Atlantic States Marine Fisheries Commission

American Lobster Management Board

October 22, 2018
8:30 a.m. – 12:30 p.m.
New York, New York

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 *(S. Train)*	8:30 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from May 2018	8:30 a.m.
3.	Public Comment	8:35 a.m.
4.	Review NOAA Technical Memorandum on North Atlantic Right Whale Status and Recovery Challenges *(M. Asaro)*	8:45 a.m.
5.	Report on October 2018 Atlantic Large Whale Take Reduction Team Meeting **Possible Action** *(M. Asaro; M. Ware)*	10:00 a.m.
6.	Discuss American Lobster Addendum XXVII Timeline *(M. Ware)*	11:00 a.m.
7.	Discuss Protocol for Identifying Bait Sources *(P. Keliher; M. Ware)* **Possible Action**	11:10 a.m.
8.	Update from the Electronic Tracking and Reporting Subcommittees *(M. Ware)*	11:40 a.m.
9.	Consider Approval of 2018 American Lobster and Jonah Crab FMP Reviews and State Compliance Reports *(M. Ware)* **Action**	11:55 a.m.
10.	Review and Populate Jonah Crab Advisory Panel Membership *(T. Berger)* **Action**	12:25 p.m.
11.	Other Business/Adjourn	12:30 p.m.

The meeting will be held at the Roosevelt Hotel, 45 East 45th Street & Madison Avenue, New York, NY; 212.661.9600

MEETING OVERVIEW

American Lobster Management Board Meeting
October 22, 2018
8:30 a.m. – 12:30 p.m.
New York, New York

Chair: Stephen Train (ME) Assumed Chairmanship: 02/18	Technical Committee Chair: Kathleen Reardon (ME)	Law Enforcement Committee Representative: Rene Cloutier (ME)
Vice Chair: Dan McKiernan (MA)	Advisory Panel Chair: Grant Moore (MA)	Previous Board Meeting: May 2, 2018
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, VA, NMFS, NEFMC (12 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from May 2018

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. NMFS Technical Memo on North Atlantic Right Whales (8:45 – 10:00 a.m.)

Background

- In September 2018, a technical memorandum was released by NMFS reviewing the status of the North Atlantic Right Whale and factors affecting their recovery. **(Briefing Materials)**

Presentations

- Review of the technical memorandum by M. Asaro

5. Report on October 2018 ALWTRT Meeting (10:00 – 11:00 a.m.) Possible Action

Background

- The Atlantic Large Whale Take Reduction Team met October 9-12 to deliberate on the scope of measures which may be considered to reduce the effects of US fisheries on the right whale population.
- A series of recommendations regarding potential action were developed at the meeting. These will undergo further review ahead of the next ALWTRT meeting in March 2019.

Presentations

- Report on the ALWTRT Meeting by M. Asaro, M. Ware

Board Actions for Consideration at the Meeting

- Consider any management responses to the ALWTRT recommendations

6. American Lobster Addendum XXVII Timeline (11:00 – 11:10 a.m.)

Background

- The Board initiated Draft Addendum XXVII to increase the resiliency of the GOM/GBK stock. The PDT and TC continue to work on developing this document.
- Given there may be regulatory action in response to the ALWTRT recommendations, the Board will need to provide guidance to staff on the prioritization and timing of multiple actions.

Presentations

- Overview of current Draft Addendum XXVII timeline by M. Ware

7. Protocol for Identifying Bait Sources (11:10 – 11:40 a.m.) Possible Action

Background

- Given the results of the 2018 Atlantic Herring Stock Assessment, it is expected that there will be reductions in the Atlantic herring ABCs for 2019 through 2021. This could have impacts on the lobster fishery given herring is a preferred bait source.
- Maine currently has a protocol for identifying alternative bait sources and classifying potential bio-hazards. **(Briefing materials)**

Presentations

- Overview of Maine's bait protocol by P. Keliher, M. Ware

Board Actions for Consideration at this Meeting

- Consider a coastwide protocol for identifying alternative bait sources

8. Electronic Reporting and Tracking Subcommittee Updates (11:40 – 11:55 a.m.)

Background

- In response to final action on Addendum XXVI, the Board established Electronic Reporting and Tracking Subcommittees. The Electronic Reporting Subcommittee is charged with guiding the development of electronic harvester reporting. The Electronic Tracking Subcommittee is charged with implementing a 1-year tracking pilot program.

Presentations

- Updates on the Electronic Reporting and Tracking Subcommittees by M. Ware

9. Fishery Management Plan Reviews (11:55 a.m. – 12:25 p.m.) Action

Background

- State compliance reports for American lobster and Jonah crab were due August 1, 2018.
- The Plan Review Teams reviewed state compliance reports and compiled the annual FMP Reviews.
- Delaware, Maryland, and Virginia have requested and meet the requirements for *de minimis* in the lobster and Jonah crab fisheries.

Presentations

- Overview of the FMP Review Reports by M. Ware **(Briefing Materials)**

Board Actions for Consideration at this Meeting

- Accept the 2018 FMP Reviews and State Compliance Reports
- Approve *de minimis* requests

10. Jonah Crab Advisory Panel Membership (12:25 – 12:30 p.m.) Action

Background

- Marc Palombo from MA has been nominated to the Jonah Crab Advisory Panel.

Presentations

- Nominations by T. Berger **(Briefing Materials)**

Board Actions for Consideration at this Meeting

- Approve Jonah Crab Advisory Panel nomination

11. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

AMERICAN LOBSTER MANAGEMENT BOARD

The Westin Crystal City
Arlington, Virginia
May 2, 2018

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ATTENDANCE

Board Members

Pat Keliher, ME (AA)
Steve Train, ME (GA)
Douglas Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
G. Ritchie White, NH (GA)
Raymond Kane, MA (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
Rep. Sarah Peake, MA (LA)
Jay McNamee, RI (AA)
David Borden, RI (GA)
Colleen Giannini, CT, proxy for P. Aarrestad (AA)
Maureen Davidson, NY, proxy for J. Gilmore (AA)
Emerson Hasbrouck, NY (GA)
John McMurray, NY, proxy for Sen. Boyle (LA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Jeff Brust, NJ, proxy for L. Herrighty (AA)
Tom Fote, NJ (GA)
Roy Miller, DE (GA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
John Clark, DE, proxy for D. Saveikis (AA)
Russell Dize, MD (GA)
Mike Luisi, MD, proxy for D. Blazer (AA)
Pat Geer, VA, proxy for S. Bowman (AA)
Peter Burns, NMFS
Allison Murphy, NOAA

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

Ex-Officio Members

Rene Cloutier, Law Enforcement Representative

Staff

Robert Beal
Toni Kerns
Jeff Kipp
Jessica Kuesel
Megan Ware

Guests

Joe Cimino, NJ DFW
Heather Corbett, NJ DFW
Matt Gates, CT DEEP
Arnold Leo, E. Hampton, NY
Andrew Petersen, Baton Rouge, LA
Melissa Smith, ME DMR

The American Lobster Management Board of the Atlantic States Marine Fisheries Commission convened in the Jefferson Ballroom of the Westin Crystal City Hotel, Arlington, Virginia; Wednesday, May 2, 2018, and was called to order at 1:25 o'clock a.m. by Chairman Stephen Train.

CALL TO ORDER

CHAIRMAN STEPHEN TRAIN: I want to thank everybody for showing up for the American Lobster Management Board meeting. My name is Steve Train from the state of Maine, and I'll be Chair of the meeting. I assume everyone has the packets. Do we have consent on approval of the agenda? Is there any opposition to the agenda; if not I'll assume it's approved? I guess we have consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN TRAIN: Does everyone have the meeting proceedings from our last meeting? Are there any additions, changes or deletions? If there is no objection I'll considered them approved with consent. We have nobody signed up for public comment. If somebody forgot to sign up and would like to speak to something that is not on the agenda, please step up to the microphone. Okay then.

LOBSTER CONSERVATION MANAGEMENT TEAM PROPOSALS TO REDUCE LATENT EFFORT

CHAIRMAN TRAIN: The fourth item Lobster Conservation Management Team, the LCMTs Proposals to Reduce Latent Effort, there is four bullets. Review Board Task Regarding Latent Effort, Review the LCMT Proposals, Discuss the Board Goals/Objectives Regarding Task, and Consider Board Action in Response to the Proposals. Megan will bring us through this. There is a potential action here; and if there is action it's going to require an addendum. Megan.

MS. MEGAN WARE: At the 2017 Annual Meeting, the Lobster Board tasked all of the LCMTs with developing proposals to reduce latent effort. To provide some context for this tasking, in August the Board decided not to move forward with Addendum XXV for management use in southern New England.

REVIEW BOARD TASK REGARDING LATENT EFFORT

MS. MEGAN WARE: As a result they established a workgroup to discuss future management of that stock. In October the Workgroup identified potential paths forward; including a recommendation to reduce latent effort in LCMAs 4, 5, and 6. The Board decided to task all LCMTs with assessing levels of latent effort; and developing proposals to reduce latent effort in the fishery.

