0.0000067 - 0.00338
0.00338 - 0.0179
0.0179 - 0.089
0.089 - 1.64
1.64 - 3.17
KG per station
No Catch Rec.
0.204 - 9.19
9.19 - 71.3
71.3 - 1228
1228 - 2408
0
100
200 km
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
-77.0
-76.0
-75.0
-74.0
-73.0
-72.0
-71.0
-70.0
-69.0
-68.0
-67.0
-66.0
-65.0

Fig. 4 This map represents survey catches for DOGFISH, SPINY, Squalus acanthias.

The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2014.

The points represent catch weights for year(s): **2014 – 2014**

Of the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series. The RED points show the locations of the 6 largest tows in the set.

Weights have not been calibrated.

Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid for your reference.

Data queried on August 21, 2015

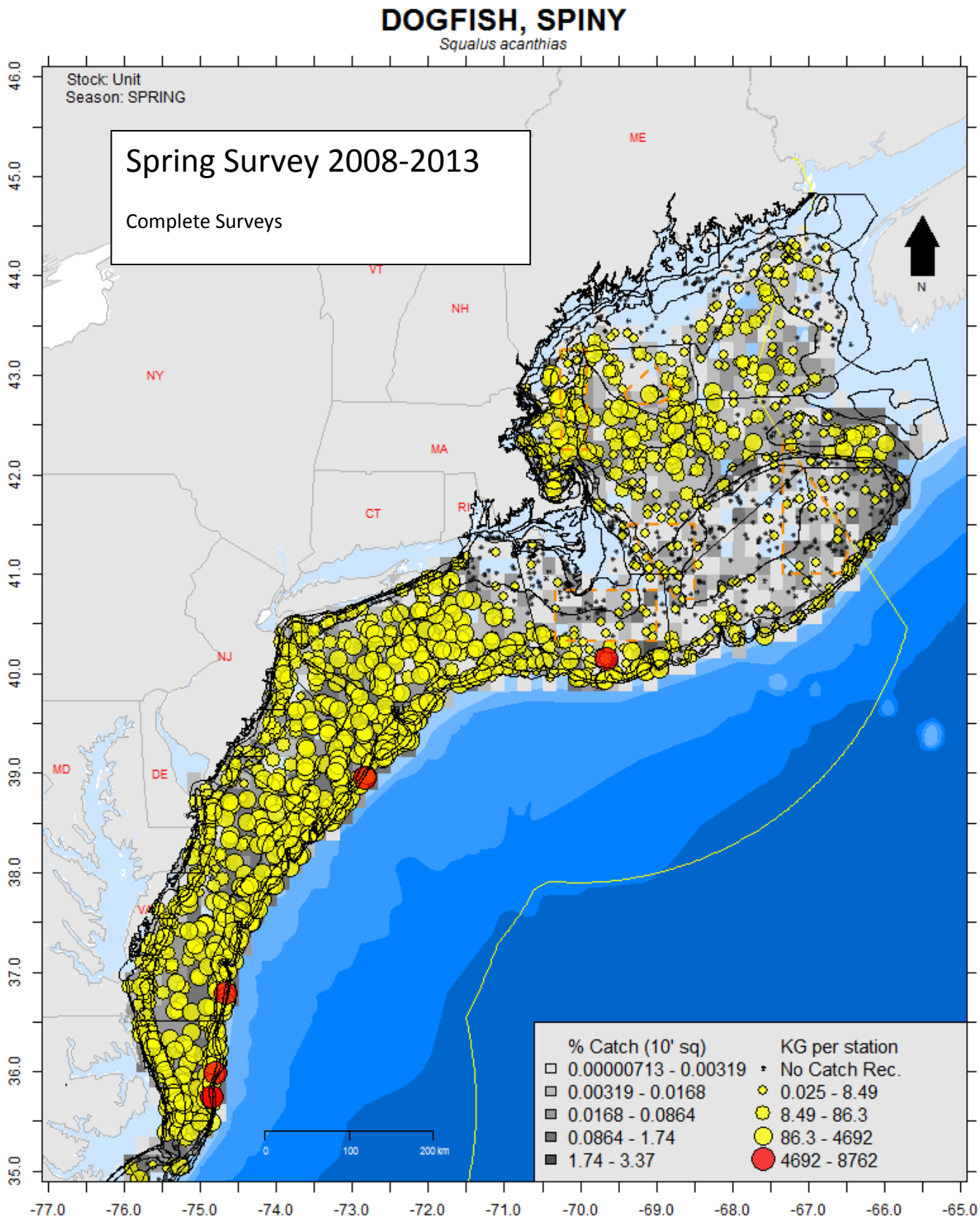

DOGFISH, SPINY
Squalus acanthias
Stock: Unit
Season: SPRING
Spring Survey 2008-2013
Complete Surveys
ME
VT
NH
NY
MA
CT
RI
NJ
MD
DE
VA
N
% Catch (10' sq)
0.00000713 - 0.00319
0.00319 - 0.0168
0.0168 - 0.0864
0.0864 - 1.74
1.74 - 3.37
KG per station
No Catch Rec.
0.025 - 8.49
8.49 - 86.3
86.3 - 4692
4692 - 8762
0
100
200 km
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
-77.0
-76.0
-75.0
-74.0
-73.0
-72.0
-71.0
-70.0
-69.0
-68.0
-67.0
-66.0
-65.0

Fig. 5. This map represents survey catches for DOGFISH, SPINY, Squalus acanthias.

The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2013.

The points represent catch weights for year(s): **2008 - 2013**

Of the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series. The RED points show the locations of the 6 largest tows in the set.

Weights have not been calibrated.

Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid for your reference.

Data queried on August 21, 2015

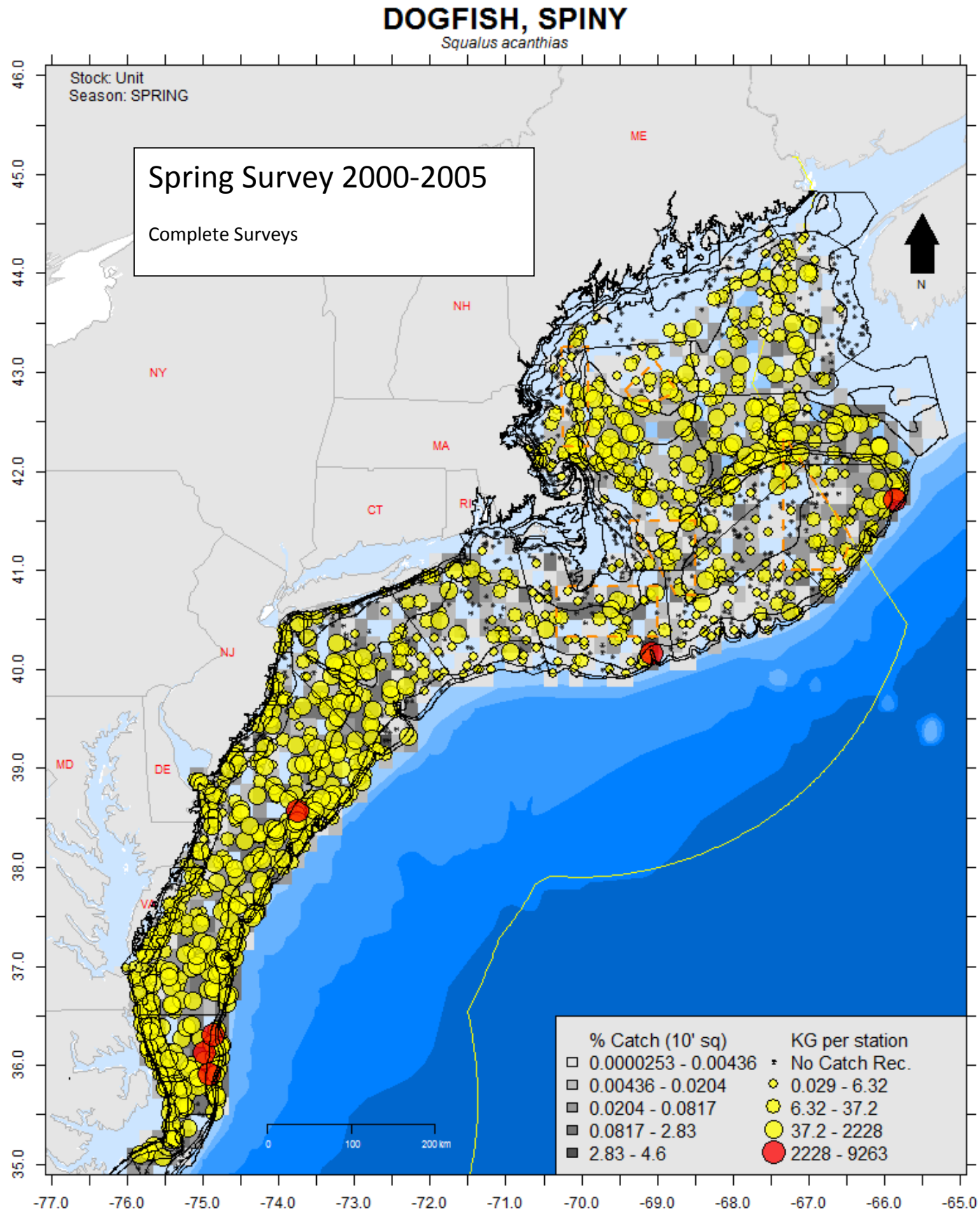

DOGFISH, SPINY
Squalus acanthias
Stock: Unit
Season: SPRING
Spring Survey 2000-2005
Complete Surveys
ME
NH
NY
MA
CT
RI
NJ
MD
DE
VA
N
% Catch (10' sq)
0.0000253 - 0.00436
0.00436 - 0.0204
0.0204 - 0.0817
0.0817 - 2.83
2.83 - 4.6
KG per station
No Catch Rec.
0.029 - 6.32
6.32 - 37.2
37.2 - 2228
2228 - 9263
0
100
200 km
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
-77.0
-76.0
-75.0
-74.0
-73.0
-72.0
-71.0
-70.0
-69.0
-68.0
-67.0
-66.0
-65.0

Fig. 6. This map represents survey catches for DOGFISH, SPINY, Squalus acanthias.