REVIEW OF THE LCMT PROPOSALS

MS. MEGAN WARE: Proposals were received by Areas 4, 5, and 6. For Areas 4 and 6, separate proposals were submitted by each state; given the state's managed trap allocation separately. Some of the other LCMTs have indicated initial discussions amongst state staff; but no proposals have been developed. As a reminder, Areas 2 and 3 are going through a series of trap allocation reductions; aimed at scaling the size of the fishery to the size of the resource, and Year 3 will be impacting the 2018 allocations. I'm now going to go through each of the proposals. For Area 4, the New York proposal is to reduce permit holders trap tag allocation by 50 percent if they haven't reported actively fishing 50 days during 2013 to 2017. For this proposal, actively fishing means the permit holder must have reported fishing for any species; not just lobster. The minimum allocation would be capped at 50 traps; and this proposal is expected to decrease trap allocations by 19 percent.

The proposal does note considerations for federal waters; particularly that reducing trap allocations for some permit holders rather than a percent reduction across all of the Area 4 permits would be akin to a new trap allocation program, and state and federal decisions on revised allocations would have to match, in

order to avoid a disconnect on the number of traps a permit holder can fish.

Next is the Area 4 New Jersey proposal. Consensus was not reached at this meeting. There was concern about the validity of New Jersey permit information; since federal permits are not required to report through VTRs, and were only recently required to report to the state. Two concepts were put forward in the proposal; the first was status quo, and rationale for this was that New Jersey has had a moratorium on permits since 2002, and the number of permits has decreased from 42 in 2008 to 32 in 2017.

Another concept put forward was latency by owner, not vessel. Several active harvesters possess multiple lobster permits; but due to the poor stock status, have not utilized all permits in recent years. As a result if a fisherman actively fished on one permit, the recommendation was that all lobster permits under their possession would be exempt from latency.

Next is the Area 5 proposal; and their proposal was for status quo or natural attrition. Rationale for this was that permit numbers have decreased from 28 permits in 2009 to 26 permits in 2017. Traps allocated to each fisherman are based off of historical allocations and cannot increase. The Delmarva states contribute less than 3 percent of landings in southern New England, and less than 0.1 percent of landings coastwide.

Harvesters in the region really participate in the multiple fisheries; and their choice on which species to harvest depends on market, quotas, availability, et cetera. Next is the Area 6 Connecticut proposal. There were two options here. The preferred option was status quo. Rationale was that there is a substantial decrease in effort in Long Island Sound since 1999.

Connecticut, their commercial fishery statutes were amended in 2015; and mandate yearly renewal of limited entry lobster licenses. In the initial year of this program, trap allocations fell by 46.7 percent. The non-preferred option was a trigger approach. Through this approach trap reductions would be required if there is an 80 percent increase in the number of lobster traps actively fished.

The baseline here would be 2016; so that would require an 80 percent increase from 2016 levels. If that were to be triggered, then we would go to the table on the right; and the trap allocation reduction would be based on the number of years fished between 2013 and 2017. As an example, if a fisherman fished four out of those five years that individual would have a 20 percent allocation reduction. The proposal did note trap allocations at 50 traps or fewer would not be reduced; and it's expected that if this were to trigger, it would reduce the state's trap allocation by another 41.8 percent from 2017 levels. Finally we have the New York Area 6 proposal. Consensus was not reached at this meeting; but the proposal included three of the options that were discussed.

The first option was status quo; and rationale for this was that New York has a moratorium on lobster licenses, and there is no trap transferability. Then trap allocations have decreased on average by 4 percent each year since 2008. Another option that some members supported was an 800 trap cap; and that would result in about a 30 percent reduction in allocations.

There was also some consideration of increasing the cost of trap tags to a dollar; as this would limit the purchase to the amount permittees intend to fish, and funds could support research. The third idea was to decrease allocations on non-active permits. Some of the other members proposed that permit holders who haven't submitted at least 50 harvester reports, and that would be for any type of fishing, in the last five years would A,

have their trap allocations reduced by 50 percent, or B, have their trap allocations reduced to 800.

Those are the proposals we received. Going through these I just had some staff observations. The first is that these LCMTs are all using different definitions of active permits. Some people are thinking of permits associated with lobster landings. Some are thinking about permits associated with landings of any species. Some are thinking about permits that are renewed; that may not have landings.

Then some are thinking about permits that are owned by a fisherman that has at least one permit with landings. There are also a variety of response levels. Some are proposing action after a trigger is met. Others are proposing a reduction from current levels, and then others are recommending natural attrition.

DISCUSS BOARD GOALS AND OBJECTIVES REGARDING TASK

As a result, it may be helpful in the future to be more specific in the tasking of LCMTs. For example, what does the Board consider to be latent or active effort; and is there a desired percent reduction in trap allocations? The primary question for the Board today is the Board interested in reducing latent effort via these LCMT proposals?

I think very much akin to that question is thinking about the future management of lobster, what priority level would the Board give this potential action? Just as a reminder, there are several other discussions and actions ongoing. We have the 2020 stock assessment; which is being worked on by the TC and Stock Assessment Subcommittee. We have Addendum XXVII, which is being worked on by the TC and the PDT.

Then there are ongoing whale discussions; which is primarily staff and state personnel. If the Board is interested in pursuing one of these proposals that would require an addendum; and some of the questions for the Board to think about are is this action specific to LCMTs, or a biological stock? How does the Board want to define latent effort; and what is the goal or target of the Addendum? With that I will take any questions.

CHAIRMAN TRAIN: That was a very good presentation; and the summary towards the end to bring it all back into the specific questions was helpful. Do we have any questions for Megan? I guess that was really good. Okay if there aren't any questions, is there anybody that thinks we have an action item here at this point, remembering that this will require an addendum? This might not take long. Okay, can we get the Law Enforcement Committee report? Oh, we've got somebody's hand up. Go ahead, Dan.

CONSIDER BOARD ACTION IN RESPONSE TO THE PROPOSALS

MR. DANIEL McKIERNAN: I can't help myself here. I just want to have the Board recall what we did in Area 2 about ten years ago; for a couple of reasons. First, there was an effort control plan that was enacted through an addendum; that when we went to the National Marine Fisheries Service, they basically said it was a nonstarter.

In other words, the rules that the fishermen had developed in terms of the eligibility for traps, given a certain level, NMFS rejected it. It's critical that if we do anything, other than Area 6. NMFS has to be a partner and really embrace this; because if you get too far down the road and NMFS won't adopt it, then you've wasted everybody's time.

Then the other issue is because Rhode Island and Massachusetts have driven out most of the latent effort in Area 2, and continues to cut traps in a way that we think is going to get to bone within the end of that schedule. I think it's really an issue that the states of Connecticut, New York, New Jersey and others really need to address personally; in terms of

administrative burden, because what you're seeing on the board is a lot of work that I don't think is going to pay dividends for lobster conservation.

As someone recently said at the last two meetings we decided not to regulate the active lobster fishery; and now we're thinking about regulating the non-active lobster fishery. It is just counterintuitive. I think if the other states want to proceed with the National Marine Fisheries Service, then we can hear from them. But I think it's not wise at this time; based on what I see in terms of some of the chaos, the lack of consistency, the lack of terms, and lack of definitions.

CHAIRMAN TRAIN: Is anyone else having second thoughts on speaking on this topic?

LAW ENFORCEMENT COMMITTEE REPORT

ENFORCEABILITY OF ROPELESS FISHING

CHAIRMAN TRAIN: Okay under the Law Enforcement Committee Report, Rene, do you have it?

MS. WARE: I'm going to jump in before Rene; an intro. We'll wait for the presentation to get up, thank you. Just some very brief background; so everyone is on the same page here. There have been several ongoing discussions regarding the role that human activities have on right whale populations.

This has been primarily prompted by the decline of the right whale population since 2010. Specifically there have concerns about the entanglement of right whales in fishing gear. A subgroup of the Take Reduction Team was formed to investigate the feasibility of ropeless fishing, and then also in February the Board tasked the Law Enforcement Committee with reviewing the enforceability of ropeless fishing in the lobster fishery.

While some members have been involved in the discussions on ropeless fishing; others have not. As a result these slides are intended to provide a baseline of what ropeless fishing could mean. The intent of this overview and the Board's discussion today is not to analyze these technologies; but to provide context for Rene's discussion. For full transparency these schematics are borrowed from others. Ropeless fishing at the most basic level means the elimination of vertical lines from the water column.

This is proposed to be done through an acoustic modem; which sends an acoustic signal to a trap, and either triggers its release or the release of a rope, so that the trap can be retrieved. Here are some schematics for different retrieval methods. One idea is a lift bag; which would upon a trigger from acoustic modem inflate a bag, and then lift the trap to the surface of the water column.

This idea comes from the salvage industry. Another idea is to have a spool; which upon trigger would unwind through the water column, providing rope for the trap retrieval. This is not a complete list of the different ropeless prototypes; but hopefully this provides some visual images of what ropeless fishing could mean, and provide context for Rene, now Rene, on to you.

MR. RENE CLOUTIER: Hello everyone, my name is Rene Cloutier; I'm the LEC representative to the Lobster Board. The LEC met on May 1, to discuss the enforceability of ropeless fishing. We outlined five primary concerns with enforcement of current technology. Consensus statement is that significant enforcement concerns about the technology as presented.

I want to also say that I've been to several ropeless fishing seminars; and a lot of the equipment they're talking about is yet to be developed. We're being asked to say how this would work if we could make this work. The first one is the inability to enforce current lobster regulations, trap tag allocations and

vent sizes are management measures which are verified on the trap and require gear retrieval. If measures cannot be enforced, there is greater incentive for cheating and reduced conservation in the fishery. The third one is the inability to enforce regulations is detrimental to a sustainable lobster fishery. Our second concern was additional cost in time required to retrieve ropeless fishing gear.

Ropeless gear will require new retrieval technologies and the ability to reset the gear. These are higher cost technologies; which will require greater enforcement time. Multiple technologies mean enforcement vessels will need to have multiple retrieval methods. Then we get into the security of the location information.

Who is the gate keeper of the information that is going to be stored? How do we protect against fishermen stealing acoustic frequencies? There is limited ability to conduct covert operation if a fisherman is notified every time a trap comes to the surface that is a very big concern for us. Four is the limitation of enforcement vessels.

Technologies require additional deck space to store spools, rope, bags, et cetera. This results in limits on the amount of gear that enforcement can haul and inspect. One of the technologies that we looked at that is available, and they're using in Australia right now. A Maine fisherman went over and fished with the guy for a day, an entire day he fished 14 traps. The scale of it is just completely different when you come back to the northeast. Ropeless technology involves all vessels; with no buoys, no surface system to indicate where traps are located. This means that all vessels, including mobile gear, all the draggers, everything else that's towing anything around in the ocean, will have to have the technology onboard, not only to determine that his traps are there, but what direction they're going in. The gear conflicts that we see just among fixed gear fishermen are a giant, and then when you involve mobile gear it just gets a lot bigger. Does anyone have any questions about ropeless fishing?

CHAIRMAN TRAIN: Go ahead, Ritchie.

MR. G. RITCHIE WHITE: I've heard that this technology is ten years away. Do they talk about what they're going to do in ten years? This clearly is not workable today; so what are they talking about that they can figure out that would make it workable?

MR. CLOUTIER: Like I said earlier at the beginning, this technology some of it is there, some of it is yet to be developed; so we really can't comment on what's going to happen in ten years from now. We all have smart phones now and 20 years ago nobody said that would ever happen. But this is a lot bigger than that probably.

CHAIRMAN TRAIN: I saw a hand over here, Colleen.

MS. COLLEEN GIANNINI: Rene, aside from the operational inefficiencies, I always think about budgetary limitations. Did they give you all any kind of an idea, like what it would cost say an enforcement vessel to outfit?

MR. CLOUTIER: They were very vague about the cost. They said that the cost should be passed on to some government agency or something; it shouldn't be passed on to the fisherman. But just something that maybe a lot of you can equate is the lift bag. What that is; anybody that dives they have a little buddy pack, in case they have problems with air.

Those are fairly expensive; so that's what's hooked to that thing. That whole thing, that whole system would be cost prohibitive. When that bag comes to the surface you need to be right there; because it's an opening in the bag, and that bag isn't going to hold that air forever, it's going to lay down in the wind and that's going to sink. There are a lot of questions with this whole technology; all of it.

CHAIRMAN TRAIN: Emerson.

MR. EMERSON C. HASBROUCK: I know that there are acoustic releases that are currently being used in oceanographic studies. They are fairly expensive. I mean you're talking about at least a couple thousand dollars for the unit that's in the water that's going to release whatever you want it to release; as well as at least a couple thousand dollars for the deck unit to communicate with what's underwater, to trigger it. In terms of what's available now, it's fairly expensive. Whether it's for a lobsterman to put it on his boat and put it on his traps, or for a law enforcement entity to put it on their boat.

MR. CLOUTIER: Agreed. One of the technologies was probably 18 inches long, maybe 4 or 5 inches through it. In order to make that work you took a little piece of filament wire, threaded it through there, had to tighten off both ends of it just right and it is filament wire. You're trying to do that with gloves on. It just didn't seem very practical.

CHAIRMAN TRAIN: Sarah Peake.

REPRESENTATIVE SARAH PEAKE: Wearing my Legislators hat here, since I sit here as a Legislative member. What strikes me is for myself and my colleagues who are either proxies for or actual legislators who are here. If this technology is ten years out, now is the time for us to start to lay the groundwork about the importance of this industry in our respective states.

I'm thinking about Massachusetts, where we spend something north of a hundred million dollars a year in film tax credits, in order to support that industry. We're about to take up a tech industry bond bill, to invest another hundred, hundred and fifty million dollars in the tech industry; the same thing for the biotech industry.

What this is to me is a wakeup call that what we're talking about is not nearly that much funding. The research seems to be being done through other funded agencies. But the lobster industry and the fishing industry are important industries certainly in the state of Massachusetts; and as I look across the aisle here to my colleagues to the north in New Hampshire and Maine, it's still a critical part of the economy in our coastal communities.

I think that we need to really start making the case that although it's an old and traditional industry, it is still a viable industry that sends a lot of kids to college, and puts a lot of meals on people's dining room tables, and puts a lot of roofs over people's heads, and offers a good way for a lot of families to earn a very sustainable living.

Let's start having those conversations when we go back home, with the folks that have an eye on economic development, environmental issues. I mean this is where economic development and environmentalists can and should come together. The Center for Coastal Studies should be as concerned about this and looking for funding support as the Mass Lobsterman's Association is.

When I spoke with the Executive Director of the Mass Lobsterman's Association at Ag Day at the State House in Boston, I said wow, these things are expensive. Her response to me was, yes but Sarah, who is the lobsterman that wants to be responsible for entangling the last right whale. That is sort of the point that we're coming to on this.

CHAIRMAN TRAIN: Dennis Abbott.

MR. DENNIS ABBOTT: I sat in on the LEC meeting yesterday when they had the presentation made to them. I appreciate Representative Peake's remarks. But I think we're really at this point so far away from the practicality of this; and I think the Law Enforcement Committee acknowledged that.

Several of them raised their cell phones up and said you know 20 years ago or X number of years ago they didn't believe the technology would be available. However, it just seems that at this point in time that we're way ahead of looking at this very serious, not very seriously, but we're just in the beginning stages, and looking at the economics of it and the issues with Law Enforcement that it's really at the moment I think sort of pie in the sky to think that we could have this. It's technologically possible, but practically possible from every angle, from the Law Enforcement angle, from the lobstermen's point of view, from others that use the ocean and the resource.

It's just a difficult situation; but one I think we should keep our eyes on and do what we can, and it's just to monitor things as they move forward. We all recognize the problem with the right whales. We can't not acknowledge that and make efforts to do something about entanglements. Well, I'll leave it at that.

CHAIRMAN TRAIN: I think we just heard two divergent opinions on this; they're not totally separate. Unless we have something different than those two, would the Board consider sending a letter, kind of incorporating both of those; that this technology has a lot of promise, but we're not ready for it yet? The enforcement has something like that. Should we be sending such a letter, or are we just going to sit here and wait for the next thing to come around? Pat Keliher.

MR. PATRICK C. KELIHER: I think we should send a letter; but I see nothing in the technology that holds any promise. I don't want to diminish the fact that technology in the future couldn't play a role here. But as it exists, and I think this gets to Representative Peake's point. There needs to be investment in that technology for the future.

I don't disagree with that. But I think in the statements that I've made to the subgroups, the TRT Subgroups is, and the NGOs, you should be focused on that technology. But right now this is a non-starter when it comes to enforcing the conservation rules and laws that we have set up to protect this fishery. We've done a good job at doing that.

I don't want to tie the hands of, in my case the Maine Marine Patrol, in doing their jobs. We haul somewhere between 20 and 30,000 traps a year; and if we don't have the ability to do that trap limits don't matter, there will be no escape vents, they will be able to block those escape vents without our knowing. We will see rampant problems with the enforcement.

I would support a letter being sent, and I don't know what the motion should look like. But a letter being sent that after review of the Law Enforcement Committee at ASMFC; that the Commission does not support ropeless fishing at this time, and would certainly be willing to reengage in the topic once technology is advanced.

CHAIRMAN TRAIN: Ritchie White, you had your hand up before. You're good. Doug Grout.

MR. DOUGLAS E. GROUT: Yes, and based on the conversations I've had with my staff who is on the Large Whale Take Reduction Team, there is a subgroup that is working on this that was looking into this. They were the ones that came back to me with the conclusion that they were unanimously going to have to recommend that this technology is ten years away.

That's another issue about making this viable; because what they're looking at is trying to put something in place sooner, rather than ten years from now, because if we're having problems with mortalities with whales, they are looking at something that can be done in the short term. Now whether that's something that would be done here in the U.S. or in Canada, I don't know. But I think that's another point that it's reason not to move forward with this right now, because we need to do something sooner rather than later.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Maybe I missed it, but who would this letter be addressed to; is it GARFO, Take Reduction Team, to ourselves?