The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2005.

The points represent catch weights for year(s): **2000 - 2005**
Of the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series. The RED points show the locations of the 6 largest tows in the set.

Weights have not been calibrated.

Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid for your reference.

Data queried on August 21, 2015

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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

DATE: September 24, 2015

TO: Joint Spiny Dogfish Committee, Council

FROM: Jason Didden

SUBJECT: Spiny Dogfish 2016-2018 Specifications, Monitoring/Technical Committees Summary

On October 6, 2015, the Council will meet as a Joint Spiny Dogfish Committee of the Whole to set Spiny Dogfish Specifications for 2016-2018. This memo summarizes the results of the September 22, 2015 Spiny Dogfish Monitoring Committee (MC) meeting (webinar), which was held in conjunction with the ASMFC's Spiny Dogfish Technical Committee (TC). The purpose of the meeting was to review management measures for the upcoming fishing years and make recommendations as appropriate. Monitoring Committee members in attendance included Jason Didden (MAFMC staff, Chair), Fiona Hogan (NEFMC staff), *Tobey Curtis (NMFS-GARFO), Eric Schneider (RI-DEM), Dan McKiernan (MADMF), Angel Willey (MDDNR), Jack Musick (VIMS), and Chris Hickman (NC, Industry – ex officio/non-voting). Members of the TC (but not on the MC) that were in attendance included* Ashton Harp (ASMFC staff), Greg Hinks (NJ) *Matt Cieri (ME DNR), Greg Skomal (MADMF), and Scott Newlin (DNREC). Others in attendance included Chris Batsavage, Ted Ligenza, Ali Donargo, Greg DiDomenico, John Whiteside, Katie May Laumann, Kevin Wark, and Rob O'Reilly.*

There was also a public informational webinar held in the evening of September 22, 2015. Public comments from both meetings are summarized separately in this tab immediately after this memo.

Stock Status / OFL / ABC

Jason Didden provided an overview of the 2015 spiny dogfish assessment update and the findings of the Council's Scientific and Statistical Committee (SSC). The stock is not overfished and overfishing is not occurring. However, compared to the last update (2013), the stock is estimated to be lower (87% of target in 2015) compared to 2013 (135% of the target). The primary cause of the reduction in the biomass estimate is that the last update was driven by survey data points that were above average (2011), very above average (2012), and near average (2013) while the current update is driven by survey data points that are near average (2013) and below average (2015). There is no NMFS survey value (and therefore no stock size estimate) for 2014 because important spiny dogfish areas were skipped by the Bigelow trawl survey due to a mechanical breakdown.

Discussion during the call highlighted that the 2012 data point, in addition to being extremely high, had a very high variance, and an appropriate interpretation may be that we are moving away from an erroneously estimated increase in estimated stock size tied to the 2012 data point, rather than actually having a rapid increase followed by a rapid decrease. This interpretation would also align with the previously-predicted declines in stock size for the current year given the low pup indices from 1997-2003. As a follow up, Council staff notes that the current estimate in 2015 is somewhat lower but relatively close to the projected stock size for 2015 done in 2011 (before the high 2012 data point began to influence estimates). Discussion also pointed out that after 2019, the spawning stock is still predicted to start increasing due to higher recent pup indices.

Based on the updated assessment, the overfishing level (OFL) catch for 2016 is estimated based on application of Fmsy (F = 0.2439), and is 53,455,485 pounds (24,247 mt). Based on the projections in the assessment using the Council's risk policy, the Acceptable Biological Catches (ABCs) for 2016, 2017, and 2018 would be 37.0 million pounds (16,765 mt), 36.4 million pounds (16,526 mt), and 36.7 million pounds (16,636 mt), respectively. The risk of overfishing in these years from the Council's risk policy would be 33%, 30%, and 28%. The risk of overfishing is less than 40% because the Council's risk policy requires a lower chance of overfishing when stock size is below the reference target for spiny dogfish female spawning stock biomass. Relative to the 2015 ABC, the recommended ABCs represent reductions of 41%, 42%, and 41% for 2016, 2017, and 2018, respectively. Additional details on the

assessment update and recent fishery performance may be found at the SSC meeting site at http://www.mafmc.org/ssc-meetings/2015/sept-16-17 and in the staff memo included later in this tab.

Calculation of Existing 2014 Federal TAL and commercial quota

The federal spiny dogfish TAL is calculated using the process outlined in Amendment 2 to the Spiny Dogfish FMP (i.e., Omnibus Annual Catch Limit (ACL)/ Accountability Measures (AM) Amendment). The current (starting May 2015) fishing year's values corresponding to the steps in the process are given in Table 1. The Total Allowable Landings (TAL) and commercial quota are the remaining catch available for landings after accounting for management uncertainty and all other types of removals specified in the fishery management plan. The other types of removals include Canadian commercial landings and U.S. discards (commercial and recreational). The commercial quota is the remaining landings available after a further reduction from the TAL to account for expected U.S. recreational landings. The recommended values for 2016-2018 are provided in Table 2, and were endorsed by all participating members of the Monitoring Committee except for Chris Hickman, the ex officio industry representative on the Monitoring Committee, who believed that the quotas should not be reduced. He indicated that there are many fewer participants, that the current fleet cannot hurt the spiny dogfish population under the current regulations, and that too many assumptions are being used to make quota decisions.

Several modifications to how the various reductions from ABC were proposed by staff and accepted by the Monitoring Committee. While the absolute quantities for these reductions (discards, recreational landings) did not change appreciably, correlation analysis suggested different methods of using recent years' values were more appropriate for determining the amounts to subtract for expected discards and recreational landings. Additional discussion of these changes can be found in the staff memo to the SSC and MC, which is included later in this tab.

Table 1. Spiny dogfish management measures for 2015 fishing year as currently specified.

Specifications	Basis	2015 (pounds)	2015 (mt)
OFL	Projected Catch at Fmsy		
ABC	Constant F	62,412,866	28,310
Canadian Landings	= avg last 3 years (09,10,11)	143,300	65
Domestic ABC	= ABC – Canadian Landings	62,269,566	28,245
ACL	= Domestic ABC	62,269,566	28,245
Mgmt Uncert. Buffer	Average Overages 2010-11	0	0
ACT	= ACL - mgmt uncertainty	62,269,566	28,245
U.S. Discards	2002-2011 average	11,605,133	5,264
TAL	ACT – Discards	50,664,432	22,981
U.S. Rec Landings	2010-2011 average	52,911	24
Comm Quota	TAL – Rec Landings	50,611,522	22,957

OFL = Overfishing Level

ABC = Acceptable Biological Catch

ACL = Annual Catch Limit

ACT = Annual Catch Target

TAL = Total Allowable Landings

Table 2. Proposed spiny dogfish management measures for 2016-2018 fishing years.

Specifications	Basis	2016 (pounds)	2016 (mt)	2017 (pounds)	2017 (mt)	2018 (pounds)	2018 (mt)
OFL	Projected Catch at Fmsy	53,455,485	24,247	55,313,982	25,090	56,824,148	25,775
ABC	Council Risk Policy	36,960,498	16,765	36,433,593	16,526	36,676,102	16,636
Canadian Landings	= avg last 3 years (10,11,12)	143,300	65	143,300	65	143,300	65
Domestic ABC	= ABC – Canadian Landings	36,817,198	16,700	36,290,293	16,461	36,532,801	16,571
ACL	= Domestic ABC	36,817,198	16,700	36,290,293	16,461	36,532,801	16,571
Mgmt Uncert. Buffer	Ave pct overage since 2011	0	0	0	0	0	0
ACT	= ACL - mgmt uncertainty	36,817,198	16,700	36,290,293	16,461	36,532,801	16,571
U.S. Discards	=3 year average 12-13-14	11,494,167	5,214	11,494,167	5,214	11,494,167	5,214
TAL	ACT – Discards	25,323,030	11,486	24,796,126	11,247	25,038,634	11,357
U.S. Rec Landings	= 2014 estimate	68,343	31	68,343	31	68,343	31
Comm Quota	TAL – Rec Landings	25,254,687	11,455	24,727,782	11,216	24,970,291	11,326

The Monitoring and Technical Committees also reviewed and/or discussed a variety of other issues, as described below.

Management Uncertainty and Calculation of the ACT

Because there have been no recent overages of the ACL in this fishery, and the existing trip limits should allow accurate quota monitoring, no management uncertainty buffer is proposed. Thus the Domestic ABC = ACL = ACT.