MS. WARE: I think it would be to GARFO, is my understanding.

CHAIRMAN TRAIN: David Borden, then Pat Keliher.

MR. DAVID V. BORDEN: I support what Doug and Pat are advocating here; I think it's appropriate. I also attended the Enforcement Committee meeting, and I thought that was a good discussion pointing out a lot of the nuances of the implications of this. I would also point out that I've attended as a member of the Take Reduction Team.

I have attended a number of meetings where the same technology had been discussed, and the lead advocates for the technology acknowledged that it's at least five years away. This won't come as any shock to anyone that more time is needed. I think it's also important for us to support the positions that the Enforcement Committee advocated, because they are legitimate concerns, and have to be addressed as part of the process.

We don't want to necessarily go forward with one strategy that works on whales, but causes significant problems in terms of lobster conservation. It's a net loss for us. As far as addressing the letter, Mr. Chairman, I think it should go to Mike Pentony and David Warren, who is the head of the program that is considering this technology.

CHAIRMAN TRAIN: Pat.

MR. KELIHER: The Ropeless Fishing TRT Subgroup did meet. There was conversations that resulted from input from the Commonwealth of Massachusetts in regard to the closed areas that you guys deal with; and I think that is frankly the perfect spot for some of this technology to be looked at, because if it gives the ability of your fishermen to be able to access these closed areas while at the same time protecting right whales. By all means I think that is a very appropriate place to try to determine if that technology is even feasible.

CHAIRMAN TRAIN: Dan.

MR. McKIERNAN: Pat is right. If I could identify one really important thing I would like to see in that letter is to urge GARFO to work diligently to approve experimental fisheries to test out some of this gear in the ocean. We have a closure in Cape Cod Bay, and elsewhere around Cape Cod, February through April.

We just extended that closure because we have over 100 right whales in Cape Cod Bay right now. We're probably going to extend it another week; hoping that the whales leave soon. But we are interested in trying out this technology. I did speak to the proponents of some of the folks from WHOI, Woods Hole Oceanographic Institute. But I guess I was a little disappointed when we had that seminar down at Woods Hole. I don't think the National Marine Fisheries Service really understood the urgency to try to get this stuff tested in the water; or if they do, I think maybe the first task is to facilitate an easier path forward to get the gear in the water and test it out.

CHAIRMAN TRAIN: Peter Burns, are you volunteering to receive the letter?

MR. PETER BURNS: Well, not specifically no. But I can get it where it needs to go, I guess. But no, I was just going to add that this is an important problem and there aren't a lot of solutions out there right now that are being vetted. I certainly understand the implications with the costs and with the limitations in the technology right now; and also with the limitations on enforcement.

But as I heard people say at the Law Enforcement Committee meeting that they

didn't want to dismiss it out of hand, because they know that the technology could potentially improve over time, and that could change things. Certainly we had some interest on the part of the lobster industry, like Mr. Keliher said.

They might be interested in looking at some pilot programs to test the feasibility of these technologies under certain circumstances. That is certainly a good thing forward. I guess that is just my thought going forward is just to certainly understand the limitations on these types of technologies, but also in the absence of other types of alternatives here, I think it's something still worth considering.

CHAIRMAN TRAIN: Ritchie White.

MR. WHITE: I would suggest the letter also include that we're clearly on top of this issue as new technology comes available we'll be reconsidering this on a regular basis; something to soften it a little bit.

CHAIRMAN TRAIN: I see a hand going up in the back; and I can't tell who it is. My eyes aren't that good. Go ahead.

MR. ARNOLD LEO: It's Arnold Leo. I represent the fishing industry of the town of East Hampton, Long Island. Actually I have a question. I realized I'm really puzzled how entanglement occurs on these lines which are single lines from a buoy down to the bottom. Can someone explain that to me?

MS. WARE: I'll try my best, Arnold, but my sense is that there will be some acting in this. When a whale approaches a line it hits it, and it gets a little nervous and it might spin. It's that spinning of the whale in the water column which causes the wrapping.

MR. LEO: You're telling me that the whale actually spins around and wraps the rope around itself?

MS. WARE: Unintentionally so, but yes that is what happens.

MR. LEO: Okay thanks. It does sound farfetched, but I gather there is evidence that that has been happening.

CHAIRMAN TRAIN: David Borden and I think that has been enough on this topic.

MR. BORDEN: Well, I was going to suggest Mr. Chairman that it seems to be a consensus around the table to send a letter, and unless somebody objects, my suggestion to you is we just allow the staff to prepare a letter on behalf of the Management Board, reflective of the discussion today, and then present the results to the Policy Board tomorrow.

CHAIRMAN TRAIN: Toni, you have input?

MS. TONI KERNS: I was just going to say we just make a recommendation to the Policy Board that the Commission send the letter.

CHAIRMAN TRAIN: Okay so a letter will be sent either from us or from the Commission; recommendation to the Policy Board, if they don't send it we will.

MS. KERNS: No. The Policy Board would have to approve that letter; so the letter will only be sent if the Policy Board approves it. Individually as states you can send your own letters, if the Policy Board does not approve it.

CHAIRMAN TRAIN: Do we have any Policy Board members present, we can get this up? No, I'm kidding. Okay we'll finish that up and we'll pass that to the Policy Board for recommendation. I'm going to jump back to Item Number 4 quickly, just to see if anyone here wants to reconsider. We moved through it. We presented it. There wasn't much; and if anyone wants to reconsider anything on that re-tasking or anything else, before we jump down to the next item. Pat.

MR. KELIHER: I don't want to reconsider. But in light of the lack of conversation around Board action as it deals with latent effort. I'm wondering if we should be doing any additional work regarding latency. The LCMT-1 within the Gulf of Maine with Maine, New Hampshire and Mass, we talked about doing this.

The state of Maine has done a lot to engage the industry to try to address latency. Latency does become a hot button topic within our state and how to address it. We've advanced legislation to try to address it; it has failed. But frankly, and I've said this to several of you. We caught 130 million pounds two years ago, we caught 110 million pounds last year, and we still have a thousand licenses that are not active.

If that latency wasn't going to be active during the height of this fishery; when is it ever going to be active? It becomes in my mind kind of a state issue on how we deal with it. I'm going to have to be dealing with 100 percent lobster reporting and there is still going to be a price tag to that. If I got rid of latency, and the tags associated with latency, you think I've got a budget problem now. Wait until that happens; when those licenses aren't purchased and when those tags aren't purchased. I would just as soon not do anymore work in regards to conversations around latency; if there is no interest in the Board to take any action.

CHAIRMAN TRAIN: Dan McKiernan.

MR. McKIERNAN: Yes thanks Pat for reminding me. We did have a couple conference calls since the last Board meeting; and the three states of New Hampshire, Maine and Massachusetts, we talked about the potential to convene the LCMT in the future to talk about this. It's not just for the resiliency issues of a potential declining Gulf of Maine/Georges Bank stock.

But it's inevitably part of the conversation when you talk about right whale conservation; in terms of the number of vertical lines. We've decided as a group of three states that we would work collectively on kind of a white paper that compares and contrasts each of the jurisdictions permitting rules, statistics about active permits, without necessarily a proposal or any kind of changes in policy intended.

But just to inventory it, because as someone who deals with permitting in Massachusetts, I don't always understand the range of permitting issues in the other states. Of course NMFS would be valuable to include as well; and so this is something that we've created outlines. We intend to bring this to the Board in the future. I was remiss in not bringing that up.

I imagine our goal is probably if not by the next Board meeting, probably by the end of the summer we would like to complete that. I'm speaking for myself; but I think that was the consensus of the group. Then in the Area 2 Zone, we've been talking with the state of Rhode Island about trying to assess the actual performance of the effort control plan that is well on its way to driving out effort, including latent effort. We want to continue to track that progress, and to demonstrate whether that plan is working and to what extent.

Those two issues are ongoing. Jay and I have been talking about, comparing notes, because sometimes the vessels can move from one state to another. If you're not doing it jointly you can see an increase in one state, when in fact there was an overall decrease in the zone. Those two issues are ongoing. I just want to let the Board know that.

CHAIRMAN TRAIN: David Borden and then Doug Grout.

MR. BORDEN: A quick point, Mr. Chairman. I totally agree with what Dan said; and I won't repeat it, but I think we're going to have an evolving need to go back and revisit this issue as this issue kind of comes together with whales and some other issues that seem to be developing.

I would hope that over the next six months at some point, we could get the type of report that Dan has been characterizing. Then we'll know a little bit more about where we stand; in terms of some of the whale issues, and there may be a need to kind of bring some of these issues together and try to find solutions that cut across all of those types of alternatives.

CHAIRMAN TRAIN: Doug.

MR. GROUT: As we've had this discussion between the three states dealing with LCMA-1. I originally when this was brought forward, I thought of this as a way that at least we could potentially consider some mechanism to build resiliency into this particular lobster management area. I think it's a good idea to continue to move forward with a white paper; to at least see if there is some mechanism that we can utilize out of that for building resiliency.