Discards

The discard levels recommended by Council staff are slightly different than those used in the assessment update, but total mortality would be the same so the projections would not be impacted. Earlier discussions with Paul Rago suggested that a recent three-year average was a reasonable approach given the strong correlations observed. If discards are higher than predicted this will increase the chance of ACL overages (there is no management uncertainty buffer). In the event that the ACL is exceeded in a given fishing year, the overage is deducted (as soon as possible) from a subsequent single fishing year ACL.

Trip Limits

The MC did not make a recommendation on trip limits. The MC did discuss trip limits at length, but came to the conclusion that there is no biological basis for recommending alternative trip limits at this time. Discussion noted that states can set higher trip limits in state waters, for example North Carolina increased its state trip limit to 20,000 pounds effective February 19, 2015. There was discussion that the current trip limits may not be optimal for some participants but that changing trip limits impacts various fishery participants differently, especially depending on their location relative to processors. Some constituents may want consideration of different trip limits in a separate action (where the impacts throughout the fishery can be more fully evaluated).

Missing 2014 Data Point

The MC discussed whether different approaches to impute/fill-in the missing 2014 data point were considered. Council staff relayed that there were some discussions with Science Center staff but there were concerns that generating and selecting imputation methods were outside the scope of this assessment update. Council staff is recommending that an assessment update be conducted again next year and include additional consideration of ways to impute the missing 2014 data point.

Benchmark

There was discussion of whether the time was right for another benchmark assessment given the current assessment draws heavily on the results of the last peer-reviewed stock assessment vetted at SARC 43 in 2006 and the revised biomass reference points peer-reviewed by the Transboundary Resource

Assessment Committee in April 2010. Council staff noted that spiny dogfish is not currently on the SAW/SARC calendar for assessments.

Management Priorities

There was a discussion whether the MC/TC should flag management priorities other than specifications for managers to consider via a separate action(s). Given that was not the advertised purpose of the call, Council staff was hesitant to conduct such a prioritization exercise during this call but noted that a prioritization process could be conducted/requested by the Council.

Selected References

MAFMC staff memorandum from Jason Didden to Chris Moore: "Spiny Dogfish Specifications for 2016-2018 fishing years," dated September 11, 2015.

NEFSC (Rago & Sosebee). 2015. Update on the Status of Spiny Dogfish in 2015 and Projected Harvests at the Fmsy Proxy and Pstar of 40%. Report to MAFMC SSC, August 26, 2015. Available, with recorded presentation, at http://www.mafmc.org/ssc-meetings/2015/sept-16-17.

Spiny Dogfish Assessment - SARC 43 (2006), available at http://www.nefsc.noaa.gov/saw/reports.html.

Spiny Dogfish Assessment - TRAC 2010, Status Report available at http://www2.mar.dfo-mpo.gc.ca/science/trac/TSRs/TSR_2010_02_E.pdf.

Mid-Atlantic Council Votes to Reduce Spiny Dogfish Quota for 2016

October 15, 2015

At last week's meeting in Philadelphia, the Mid-Atlantic Fishery Management Council recommended a substantial cut in the spiny dogfish commercial quota for next year. Following a review of the most recent scientific information, public comments, and advice from the Scientific and Statistical Committee (SSC) and Spiny Dogfish Advisory Panel, the Council voted to set the 2016 commercial quota at 25.3 million pounds, a 50% reduction from the 2015 quota of 50.6 million pounds. If approved by the National Marine Fisheries Service, the new measure will go into effect May 1, 2016.

The Council's decision was driven by the recent spiny dogfish stock assessment update, which estimated the stock's biomass to be at 87% of the rebuilt target in 2015. Although the stock was found to be neither overfished nor subject to overfishing, the new estimate of stock biomass was a marked decrease from the 2013 update, which indicated that the stock's biomass was at 135% of the target.

The Council received a considerable number of comments from the fishing industry, with the majority in opposition to the proposed cuts. Several commenters expressed concern about the accuracy of the trawl survey data used in the assessment update and requested that the Council maintain status quo regulations until a benchmark assessment for the stock has been completed.

After extensive discussion, the Council approved the SSC's recommended acceptable biological catch (ABC) limit of 37.0 million pounds. After accounting for management uncertainty, projected discards, Canadian landings, and recreational landings, this ABC translates into a commercial quota of 25.3 million pounds for 2016. However, because the fishery has not taken the full quota in recent years, the recommended quota for 2016 would still be 11% above the landings in the most recent fishing year.

Given that the survey data from 2014 was not included in the 2015 update due to a mechanical breakdown in the NEFSC trawl survey, the Council also requested that the SSC determine an overfishing limit (OFL) and ABC for 2016 using averaged data to fill in the missing 2014 data point. The SSC will meet later this year to consider this request.

Finally, because the spiny dogfish fishery is managed jointly, the New England Fishery Management Council must also make recommendations for spiny dogfish specifications at its upcoming meeting in December.

http://www.mafmc.org/newsfeed/2015/mid-atlantic-council-votes-to-reduce-spiny-dogfish-quota-for-2016

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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

DATE: 22 September 2015

TO: Richard M. Robins, Jr., MAFMC Chairman

FROM: John Boreman, Ph.D., Chair, MAFMC Scientific and Statistical Committee

SUBJECT: Report of the September 2015 Meeting of the MAFMC SSC

The SSC met in Annapolis, MD, on 16-17 September 2015 for the main purpose of developing new ABC recommendations for Spiny Dogfish and revisiting the ABC recommendations for Black Sea Bass. The SSC also reviewed a draft of the MAFMC research plan, discussed establishing clearer criteria for setting the coefficients of variation on overfishing limits (OFLs), discussed the composition of membership of the SSC and participation of SSC members in the SAW/SARC process, and were updated on summer flounder modeling efforts by Pat Sullivan, actions being taken by the South Atlantic Fishery Management Council with regard to Blueline Tilefish, and the status of the report from the most recent National SSC Workshop. The final meeting agenda is attached (Attachment 1).

A total of 13 SSC members were in attendance on September 16th for the discussions on setting ABCs for Black Sea Bass and Spiny Dogfish, which constituted a quorum (Attachment 2). Also in attendance were staff from the NMFS Northeast Fisheries Science Center (by phone), and staff from the Council, NMFS Northeast Regional Office, and ASMFC; no representatives from the fishing industry and general public were in attendance. Discussion of ABC recommendations for each species began with a review of supporting information by the MAFMC staff lead and/or NEFSC assessment lead, then the SSC species leads (Attachment 3), followed by SSC deliberations. Documents cited in this report can be accessed via the MAFMC SSC website (http://www.mafmc.org/council-events/2015/ssc-meeting-2).

Black Sea Bass

The SSC discussion on revisiting the Black Sea Bass ABC recommendation made by the committee at its July 2015 meeting began with a presentation by Tom Miller on the results of the 10 September 2015 peer review of the McNamee et al. (2015) white paper (Miller 2015). Members of the peer review panel were Tom Miller (SSC member and panel chair), Olaf Jensen (SSC member), John Wiedenmann (Rutgers University), and Katie Drew (ASMFC).

The McNamee et al. white paper used the Caruthers (2015) DLMtool in R to develop reference points and catch level recommendations. DLMtool evaluates the performance of 47 different fishery management procedures in an operating model, which is parameterized to represent a particular species defined by a suite of biological and fisheries related parameters. Many of the 47 different management

procedures are alternative "flavors" of the same approach, only with slightly different parameterizations. The selected management procedures are evaluated against a set of user defined performance measures in a closed loop management strategy evaluation (MSE) that projects a population forward under a defined management procedure by sampling from distributions of biological, fishery, and observation processes. The MSE assumes perfect implementation of each management procedure. From the output of the MSE, the management procedures that are determined to perform "best" are identified. The values of these "best" management procedures are then estimated based on the real data.

The white paper applied the DLMtool approach to Black Sea Bass. McNamee et al. used the probability of overfishing < 0.3, the probability that the biomass will be less than 10% of the BMSY < 0.2, and the relative yield should be > 0.5 as performance measures. The closed loop MSE evaluation was undertaken and a suite of "best" management policies identified. The reference points derived from these best management procedures were then estimated for Black Sea Bass by using data from 1982-2014.

The peer review panel concluded, based on the evidence presented in the McNamee et al. white paper, that three methods used to estimate reference points provide a reasonable foundation for providing an ABC for Black Sea Bass. All three methods use recent catch levels combined with the recent trend in stock abundance to derive an ABC recommendation. After a lengthy discussion, the SSC concurred with the panel's recommendation, and added a fourth method that is solely based on a constant catch (the method that the SSC is currently using to develop ABC recommendations for Black Sea Bass) that met the same criteria as the three methods selected by the panel. The SSC determined that using these four methods would provide an ABC recommendation that is based on the best scientific information available. Therefore, the SSC revisited the MAFMC's terms of reference used for its July 2015 deliberations (terms of reference (TORs) provided by the Council are in *italics*).

For Black Sea Bass, the SSC will provide a written report that identifies the following for fishing years 2016-2017:

1) The level of uncertainty that the SSC deems most appropriate for the information content of the most recent stock assessment, based on criteria listed in the Omnibus Amendment.

The SSC determined that the OFL could not be specified given the current state of knowledge.

2) If possible, the level of catch (in weight) and the probability of overfishing associated with the overfishing limit (OFL) based on the maximum fishing mortality rate threshold or, if appropriate, an OFL proxy.

Because no OFL was accepted for this species, the level of catch cannot be derived given the current state of knowledge.