The state of New Hampshire is already, at the request of our lobster industry, been trying to address some of our latent effort, and in fact have effectively removed several hundred latent licenses out of our licensing, just ones that weren't being used. We're going to move down this road anyways, whether this is done through the ASMFC or just at the state level.

CHAIRMAN TRAIN: Colleen Giannini.

MS. GIANNINI: Kind of just a follow up question to the indexing that Dan was talking about. Will that include any kind of accounting for individuals with multiple federal permits? I mean I do agree with that 800 cap and the systematic reductions for a single federal permit holder. It is addressing latency. But it was my understanding that there are still individuals out there with multiple permits for the same management area, above 800 or above the reduction would then be latent.

CHAIRMAN TRAIN: Go ahead, Dan.

MR. McKIERNAN: Yes, Colleen. That was brought to our attention in the conference call; and we would want to describe and then maybe partition those permits that we know are held by active fishermen but remain unfished. We see this in Area 2, because with the trap cuts that are still coming, we have fishermen who have obtained and have pocketed second permits as sort of their own personal trap allocation bank. We'll do our best to describe the status of those permits that is a little bit separate than simply an unfished permit, an unfished business really.

CHAIRMAN TRAIN: Okay, I'm the one who brought that back around; and it appears that the states can do what they want, and we're not going to act as a Commission on it. Is that understood? Pat, go ahead.

MR. KELIHER: I would just say, Mr. Chairman, I think my point was to bring it up in relationship to possible Board action; the issues that Dan brought up, and David as well in regard to cataloguing some of this information, in particular to the whale conversation I certainly understand and support. We'll do our part.

PLAN DEVELOPMENT TEAM UPDATE ON THE LOBSTER DRAFT ADDENDUM XXVII

CHAIRMAN TRAIN: Okay, we have a PDT Update on the Lobster Draft Addendum XXVII. Megan.

MS. WARE: This is just a very brief update on the progress of that Addendum. As a reminder, the Board did initiate Addendum XXVII in August to increase the resiliency of the Gulf of Main/Georges Bank stock; by considering the standardization of management measures across LCMAs. The Addendum is intended to be a proactive-management action in response to signs of reduced settlement; as well as the joining of the Gulf of Maine/Georges Bank stocks following the 2015 stock assessment. With Addendum XXVI complete, the PDT has focused its attention onto Addendum XXVII, and we've started to develop that document. Then

the TC is also in the process of starting analysis for the Addendum. This will be one of the discussion topics at their upcoming meeting; which is in about a week and a half. Just to update that the work is going on for Addendum XXVII, and a reminder that the Board did initiate that Addendum; so that will be something we continue to work on.

CHAIRMAN TRAIN: Questions for Megan. Pat Keliher.

MR. KELIHER: Megan, can you remind me. The way we move forward with this Addendum, does it include the – I know it's about resiliency – but does it include the discrepancies between the minimum sizes throughout the range, to get at this issue of commerce that keeps popping up?

MS. WARE: Yes, so it would include considering standardization of measures; such as the gauge sizes. That would be included, yes.

CHAIRMAN TRAIN: Is there anybody else? Megan, you're on a roll this week. You've got shortened meetings. Is there any other business**?** Peter Burns.

OTHER BUSINESS

MR. BURNS: Just an announcement, really. All the talk about resilience here is making me realize that I wanted to let everyone know that we're having a Fishing Community Resilience Workshop down in Cape May, New Jersey on Monday, June 4. This is co-hosted by the Greater Atlantic Regional Fisheries Office, and also our Northeast Fisheries Science Center.

This is something that stems from our recent strategic plan that tries to figure out ways how we can help communities be more resilient in the wake of changes in fishing regulations, fish stocks, and climate change and other things like that. We had our first workshop last June in our Gloucester Office, and we were graced and privileged to have our own Pat Keliher and Mike Luisi there as VIP speakers. They are off the hook for this one I guess, although you guys are certainly welcome to come. But we have ASMFC Chair Jim Gilmore is going to be giving a presentation at this workshop too. If anyone is interested in coming, please let me know, I can make sure you get the registration information. But we're looking forward to it. We have two mayors from southern New Jersey who are going to be speaking at the event; as well as members of the commercial fishing industry and aquaculture industry. I hope you can come. Thank you.

CHAIRMAN TRAIN: Thank you, Peter; Pat.

MR. KELIHER: I don't know if this was brought up at the Law Enforcement Committee meeting; so I'm going to bring it up here. We recently had a Coast Guard recently wrote a ticket for a high fly violation off the coast of Maine several weeks ago. Was that addressed at Law Enforcement Committee? It's a non-enforceable issue.

MR. CLOUTIER: Mr. Burns and I have talked about that.

MR. KELIHER: Mr. Burns and Major Cloutier have good resolution?

MR. CLOUTIER: Absolutely.

CHAIRMAN TRAIN: Go ahead, Peter, if you've got input too.

MR. BURNS: No, I'll just try to be the conduit between our enforcement folks and whatever the issue is here; just to make sure that it gets fully reviewed, so thank you.

ADJOURNMENT

CHAIRMAN TRAIN: If there is nothing else, would the next hand be a motion to adjourn. We have a motion to adjourn, consensus, thank you.

(Whereupon the meeting adjourned at 2:20
o'clock p.m. on May 1, 2018)

American Lobster and Jonah Crab TC Task List

Activity level: High

Committee Overlap Score: Low

Committee Task List
Lobster TC • Conduct analysis to evaluate results of changes to the lobster minimum and maximum gauge size for Addendum XXVII (aiming to be completed in spring 2018) • 2020 Benchmark Stock Assessment   • Assessment Workshop – January 2019 • Annual state compliance reports are due August 1 *Jonah Crab TC* • Annual state compliance reports are due August 1

TC Members

American Lobster: Kathleen Reardon (ME, TC Chair), Joshua Carloni (NH), Chad Power (NJ), Colleen Giannini (CT), Jeff Kipp (ASMFC), Kim McKown (NY), Conor McManus (RI), Tracy Pugh (MA), Burton Shank (NOAA), Megan Ware (ASMFC), Craig Weedon (MD), Sara Blachman (VA)

Jonah Crab: Derek Perry (MA, TC Chair), Joshua Carloni (NH), Chad Power (NJ), Jeff Kipp (ASMFC), Conor McManus (RI), Allison Murphy (NOAA), Kathleen Reardon (ME), Burton Shank (NOAA), Jeffrey Shields (VA), Megan Ware (ASMFC), Craig Weedon (MD)

SAS Members

American Lobster: Kim McKown (NY, SAS Chair), Joshua Carloni (NH), Larry Jacobson (NOAA), Jeff Kipp (ASMFC), Conor McManus (RI), Tracy Pugh (MA), Kathleen Reardon (ME), Burton Shank (NOAA), Megan Ware (ASMFC)

Jonah Crab: None

NOAA Technical Memorandum NMFS-NE-247

North Atlantic Right Whales- Evaluating Their Recovery Challenges in 2018

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts
September 2018

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This series represents a secondary level of scientific publishing. All issues employ thorough internal scientific review; some issues employ external scientific review. Reviews are transparent collegial reviews, not anonymous peer reviews. All issues may be cited in formal scientific communications.

North Atlantic Right Whales - Evaluating Their Recovery Challenges in 2018

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US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts
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ABSTRACT

The North Atlantic right whale (*Eubalaena glacialis*) population has been in decline for 8 years due to increased mortality and sublethal effects from multiple factors. Together these have contributed to a decrease in calving. Shifting ecosystem conditions have also changed North Atlantic right whale behavior and fishing patterns. For example:

- North Atlantic right whales have expanded their distribution farther into northern waters, and are visiting different foraging areas.
- Calanoid copepod distributions appear to be in a similar state of change and this may be affecting available forage for North Atlantic right whales
- The whales' range expansion has exposed them to vessel traffic and fisheries in Canadian waters, which did not have protections for right whales in place until late last summer (2017).
- American lobster (*Homarus americanus)* populations are also changing distribution, moving north and into deeper, cooler waters of the Gulf of Maine. The US fisheries are moving farther offshore to capitalize on this, increasing the overlap between their fishing activity and North Atlantic right whale foraging areas and migration corridors.

The net result of these events is that severe entanglements have increased among North Atlantic right whales. Animals are in poor body condition likely from a combination of repeated entanglement stress, potentially limited forage and increased migratory costs- all contributing to a decrease in female calving rate. Ship strikes are still a real threat to the population. At the current rate of decline, all recovery achieved in the population over the past three decades will be lost by 2029.

INTRODUCTION

Signs of Trouble

After several decades of recovery and years of collaboration among stakeholders, the North Atlantic right whale (*Eubalaena glacialis*), hereafter referred to as the right whale, began to decline (Pace et al. 2017). This trend was subtle at first, initially signaled by fewer sightings in traditional survey areas, but other warning signs began to emerge (Kraus et al. 2016). The number of documented mortalities increased markedly in 2016 and 2017 (Hayes et al. 2018; Hayes et al. 2017) and an improved way of modeling the population's numbers (Pace et al. 2017) revealed a clearer picture of the population size and decline in numbers. Concern further escalated throughout 2017 and 2018 when only 5 calves were born and there were 19 confirmed mortalities through August.