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

The SSC determined the ABC to be **3,024 MT (6.67 million pounds)**. This value is calculated from the results of the application of data limited approaches given by Caruthers (2015). The approach established three performance measures that each data limited method must achieve (probability of overfishing during any year in the modeled period < 0.3, probability of B

<0.1B_{msy} in the modeled period < 0.2 and the relative yield > 0.5). From the methods that met these criteria, the SSC used only those methods for which values for Black Sea Bass could be reliably determined. For Black Sea Bass, four methods met this standard, each having its own estimate of ABC. One method relies on a constant catch strategy and three combine, in different ways, information on total catch and the NEFSC spring survey to calculate an ABC. Because there was no a reliable foundation on which to weight the alternative methods, the SSC used the simple average of the estimates derived by the four methods to calculate the ABC.

It is not possible to provide an estimate of the probability of overfishing associated with the ABC.

At its July 2016 meeting, the SSC will revisit the ABC for 2017 based on information on the total catch and the spring NEFSC survey index for 2016.

The SSC expects to maintain this approach to setting ABCs until a revised assessment is completed (expected December 2016) that will be reviewed by the SAW/SARC by Spring 2017 in time for ABC determination for 2018.

4) The most significant sources of scientific uncertainty associated with determination of OFL and ABC.

- The application of data limited methods is associated with significant uncertainty;
- The lack of an analytical assessment prevents the estimation of an OFL reference point;
- Lack of data on abundance and fishing mortality rate estimates limited the range of approaches that could be used to generate reference points;
- The reliability of the NEFSC spring survey to serve as an index of abundance for Black Sea Bass is unknown;
- Atypical life history strategy (Black Sea Bass is a protogynous hermaphrodite) means that determination of appropriate reference points is difficult;
- Tagging analyses suggest incomplete mixing throughout the stock range;
- There is evidence of changes in the spatial distribution of the species (Bell et al. 2015), and;
- Uncertainty exists with respect to M — because of the unusual life history strategy the current assumption of a constant M in the model for both sexes may not adequately capture the dynamics in M.

5) Ecosystem considerations accounted for in the stock assessment, and any additional ecosystem considerations that the SSC took into account in selecting the ABC, including the basis for those additional considerations.

No additional ecosystem considerations were included in the determination of ABC.

6) Prioritized research or monitoring recommendations that would reduce the scientific uncertainty in the ABC recommendation and/or improve the assessment level.

1. Develop a first principles foundation for establishing reference points and assessment methods to account for Black Sea Bass life history characteristics.
2. Explore the utility of a spatially structured assessment model for Black Sea Bass to address the incomplete mixing in the stock.
3. Continue and expand the application of data limited methods to Black Sea Bass as a default should an accepted analytical assessment model not be available. Specifically, the SSC recommends performance testing of the ensemble of data limited methods used by the SSC.

The committee also reference the recommendations developed by the peer review panel on Data Limited Methods for Black Sea Bass (Miller 2015).

4. Develop a reliable fishery independent index for Black Sea Bass beyond the existing surveys. This may require development and implementation of a new survey.
5. Additional monitoring and compliance investments to control ABCs at recommended levels are necessary if predicted scientific outcomes for future stock biomasses are to be realized.
6. Consider a directed study of the genetic structure in the population north of Cape Hatteras.
7. Evaluate the implications of change in distribution to stock and fishery dynamics.

7) The materials considered in reaching its recommendations.

- McNamee, J., G. Fay, and S. Cadrin. 2015. Data limited techniques for Tier 4 stocks: an alternative approach to setting harvest control rules using closed loop simulations for management strategy evaluation. RI Division of Fish and Wildlife and University of Massachusetts Dartmouth. 57pp.
- J. McNamee, G. Fay, and S. Cadrin. 2015. Memo to SSC, dated 18 July 2015, entitled "Recommendation for an ABC for Black Sea Bass based on the Data Limited analysis." 4 pp.
    - Data and code (zip file)
    - Data Limited Techniques For Level 4 Stocks (PowerPoint presentation by Jason McNamee)
- Miller, T. 2015. Memo to John Boreman, dated 12 September 2015, entitled: "Review of McNamee et al "Data Limited Techniques for Tier 4 Stocks…." 7 pp.
- Bell, R. J., D. E. Richardson, J. A. Hare, P. D. Lynch, and P. S. Frantantoni. 2015. Disentangling the effects of climate, abundance, and size on the distribution of marine fish: an example based on four stocks from the Northeast US shelf. ICES Journal of Marine Science 72(5): 1311-1322.

8) A certification that the recommendations provided by the SSC represent the best scientific information available.

To the best of the SSC's knowledge, these recommendations are based on the best available scientific information.

Spiny Dogfish

Paul Rago (NEFSC) briefed the SSC on the latest update to the Spiny Dogfish assessment, followed by Jason Didden's presentation summarizing recent management actions and the fishery performance report developed by the advisory panel. Since no public were present at the meeting, Yan Jiao (SSC species lead) then led the SSC deliberations in developing ABC recommendations for 2016 and beyond. Deliberations followed the order of the terms of reference provided by the MAFMC (in *italics*).

For Spiny Dogfish, the SSC will provide a written report that identifies the following for fishing years 2016-2018:

1) The level of uncertainty that the SSC deems most appropriate for the information content of the most recent stock assessment, based on criteria listed in the Omnibus Amendment.

The assessment includes an acceptable OFL, but the SSC deemed that the assessment uncertainty

level requires an SSC-derived coefficient of variation (CV) for the OFL. The SSC applied its default assumptions regarding the distribution around the OFL – that is, OFL is lognormally distributed with a mean as specified and a coefficient of variation of 100%.

2) If possible, the level of catch (in weight) and the probability of overfishing associated with the overfishing limit (OFL) based on the maximum fishing mortality rate threshold or, if appropriate, an OFL proxy.

The F_{msy} proxy is calculated from a projection model for which the finite rate of population increase = 1.0. For spiny dogfish, the F_{msy} proxy = 0.2439. This is equivalent to **OFL = 24,247 mt**, based on the projected biomass in 2016 and the assumption that the catch in 2015 will be equal to 16,542 mt, which is equal to the 2014 catch.

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

The SSC recommends a three-year specification of ABC. The SSC applied the Council's risk policy for a typical life history[1], an estimated B_{201x}/B_{msy} ratio < 1 for all three years, and a CV of the OFL distribution of 100% assuming a lognormal distribution. Using these parameters, the P* values and the associated ABC are as follows:

Year	P*	**ABC (mt)**
2016	0.326	**16,765**
2017	0.297	**16,526**
2018	0.282	**16,636**

The SSC notes that the stock biomass is projected to continue to decline from 2016 to 2019 because of poor recruitment in earlier years, before recovering again. This is consistent with the findings of the SSC 2013 determination of Spiny Dogfish stock status.

The SSC will examine Spiny Dogfish discard rates, survey abundance trends (size composition, sex ratio and pup size), average size and sex in commercial landings, agreement between observed and predicted catch and survey forecasts, changes in Canadian landings, and the spatial distributions of catch and survey abundances each year of the specification to determine if the multiyear ABC should be abandoned.

4) The most significant sources of scientific uncertainty associated with determination of OFL and ABC.

- The incomplete 2014 NEFSC bottom trawl survey. The assessment model uses a three-year running average, and the lack of data for 2014 means that estimates for the years surrounding 2014 are estimated from only two years of data.
- The assessment relies heavily on an assumed efficiency of the survey gear in developing minimal swept area estimates of biomass.
- Inter-annual differences in availability of the stock to the survey gear.

[1] The SSC notes that the assessment for spiny dogfish has been structured to account for many aspects of the unique life history of this species

- F_{msy} proxy is based on a projection model that relies on a time-invariant selectivity estimated from data up to 2008. The assessment assumes selectivity has not changed subsequently, but may be variable.
- Both the F_{msy} proxy and the projections rely on a model that assumes constant pup survival and pup production rates. Empirical evidence suggests pup survival correlates positively with maternal size.
- Inconsistency between the estimation model and the projection model.
- Potential changes in fishery selectivity. Large increases in catches could induce changes in the overall selectivity pattern in the fishery.
- Potential inconsistency between the life history-based estimates of fishing mortality rates and the biomass reference points derived from the Ricker stock recruitment curve.
- Total discard estimates and estimated mortality of discarded dogfish.

5) Ecosystem considerations accounted for in the stock assessment, and any additional ecosystem considerations that the SSC took into account in selecting the ABC, including the basis for those additional considerations.

No explicit or specific ecosystem considerations were included in the assessment. Furthermore, no additional ecosystem considerations were applied in calculating the ABC.

6) Prioritized research or monitoring recommendations that would reduce the scientific uncertainty in the ABC recommendation and/or improve the assessment level.

1. Revise the assessment model to investigate the effects of stock structure or distribution, sex ratio, and size of pups on birth rate and first year survival of pups.
2. Explore methods of imputing the 2014 survey-based abundance estimate. The 2014 survey was partially completed, but areas of the survey important to the estimate of abundance of Spiny Dogfish were not sampled as a result of vessel mechanical problems. Accordingly, the SSC recommends exploration of model-based methods to derive 2104 survey indices for Spiny Dogfish.
3. Continue large scale (international) tagging programs, including conventional external tags, data storage tags, and satellite pop-up tags, to help clarify movement patterns and migration rates.
4. Investigate the distribution of Spiny Dogfish beyond the depth range of current NEFSC trawl surveys, possibly by using experimental research or supplemental surveys.
5. Continue aging studies for Spiny Dogfish age structures (e.g., fins, spines) obtained from all sampling programs (include additional age validation and age structure exchanges), and conduct an aging workshop for Spiny Dogfish, encouraging participation by NEFSC, Canada DFO, other interested state agencies, academia, and other international investigators with an interest in dogfish aging (US and Canada Pacific Coast, ICES).
6. Evaluate ecosystem effects on Spiny Dogfish acting through changes in dogfish vital rates.