Taken together these signs meant that risks posed to right whales and associated management measures needed to be revisited for multiple US fisheries on the Atlantic coast. This occurs through the biological opinion process under the federal Endangered Species Act, which was reinitiated in October 2017, and through the take reduction team process under the federal Marine Mammal Protection Act.

Demographic Effects

Increased mortality rates and decreased calving have moved the population into a decline that has continued for at least the last 8 years. At present, right whale deaths attributable to human activity are mostly caused by ship strikes and entanglement in pot/trap and anchored gillnet fishing gear. An encounter with fishing gear is the most frequent cause of documented right whale serious injuries and deaths in recent years. The odds of an entanglement event are now increasing by 6.3% per year, while ship strikes events remain flat (Fig. 1). At the current rate of decline, the population will have returned to its 1990 numbers, likely with comparatively reduced genetic diversity, and could decline past a point of no return in just a few decades.

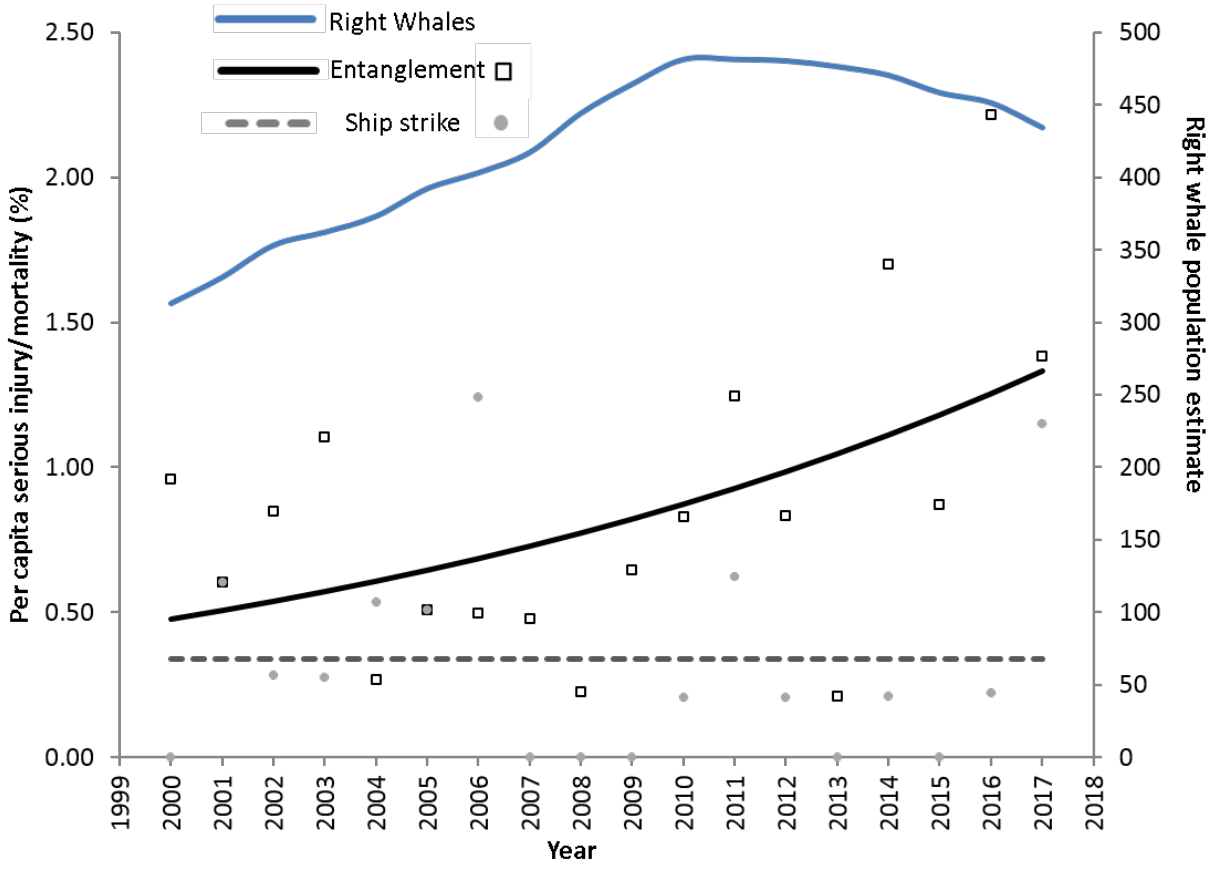

Fig. 1 North Atlantic right whale serious injury/mortality rates from known sources 2000-2017 (Henry et al 2017; 2016 & 2017 values preliminary). Models are simple logistic regressions fit using maximum likelihood-based estimation procedures available in R. The right whale population trend is overlaid and referenced to right y-axis (Hayes et al, 2018).

Distribution Change

Historically, right whales have returned to habitats in specific geographic locations annually, ensuring that a large portion of the population could be seen in each year. Therefore annual population estimates were conducted by simply sighting and counting as many animals as possible each year. Resulting estimates also assumed that an animal had died if it were not seen for 6 consecutive years.

Changes in this distribution pattern began around 2010 when the population peaked at 481 individuals. The whales were no longer using some of their established habitat areas in as great a number, and not staying within them for as long. This meant a new method was needed to account for animals, even those not sighted in a year. Once developed, this more advanced assessment tool, based upon mark recapture methods, enabled rapid assessment of the population with increased precision within one calendar year, much faster than the five or so years required to get good confidence on an annual estimate using the previous method. It also provided precise population estimates with greater resolution on the number of whales that likely died in any given year. Estimates made using the new method confirmed that in recent years, many deaths (around 10 to 20/yr) were going undetected annually and that by the end of 2016, the right whale population had declined to 451 individuals. A revised population estimate accounting for the many deaths and few births of 2017 is being developed and will be available later this year.

Increased Mortality

The large number of observed right whale mortalities in 2017 triggered an unusual mortality event (UME) to investigate the causes. The National Marine Fisheries Service (NMFS) is authorized to declare UMEs under the federal Marine Mammal Protection Act when an unanticipated significant die-off occurs in a marine mammal population, requiring an immediate response. Two other UMEs were declared that year due to 80 humpback whale and 40 minke whale deaths. Ongoing investigations for these two species have preliminarily identified causes of death that include entanglements, ship strikes, and disease.

In contrast to other large whale species, the problems of right whales are often more apparent because they are monitored more intensely and their coastal distribution means more opportunity for overlap with human activities, leading to it being nicknamed ‘the Urban Whale’ (Kraus et al. 2007).

While perhaps more attention is paid to the right whale given their more dire population status, it can be an indicator of more chronic problems that need addressing, not just for the sake of right whales but also for other populations of large whales. By example, although Gulf of Maine humpback whale status has improved, entanglement mortalities still remain high for this stock (Hayes et al. 2018).

There is considerable urgency to address the issues of mortalities that stem from human activities. Large whales, including right whales, are long-lived and can breed multiple times during their lives. This means these species can be resilient and able to recover after periods of

poor reproduction. However, recovery for any species cannot take place if the number of deaths is more than the number of births in the population.

POTENTIAL CAUSES OF THE DECLINE

Ecosystem Dynamics

One of the constant challenges of resource management is that things change. While it is much easier to make management decisions if conditions are static, ecosystems are inherently dynamic and will change over time in response to a variety of influences. This is the case for the emerging story for right whales.

Sometime around 2010, ecosystem shifts occurred within their habitat that changed right whale movements and fishing practices in a way that has increased interaction between whales and fishing gear, and that potentially presents other environmental challenges.

Currently the Gulf of Maine is warming faster than 99.9% of all other ocean regions on the planet (Pershing et al. 2015). This is having dramatic impacts across the food web, from the middle and upper trophic level organisms such as American lobster (*Homarus americanus)*, Atlantic cod (*Gadus morhua)* and right whales (Greene 2016); to the zooplankton at the base of the food web such as calanoid copepods (Grieve et al. 2017; NEFSC 2018).

Whales and Fisheries Are On the Move

American lobster are experiencing strong population fluxes and redistributions with temperature warming. The southern New England lobster fishery has been severely limited by epizootic shell disease, which lobsters become susceptible to at warmer temperatures. In the Gulf of Maine, coastal waters remain cool enough and offshore, deeper waters have warmed enough for lobsters, and lobster fishing, to expand farther offshore. As a result, Maine lobster landings have increased steadily for the past 30 years, with an increasing portion of this caught 3 or more miles offshore over the past 10 years (Fig. 2). Note that Maine lobster landings did downturn sharply in 2017, and future trends are uncertain.

Prey Availability Drives Reproductive Success

It is essential to also recognize that environmental factors and lower trophic level dynamics also contribute to right whale birth and mortality rates. Changes in prey availability influence right whale health and reproduction. In particular, abundance of the copepod *Calanus finmarchicus* in the Gulf of Maine is a strong predictor of right whale reproductive success (Greene and Pershing 2004; Meyer-Gutbrod and Greene 2014; Meyer-Gutbrod et al. 2015).