7) The materials considered in reaching its recommendations.

- Rago, P., and K. Sosebee. 2015. Update on the Status of Spiny Dogfish in 2015 and Projected Harvests at the Fmsy Proxy and Pstar of 40%. Northeast Fisheries Science Center. 73 pp.
- MAFMC Staff. 2015. 2015 Spiny Dogfish Advisory Panel (AP) fishery performance report (FPR). 4 pp.

- MAFMC Staff. 2015. Spiny Dogfish Advisory Panel (AP) Informational Document - August 2015. 7 pp.
- Didden, J. 2015. Memo to Chris Moore, dated 11 September 2015, entitled: "Spiny Dogfish Specifications for 2016-2018 fishing years." 9 pp.

8) A certification that the recommendations provided by the SSC represent the best scientific information available.

To the best of the SSC's knowledge, these recommendations are based on the best available scientific information.

Summary of Species Information Requests

The following is a summary of the information requests made at the meeting by the SSC for next year's round of ABC deliberations. Questions about specifics can be directed to the SSC species leads (Attachment 3).

Black Sea Bass: At its July 2016 meeting, the SSC will revisit the ABC for 2017 based on information on the total catch and the spring NEFSC survey index for 2016. The SSC expects to maintain this approach to setting ABCs until a revised assessment is completed (expected December 2016) that will be reviewed by the SAW/SARC by Spring 2017 in time for ABC determination for 2018.

Spiny Dogfish: The SSC will examine Spiny Dogfish discard rates, survey abundance trends (size composition, sex ratio and pup size), average size and sex in commercial landings, agreement between observed and predicted catch and survey forecasts, changes in Canadian landings, and the spatial distributions of catch and survey abundances each year of the specification to determine if the multiyear ABC should be abandoned.

Criteria for OFL CV Specification

An updated document detailing the background on the MAMFC ABC Control Rule and development of the default 100% coefficient of variation (CV) for the overfishing limit (OFL) applied by the SSC (previously termed Level 3 based ABCs) was supplied by Mike Wilberg prior to the meeting. Based on this document, the SSC discussed two related issues: first, how can the SSC clarify criteria for applying OFL CV lower than 100%; and second, what guidance can the SSC give to assessment teams in estimating OFL CV to strive for analytically-based and expert-based OFL probability distributions (what were previously termed Level 1 and Level 2 assessments)? These issues are related and should be consistent.

The SSC has included some or all of the following considerations in estimating the OFL CV:

- Uncertainty in the estimate of current biomass, including observation error and process error carried through the assessment;
- Uncertainty in the estimate of the F_{msy} reference point, including process error estimated at the same time as biomass (B) is estimated in an integrated fashion;
- Covariation in the B and F_{msy} estimates;

- Sources of uncertainty that could not be included in an individual assessment model, which could include:
    - Model structural uncertainty (e.g., structured vs biomass dynamic models; single species vs multispecies models);
    - Parameter uncertainty (e.g., as currently included in sensitivity runs); and
    - Uncertainty in current state of nature (e.g., ecosystem production regime).

The SSC discussed using measures of model forecast error in determining the OFL CV, based upon information provided by NEFSC for several recent assessments, by comparing projected stock status from a past assessment to stock status estimated from a more recent assessment. Differences between past projections and current estimated could be used to derive a "forecast error" that could also be applied in estimating the OFL's CV.

The SSC discussed establishing "bands" of OFL CV levels, associated either with different levels of uncertainty treatment within an assessment and/or with a simulation analysis of the best possible CV expected under certain data availability and stock life history conditions compared with the level of uncertainty treatment within an assessment. Simulation analyses could also address where investments in data or assessment model improvements would be most likely to result in reduced OFL CV.

Based on this discussion, the SSC formed a subcommittee (T. Miller, S. Gaichas, O. Jensen, and B. Rothschild) to develop a white paper for discussion at the March 2016 SSC meeting. This white paper would outline criteria for using different CV levels, as well as a decision table aligning managed species with current forms of assessment, ABC level, and assumed OFL CV. Over the longer term, this subcommittee would outline simulation analyses to investigate appropriate OFL CV levels to achieve the Council's risk policy for each of its managed species, given available information.

Council Research Plan

Rich Seagraves gave an overview of the draft Comprehensive Five Year Research Plan, which will be presented to the Council at its October 2015 meeting. The Council, in consultation with its Scientific and Statistical Committee, first developed a research plan to meet this requirement in 2008 through examination of research needs identified in numerous stock assessments, Council FMP/Amendment documents, and through the Council's Research Set-Aside Program. The revised document was reorganized to address the science and research needs identified by the Council during its recent Visioning Project in its Strategic Plan.

A major SSC criticism of the Council's Strategic Plan (and the associated Research Plan) is that it lacks clear articulation of the Council's fundamental social and economic objectives for MAFMC fisheries. For example, most of the fishermen participating in MAFMC fisheries have access to numerous fisheries. The Council has not explicitly identified measurable social and economic objectives relative to flexibility of participants in multiple fisheries. In addition, the current risk policy was developed almost entirely based on biological considerations with little or no consideration of social and economic factors. Analyses supporting the Councils current risk policy should be greatly expanded to include policy analysis based on social and economic considerations.

The SSC noted that another major topic of research that needs to be addressed relates to the current practice of assessment and management on a single species basis. While the Council has made some in-roads into addressing the need to take an ecosystem approach to assessment and management in its EAFM effort, some fundamental changes to the current paradigm are required. The SSC recommended

that the Council develop an Operational Plan to allow for the transition from the current single-species approach to an ecosystem-based approach. This plan should include the development of Integrated Ecosystem Assessments that include clearly stated social and economic objectives.

The SSC also recommends that the Council consider conducting a thorough evaluation of the management performance of its current FMPs. Research and analyses are needed to define OY using an objective function in the same way other reference points are developed and evaluated. This would allow the Council to evaluate management performance based the objective criteria which define OY.

Finally, the SSC noted that the funding levels that were available through the RSA program are far from adequate relative to addressing the extensive list of research needs identified in the current research plan. Since all of the needs identified cannot be addressed given existing funding, it is critical that the Council prioritize its research needs and leverage funding opportunities with those of its management partners to maximize benefits given the limited pool of available research funds.

Summer Flounder Modeling

Pat Sullivan (Cornell University) briefed the SSC on the status of his summer flounder modeling project. He is attempting to configure a model that incorporates variability in sex, size, and age, with an even longer-term goal of eventually factoring in spatial differences as well. SSC members provided him some feedback and suggestions for consideration as he develops the model. Dr. Sullivan will be making a similar presentation at the upcoming MAFMC meeting in Philadelphia.

Other Business

SSC Membership

Given the likelihood that there may be vacancies on the SSC, the committee discussed future composition of SSC membership. The SSC cautions the Council to make sure there is a role to fill on the SSC before selecting new members with a specific scientific background. There was general agreement that the SSC needs to maintain a strong social sciences component. A sociologist or cultural anthropologist would bring a unique perspective in human dimensions to the SSC, but a lot depends on how the Council envisions utilizing the committee. An expert in quantitative risk assessment would also be a useful addition.

The SSC sees its role as going beyond simply responding to requests from the Council. Many of the SSC members see participation on the committee as a means of providing direction to their own research programs, thus expanding the influence and benefits of participating in the SSC's deliberations. Committee members also expressed interest in adding socio-economics and ecosystems topics as regular agenda items in SSC meetings in order to further engage and benefit from the members who are experts in these disciplines.

NSSC V Report

John Boreman and Rich Seagraves updated the SSC on progress being made on the report of the Fifth National Stock Assessment Workshop, held last February in Honolulu. In an August 12th conference call, the report's authors informed the workshop's steering committee that a draft report is still being

prepared; final comments on the draft meeting summary from the individual SSC's were due in early September.

Blueline Tilefish Update

John Boreman briefed the SSC on the recent SAFMC SSC webinar that reviewed updated projections of the stock status of Blueline Tilefish that were prepared by the Southeast Fisheries Science Center. Given the continued problems with large uncertainty in the data sources, as well as in the assessment itself, the SAFMC SSC decided not to use projections based on the assessment model as a basis for providing an ABC recommendation to the SAFMC, instead choosing to base the ABC recommendation on catch at 75% of F_{msy}. At our next SSC meeting in March 2016, the MAFMC SSC working group on Blueline Tilefish, under the leadership of Doug Vaughan, will be presenting several options for determining the ABC for this species in the mid-Atlantic region.

Participation of SSC members on SAW Working Groups

Olaf Jensen raised concern that SSC members might no longer be allowed to participate on the stock assessment working groups in the SAW/SARC process under the new guidelines developed by the Northeast Region Coordinating Council. MAFMC staff assured the SSC that this is not true. The SSC agreed that SSC members should be allowed to participate on the working groups on a case-by-case basis, depending on their expertise on the species being addressed (as well as continue being able to chair the SARCs).

cc: SSC Members, Lee Anderson, Chris Moore, Rich Seagraves, Kiley Dancy, Jason Didden, Jason McNamee, Kirby Rootes-Murdy, Paul Rago

Attachment 1

Mid-Atlantic Fishery Management Council
Scientific and Statistical Committee Meeting
September 16-17, 2015
Final Agenda

Wednesday, 16 September 2015

0900 Receive Report of Black Sea Bass Data Limited Methods Analysis Review (Miller)

1000 SSC Discussion on data limited methods relative to MAFMC Ad hoc ABC Species
- Consider/recommend alternative ABC specification approaches for Black Sea Bass

1200 Presentation on Status Update for Spiny Dogfish (Rago)

1245 Working Lunch

1300 Continue Discussion on ABCs for Black Sea Bass

1430 2016-2018 Spiny Dogfish ABC Specifications (Didden and Jiao)

1600 Criteria for OFL CV Specification (Boreman)

Thursday, 17 September 2015

0900 AFMC Research Priorities (Seagraves)

1020 Report on Sex-specific Modeling for Summer Flounder

1115 Other Business
- SSC Membership
- NSSC V Report
- Blueline Tilefish Update
- Participation of SSC members on SAW Working Groups

1200 Adjourn

Attachment 2

MAFMC Scientific and Statistical Committee
16-17 September Meeting
Annapolis, MD

Name	Affiliation
SSC Members in Attendance:	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chair)	University of Maryland - CBL
Doug Lipton	NMFS
David Tomberlin	NMFS Office of Science and Technology
Mark Holliday	NMFS (Retired)
Doug Vaughan	NMFS (Retired)
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Sunny Jardine (9/16 only)	University of Delaware
Rob Latour	VIMS
Olaf Jensen	Rutgers University
Ed Houde	University of Maryland – CBL
Brian Rothschild	UMass – Dartmouth
Yan Jiao	VA Tech
Others in attendance:	
Rich Seagraves	MAFMC staff
Kiley Dancy (9/16 only)	MAFMC staff
Jason Didden (9/16 only)	MAFMC staff
Paul Rago (by phone, 9/16 only)	NMFS Northeast Fisheries Science Center
Kirby Rootes-Murdy	ASMFC staff
Jason McNamee	RI F&W
Pat Sullivan (9/17 only)	Cornell University
Moira Kelly (by phone, 9/16 only)	NMFS Northeast Regional Office
Tobey Curtis (by phone, 9/16 only)	NMFS Northeast Regional Office

Species and Topic Leads for MAFMC SSC Members

Species/Topic	Biology/Assessment Lead	Socio-economics Lead
Atlantic Mackerel	Dave Secor	Mark Holliday
Atlantic Surfclam	Wendy Gabriel	Bonnie McCay
Ocean Quahog	Ed Houde	Bonnie McCay
Spiny Dogfish	Yan Jiao	David Tomberlin
Bluefish	Cynthia Jones	Doug Lipton
Butterfish	Rob Latour	Mark Holliday
Black Sea Bass	Tom Miller/Olaf Jensen	Marty Smith
Golden Tilefish	Doug Vaughan	Marty Smith
Scup	Wendy Gabriel	Mark Holliday
Summer Flounder	Mike Wilberg	Doug Lipton
Long-finned Squid	Mike Frisk	Sunny Jardine
Short-finned Squid	Tom Miller	Sunny Jardine
Ecosystems	Ed Houde	Doug Lipton
Deep Sea Corals	John Boreman	Bonnie McCay
Blueline Tilefish	Sarah Gaichas	David Tomberlin

Spiny Dogfish Advisory Panel (AP) Informational Document - August 2015
Prepared by Jason Didden, Council Staff

****Note - Data Sources for the following are generally from unpublished standard NMFS databases unless noted…everything should be considered preliminary at this point.**

Basic Biology

Spiny dogfish (*Squalus acanthias*) is a coastal shark with populations on the continental shelves of northern and southern temperate zones throughout the world. It is the most abundant shark in the western north Atlantic and ranges from Labrador to Florida, but is most abundant from Nova Scotia to Cape Hatteras, North Carolina. Its major migrations on the northwest Atlantic shelf are north and south, but it also migrates inshore and offshore seasonally in response to changes in water temperature. Spiny dogfish have a long life, late maturation, a long gestation period, and low fecundity, making them generally vulnerable to depletion, as they cannot quickly rebuild their numbers. Fish, squid, and ctenophores dominate the stomach contents of spiny dogfish collected during the Northeast Fisheries Science Center (NEFSC) bottom trawl surveys but they are opportunistic and have been found to consume a wide variety of prey. More detailed life history information can be found in the essential fish habitat (EFH) source document for spiny dogfish at: http://www.nefsc.noaa.gov/publications/tm/tm203/tm203.pdf.

Status of the Stock

Reports on "Stock Status," including Stock Assessment Workshop (SAW) reports, Stock Assessment Review Committee (SARC) panelist reports and peer-review panelist reports are available online at the NEFSC website: http://www.nefsc.noaa.gov/nefsc/saw/. The NEFSC is currently updating the dogfish stock assessment, but at this point the 2013 assessment update provides the most recent scientific characterization of stock conditions. An assessment update was not done in 2014 because of mechanical issues with the survey vessel in 2014 that led to incomplete sampling. The 2013 assessment update (available at http://www.mafmc.org/ssc-meetings/september-2013) indicated that the spiny dogfish stock was not overfished, and that overfishing was not occurring. In updating the assessment, the NEFSC estimated a 97% probability that the stock is not overfished and a 91% probability that overfishing was not occurring. Female spawning stock biomass and pup indices are provided below. When the 2015 update becomes available it will be forwarded to the AP.

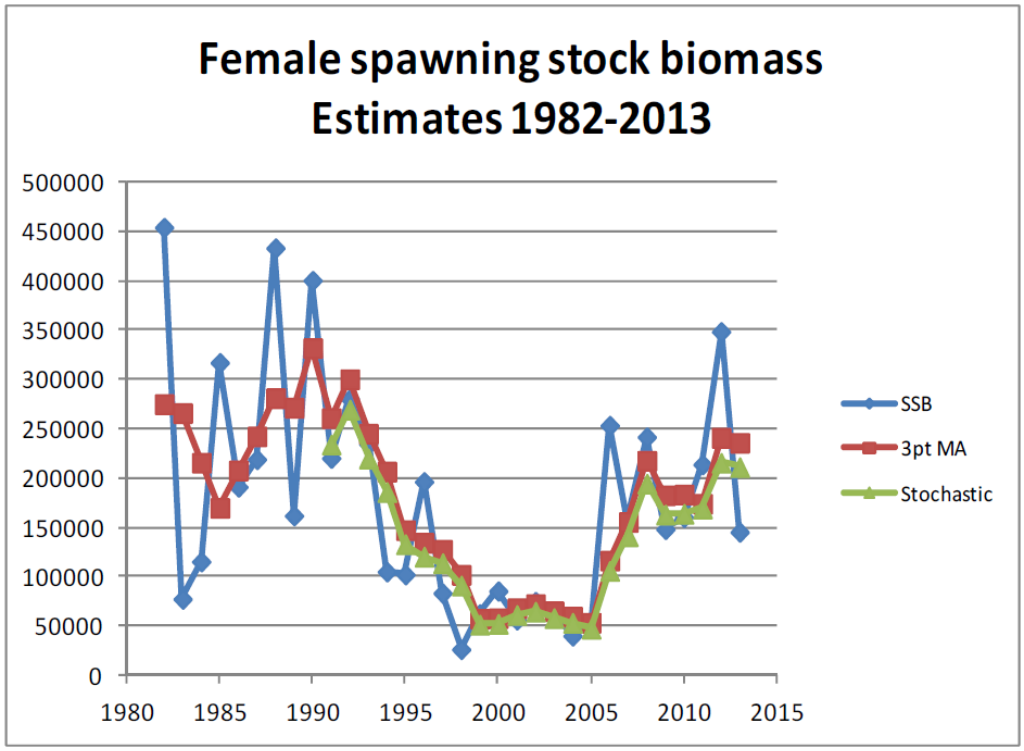

Figure 1. Comparison of alterative swept area estimates of female spawning stock biomass, 1982-2013. Stochastic SSB estimates are available for 1991 to 2013. Year refers to the terminal year in a 3 point moving average.