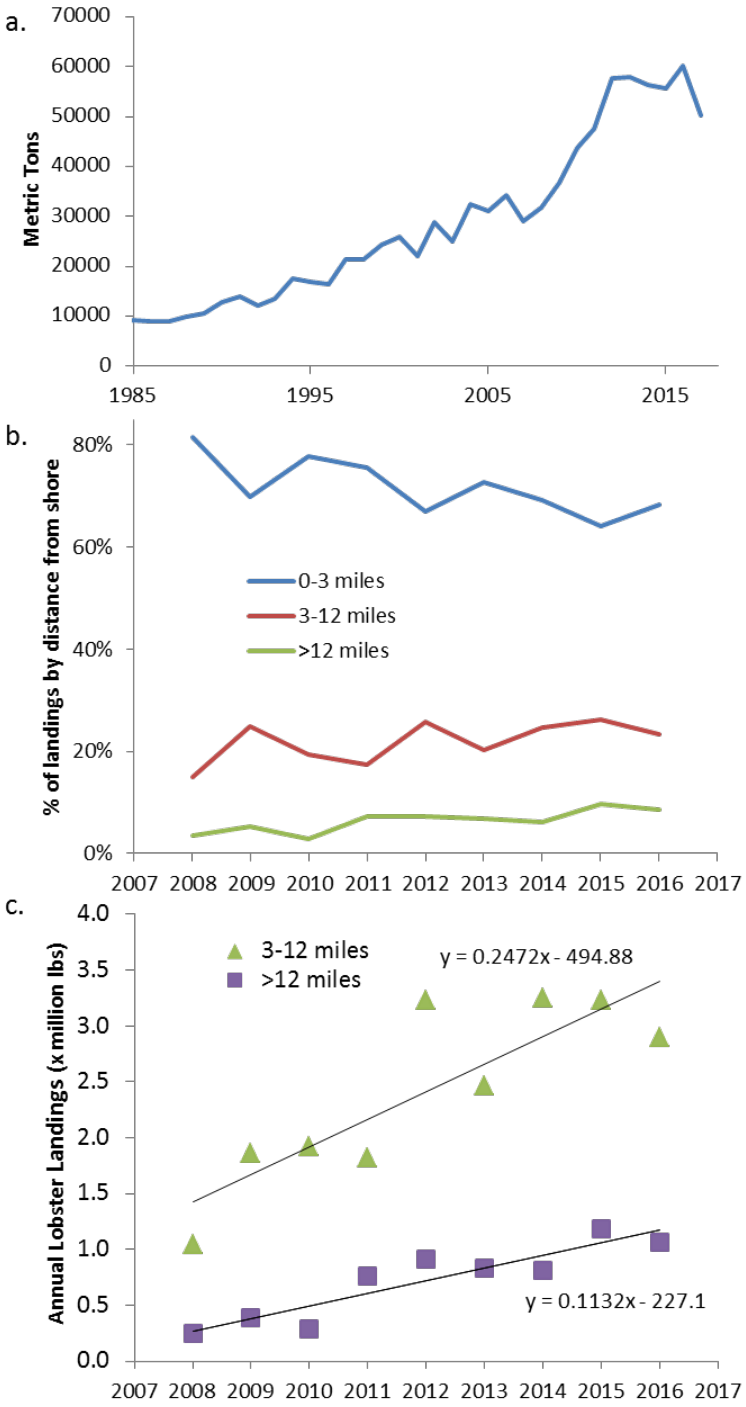

Fig 2. American lobster landings in Maine: a) total annual landings b) relative proportion of landing by distance from shore c) increase in landings from 3-12 and >12 miles offshore from Maine's 10% harvester reporting, no VTR data included. https://www.maine.gov/dmr/commercial-fishing/landings/

Meyer-Gutbrod and Greene (2018) followed individual whales over the past three decades to evaluate the relationship of calving and mortality rates to prey availability. They found that prey availability is a driver of decadal differences in the right whale population's recovery. Periods of

low prey availability coincided with reduced birth rates (Meyer-Gutbrod and Greene 2018) and the interval between births has been observed to lengthen during periods when prey availability is low (Meyer-Gutbrod et al. 2015).

Similarly, years with few births contribute to years of decline or stagnation in population growth, indicating the pronounced effect of reproductive variability on species viability (Pace et al. 2017). That said, Meyer-Gutbrod and Greene (2018) modeled population growth rates under scenarios of high and low prey availability and found that the population should continue to grow even with poor prey availability and only fails to do so when whale mortalities reach 8 to 10 per year. It is worth noting natural mortality seems to be very rare in adult right whales: there has been no confirmed case of natural mortality in adult right whales in the past several decades (Corkeron et al. *Accepted with revision;* Henry et al. 2017; van der Hoop et al. 2013).

Right Whales Follow Prey in a Changing Ocean

The copepod *C. finmarchicus* has shifted in distribution and abundance in recent years due to unprecedented warming in the Gulf of Maine, and this is likely to impact the right whale population (Greene 2016; Mills et al. 2013; Reygondeau and Beaugrand 2011). It appears that in the last decade (~2005-2015), that there has been a general decline in *C. finmarchicus* in the Gulf of Maine (2009-2014, but 2015 was average abundance) and on Georges Bank (below average abundance since 2008) (NEFSC 2018) as well as the Scotian Shelf (Johnson et al. 2017).

Changes in plankton forage species abundance likely played a role in the changing movement patterns of right whales that began sometime in the past 10 years. There have been decreases in both acoustic detections and physical observations of right whales in the northern Gulf of Maine and the Bay of Fundy, and a concurrent increase in sightings of many of the same animals in the Canadian Gulf of St. Lawrence (Daoust et al. 2018; Davis et al. 2017; Meyer-Gutbrod et al. 2018; Meyer-Gutbrod and Greene 2018).

During winter, whales are spending more time offshore in the mid-Atlantic, and less time on the coastal calving grounds just off the southeastern U.S., where in 2017 and 2018 calving has been quite poor.

Reproduction Requires Robust Females

Reproduction depends on adequate adult female health and body condition. Reproductive females are particularly vulnerable to prey reductions because pregnancy and lactation increases caloric demand and they have less access to prey during migration to calving grounds (Fortune et al. 2013; Miller et al. 2012; Rolland et al. 2016).

Several of the ecosystem shifts mentioned earlier are likely to have negative consequences for reproduction in right whales. First, a reduction in prey will have energetics costs for females. Northward shifts in the right whales' feeding grounds, as a result of changes in prey availability, will increase energetic cost of the calving migrations from the southern calving grounds off the coast of Florida and Georgia, particularly if animals do not adapt to also calve farther north.

The cost of entanglement has also been shown to have direct and indirect consequences for right whales (van der Hoop et al. 2017b; van der Hoop et al. 2017c). This will be detailed next, but in the Gulf of Maine where ecosystem shifts are occurring more trap fishing is also occurring offshore, increasing the overlap with right whale foraging areas.

Whales have also expanded their range, foraging into the Gulf of St. Lawrence. This increased the whales' exposure to risk from fixed gear fisheries. Some of this risk has reduced by strong protections put in place by the Canadian government during the spring of 2018 (DFO/TC Canada 2018; DFO Canada 2018).

Anthropogenic Stressors

In a review of mortality sources for all large whales, entanglement in fishing gear was the number one cause, followed by natural causes and then vessel strikes. An exception to this is the right whale for which there is very little evidence of natural mortality in adult whales, likely due to shortened life spans associated with anthropogenic causes (Corkeron et al. *Accepted with revision*), as all confirmed causes of adult mortality and serious injury since 1970 have been due to fishing gear and vessel strike (Henry et al. 2017; van der Hoop et al. 2013).

The relative contribution from these two causes was approximately equal through the year 2000 (van der Hoop et al. 2013), but entanglement events resulting in death or serious injury have increased steadily since then, while ship strike frequency has remained lower with no specific trend (Fig. 1). For the recent 19 known right whale mortalities (17 in 2017 and 2 to date in 2018), the cause of death could be determined for 10. Ship strikes are implicated in five blunt force trauma cases and entanglement in the remaining five. In 2017, seven other entangled whales were observed: three were disentangled, three shed the gear, and one was not seen again.

Ship Strikes

Reducing Risk

Ship strikes are currently the second most frequently documented cause of mortality in right whales. The per capita mortality frequency has not varied much, hovering around 0.34% deaths or serious injury events per year (Fig. 1). Several management actions were implemented in U.S. and Canadian waters beginning in 2008 to reduce the risk of collisions between right whales and large vessels. Major actions include:

- Voluntary two-way routes for commercial vessels off the Southeast U.S. and in Cape Cod Bay
- Modification of the Boston, Massachusetts Traffic Separation Scheme
- Canada and the International Maritime Organization established the voluntary Area To Be Avoided concept in the Roseway Basin
- Seasonal Management Areas in habitats off of Massachusetts, ports along the Mid-Atlantic coast, and the southeastern U.S. where vessels are required to slow to speeds less than 10 knots during transits for vessels 65 ft in length or longer

- Intermittent implementation of voluntary speed restrictions in Dynamic Management Areas within which right whale aggregations are observed outside the boundaries of the Seasonal Management Areas

Several analyses have been conducted to evaluate the effectiveness of these management efforts (Conn and Silber 2013; Lagueux et al. 2011; Silber et al. 2014; van der Hoop et al. 2012). In general, while these analyses were based on a short time-series of available data, collectively they suggest that after ship-strike rules put in place, a reduction in right whale mortality from ship strikes followed, and in general were at the lowest on record per capita from 2010 through 2016.