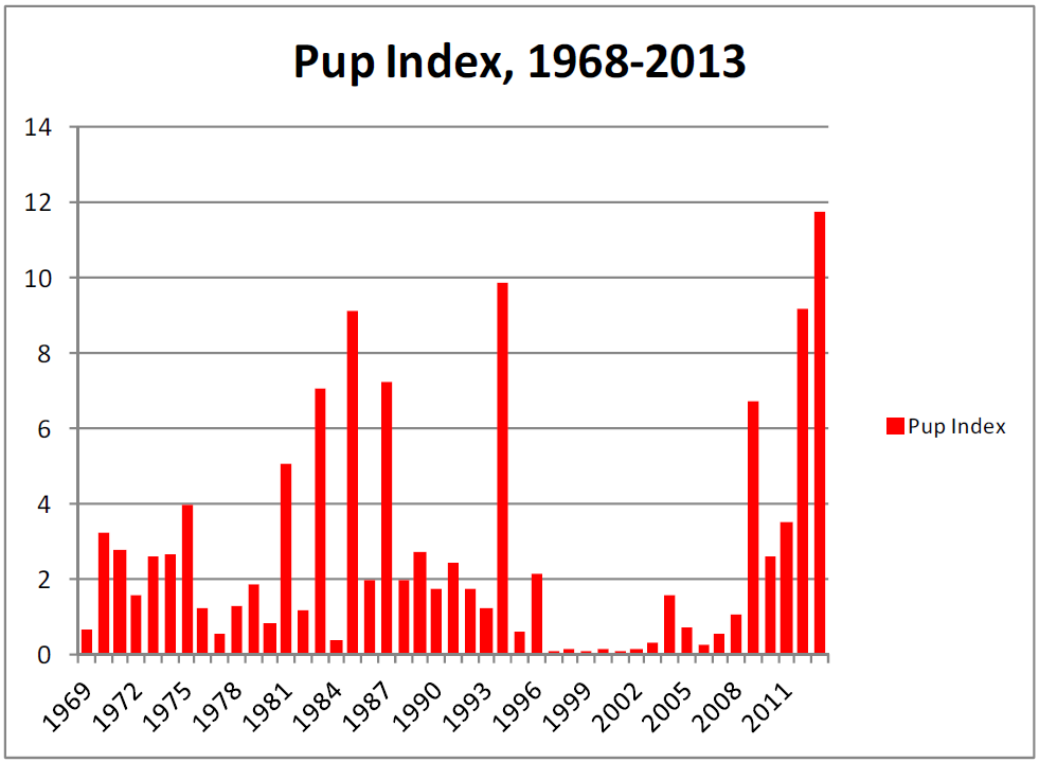

Figure 2. Estimated swept area biomass (mt) of total pups (spiny dogfish<36 cm) captured in the NEFSC spring bottom trawl survey, 1968-2013.

Fishery Performance

At the onset of the domestic commercial fishery in the early 1990's, population biomass for the Northwest Atlantic stock of spiny dogfish was at its highest estimated level (approx. 1.2 billion lb). A large scale unregulated fishery developed and quickly depleted the stock of mature female spiny dogfish such that in 1997 a stock assessment showed that the stock was overfished (NEFSC 1997). The Spiny Dogfish FMP was developed in 1998 and implemented in 2000 in order to halt further depletion of mature female spiny dogfish and allow the stock to recover to a sustainable level. Because the directed commercial fishery concentrated on mature females, rebuilding required elimination of that directed fishery. The rebuilding program was successful and in 2010 NMFS communicated the rebuilt status of the stock to the Councils.

The current (2015) quotas are derived from the recommendations of the Council's Scientific and Statistical Committee (SSC) for Acceptable Biological Catch (ABC), and how various components of fishing mortality are handled by the spiny dogfish fishery management plan, as described in the table below. The trip limit is 5,000 pounds in Federal waters however individual states may set more restrictive possession limits.

Table 1. May 2015 to April 2016 Spiny Dogfish Specifications

2015 Measures	Basis	M lb
OFL		
ABC	*Constant F (0.19528)*	62.413
Canadian Landings	*= ave 2009-2011*	0.143
Domestic ABC	*= ABC - Canadian Landings*	62.270
ACL	*= Domestic ABC*	62.270
Mgmt Uncertainty Buffer	*Ave of quota overages (pct) in 2010-2011*	0.000
ACT	*= Domestic ACL - management uncertainty*	62.270
U.S. Discards	*= ave 2002-2011*	11.605
TAL	*ACT - Discards*	50.664
U.S. Rec Landings	*= ave 2010-2011*	0.053
Comm Quota	*TAL - Rec Landings*	50.611522

OFL = Overfishing Level; ABC = Acceptable Biological Catch; ACL = Annual Catch Limit; ACT = Annual Catch Target; TAL = Total Allowable Landings; Rec = Recreational; Comm = Commercial; M lb = Millions of pounds.

The following pages provide information landings and prices since 2000 (page 4), the progression of landings through the year for the last several years (page 5), landings by state, month, and gear for 2012-2014 (page 6), and vessel activity by several categories of vessels based on landings since 2000 (page 7).

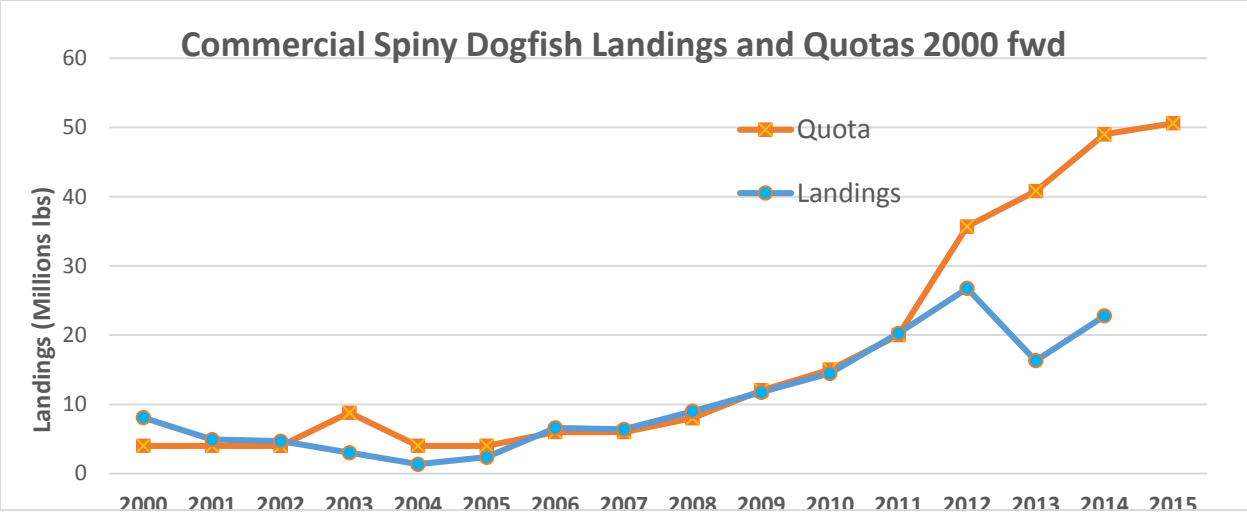

Figure 3. Spiny Dogfish Landings and Quotas 2000-2014. 2014 = May 1, 2014 to April 30, 2015.
Source: Unpublished NMFS dealer reports

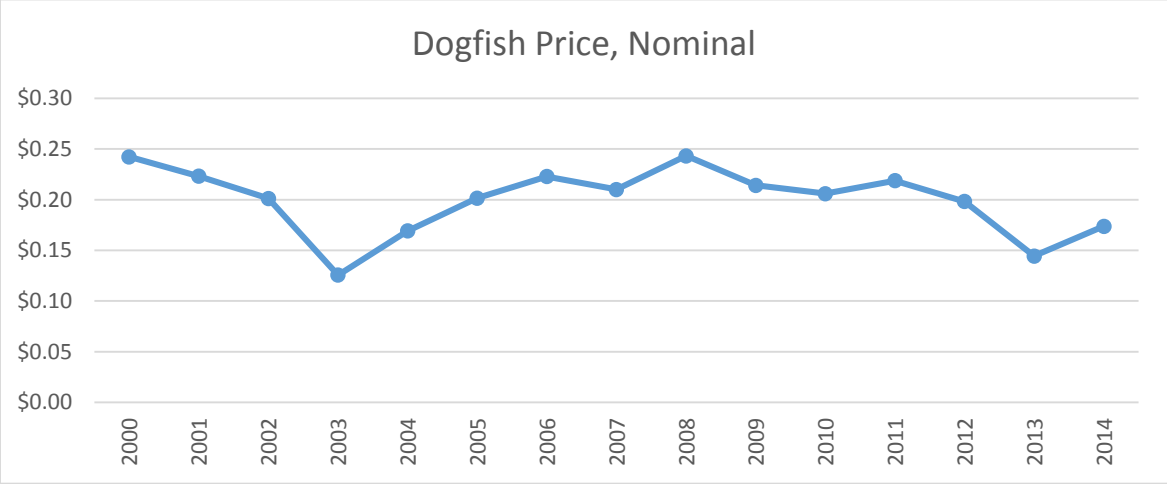

Figure 4. U.S. Spiny Dogfish fishing year ex-vessel prices (Nominal)
Source: Unpublished NMFS dealer reports

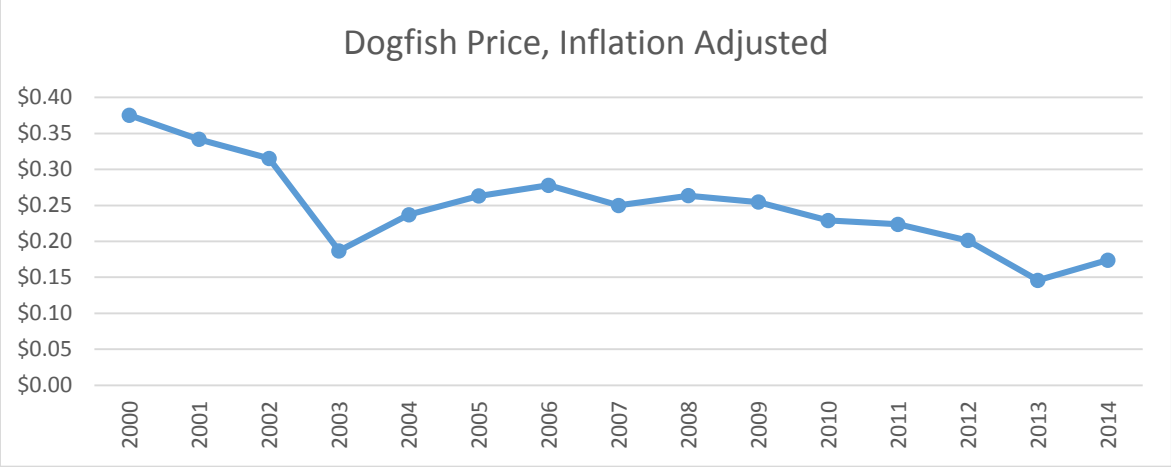

Figure 5. U.S. Spiny Dogfish fishing year ex-vessel prices (Producer Price Index adjusted, 2014 dollars)
Source: Unpublished NMFS dealer reports

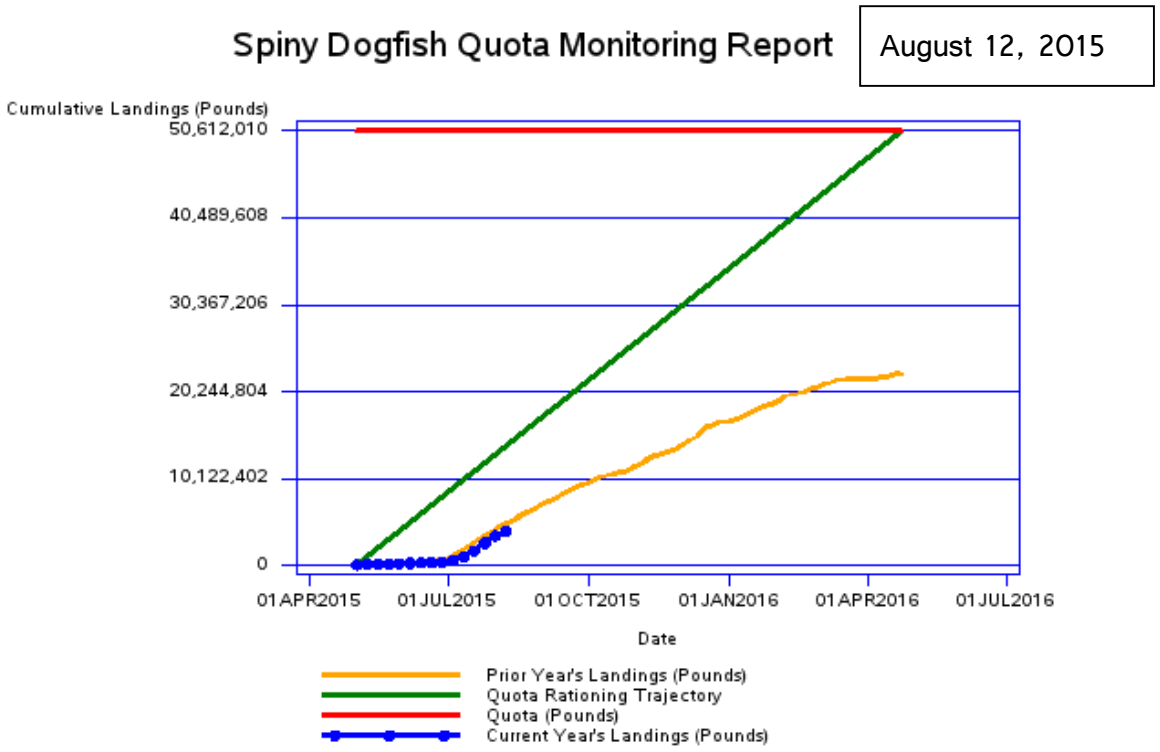

Figure 6. Spiny Dogfish Landings (Blue = 2015-2016 Fishing Year; Orange = 2014-2015 Fishing Year) (Current and Last Year)

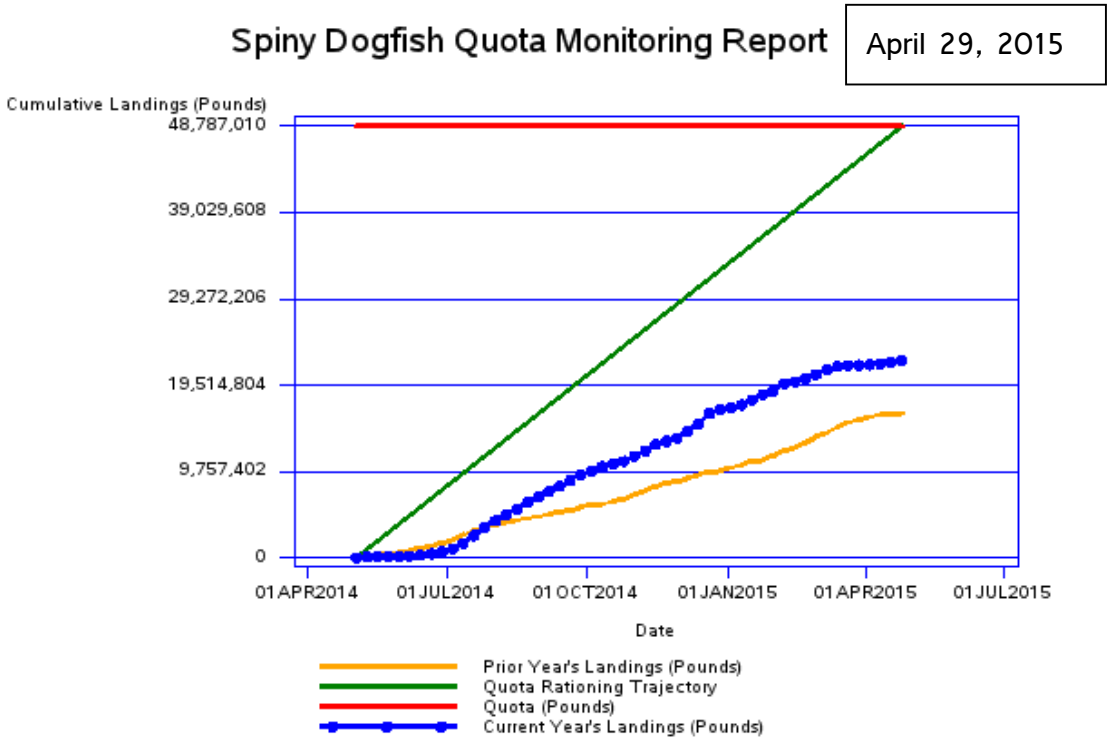

Figure 7. Spiny Dogfish Landings (Blue = 2014-2015 Fishing Year; Orange = 2013-2014 Fishing Year) (Last Year and Year Before)

Table 2. 2012-2014 Calendar Year dogfish landings by state

YEAR	CT	MA	MD	ME	NC	NH	NJ	NY	RI	VA	Other/NA	Total
2012	97,312	13,116,375	1,146,921	226,770	2,177,177	1,811,900	1,531,811	304,486	1,351,344	1,580,651	12,654	23,357,401
2013	21,990	6,216,753	1,121,019	106,610	3,134,810	515,448	1,780,265	82,291	1,000,503	2,157,096	141	16,136,926
2014	21,779	9,436,021	1,049,183	206,933	5,460,146	1,704,651	2,202,747	69,194	694,527	2,553,537	8,857	23,407,575

Source: unpublished NEFSC dealer reports

Table 3. 2012-2014 Calendar Year dogfish landings by month.

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	2,455,965	96,632	134,576	78,289	634,001	1,447,374	3,748,793	3,828,929	4,153,819	2,056,165	2,288,758	2,434,100
2013	1,900,676	1,604,985	1,721,861	942,463	598,222	1,124,305	1,906,873	978,338	1,218,308	1,258,877	1,615,281	1,266,737
2014	1,311,494	2,405,429	1,923,287	696,878	189,940	634,675	3,142,880	2,917,483	2,832,268	1,816,382	2,187,645	3,349,214

Source: unpublished NEFSC dealer reports

Table 4. 2012-2014 Calendar Year dogfish landings by gear.

YEAR	GILL_NET_SINK__OTHER	GILL_NET_SET__STAKE__SEA_BASS	UNKNOWN	LONGLINE__BOTTOM	TRAWL_OTTER_BOTTOM_FISH	HAND_LINE__OTHER	POTS___TRAPS_OTHER	DREDGE__OTHER	Other
2012	11,828,026	2,038,129	1,943,624	3,665,784	1,470,162	1,679,561	375,722	92,292	264,101
2013	8,839,470	2,707,710	1,548,630	858,259	1,335,529	634,092	27,215	85,129	100,892
2014	10,106,427	5,404,446	2,915,679	1,753,834	1,831,855	983,672	29,619	82,222	299,821

Table 5. Number of vessels active in various annual landing ranges (pounds per vessel per year)

YEAR	Vessels 200,000+	Vessels 100,000 - 200,000	Vessels 50,000 - 100,000	Vessels 10,000 - 50,000
2000	30	24	25	122
2001	4	12	11	32
2002	2	14	8	31
2003	4	5	3	11
2004	0	0	0	43
2005	0	0	2	65
2006	0	0	8	117
2007	1	5	17	74
2008	0	11	18	107
2009	0	11	42	191
2010	0	22	42	124
2011	2	55	71	140
2012	20	40	56	181
2013	10	29	42	83
2014	29	34	40	86

Source: unpublished NEFSC dealer reports