Responding to Changing Risk

In 2017, right whale deaths by ship strike increased when 5 ship-strike mortalities were confirmed, 1 in U.S. and 4 in Canadian waters (Fig. 1), likely caused in part when right whales began to spend more time in new areas with high vessel traffic and no speed restrictions. Increased survey effort in these areas also made it more likely that these events would be observed and reported.

Entanglement

Reducing Risk

Management efforts to reduce entanglement risks in U.S. waters have focused on gear technology to make entanglements less likely to harm or kill whales, restricting where and when gear that poses a threat can be used when whales are likely to be present, and reducing the amount of gear in the water column (Fig 3). Measures are recommended through a take reduction team, as mandated under the federal Marine Mammal Protection Act. Each team comprises a variety of experts and stakeholders, who assist NOAA Fisheries in developing a take reduction plan when necessary.

Since 1997, a series of rules have been implemented based on the take reduction plan (Fig. 3). These include the sinking groundline (2009) and vertical line (2015) rules. While there appears to have been a subsequent reduction in entanglements caused by groundline (Morin et al. 2018), which moved 27,000 miles of line from the water column to the bottom (NMFS, 2014), absolute entanglement rates appear to be on the rise (Fig 1).

Increase in Entanglement Risk

Fewer but Stronger Lines in US Waters

There may also have been unintended consequences of the 2015 vertical line rule. The rule required ‘trawling up’ (using more traps per trawl) in some regions. While this reduced the number of lines, it also meant that lines had to be stronger to accommodate the increased load of multiple traps. This natural adaptation, and the fact that stronger rope was available, contributed to an increase in the severity of entanglements as found by Knowlton et al. (2016), who observed very little evidence of entanglement with ropes weaker than 7.56 kN (1700 lbsf).

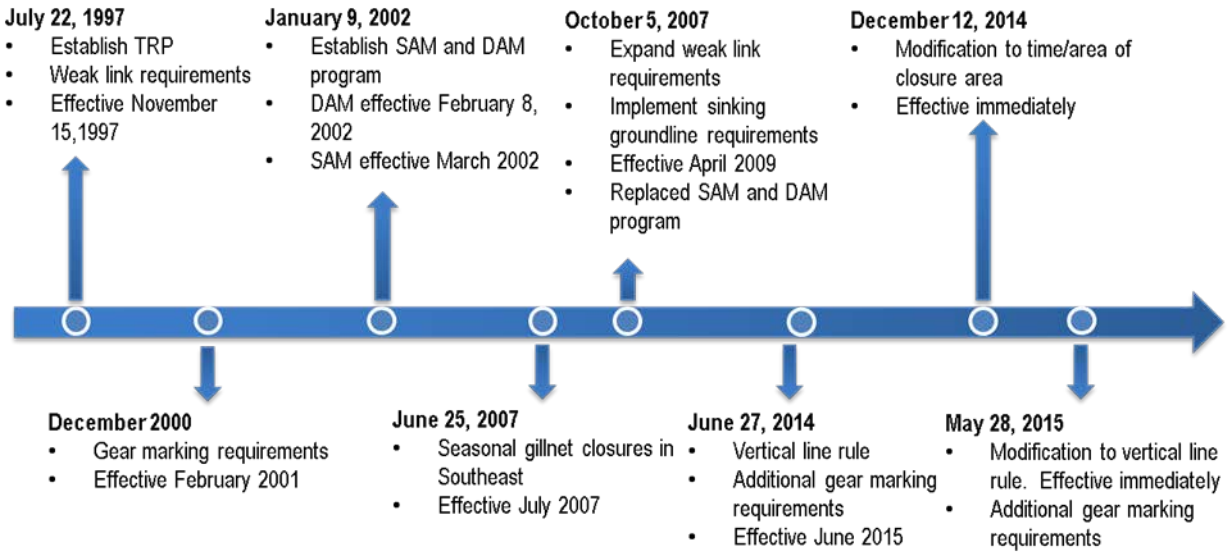

Fig 3. Timeline of significant management actions focused on reducing fishing entanglement

Entanglement Trends Upward

Knowlton et al.(2012) showed that nearly 85% of right whales have been entangled in fishing gear at least once, 59% at least twice, and 26% of the regularly seen animals are entangled annually. These findings represent a continued increase in the percentage of whales encountering and entangling in gear, which grew from to 61.5% in 1995 (Hamilton et al. 1998), to 75.6% in 2002 (Knowlton et al. 2005), confirming further the growing severity of the problem.

More Vertical Line in Right Whale Habitat

Rough estimates are that approximately 622,000 vertical lines are deployed from fishing gear in U.S. waters from Georgia to the Gulf of Maine. Notably until spring of 2018, very few protections for right whales were in place in Canadian waters. In comparison to recent decades, more right whales now spend significantly more time in more northern waters and swim through extensive pot fishery zones around Nova Scotia and into the Canadian Gulf of St. Lawrence *(Daoust et al. 2018).*

Taken together, these fisheries exceed an estimated 1 million vertical lines (100,000 km) deployed throughout right whale migratory routes, calving, and foraging areas. Figure 4 illustrates the scale of the challenge by providing fishery statistics for the various regions (data sources provided in Appendix 1).

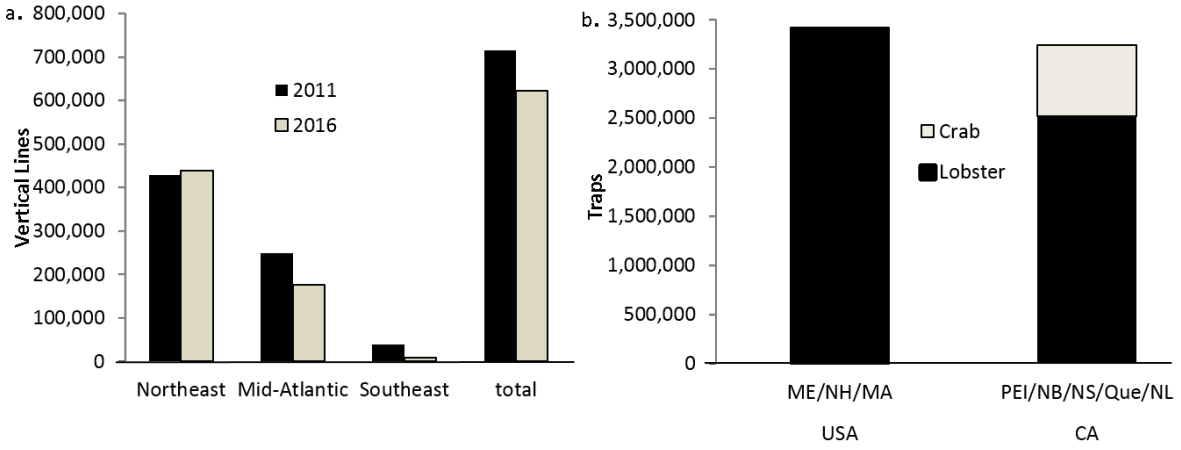

Fig 4. Index of fishing effort. a) The change in number of vertical lines in US waters from 2011 to 2016, b.) The approximate number of traps in USA Northeastern states and Canadian provinces. Data sources in Appendix 1.

Closures Are Effective, But May Not be Enough

A great deal of effort has been put into identifying entanglement 'hot-spots': relatively small areas where focused management measures can have minimal impact to fishing while providing great benefit to whales. Clear examples of this approach include the seasonal closure of Cape Cod Bay, and now the static closure within the Area 12 fishing zone of the Canadian Gulf of St. Lawrence. Both are relatively small areas where a significant portion (30 to 50+ %) of the right whale population has reliably occurred for several weeks to months over the past few years. Management actions have a population level benefit with impacts restricted to very local portions of fisheries. While still difficult choices, this has been the preferred management approach.

However, these closures, while likely very effective regionally, may not be enough. Each vertical line out there has some potential to cause an entanglement. With a 26% annual entanglement rate in a population of just over 400 animals, this translates to about 100 entanglements per year, which is significant for such a small population. But from the perspective of an individual fixed gear fisherman, they may never encounter a right whale. With more than 1 million lines out there, any single line has perhaps a 1 in 10,000 chance of entangling a whale in any one-year period. This can vary somewhat from regions with high to low densities of lines and/or whales.

However, in general, this means a fisherman and his or her descendants could go several generations without ever entangling of a right whale. Given this, it's easy to believe that *'all these entanglements are happening somewhere else'* regardless of where one fishes. Being able to directly link an entanglement with specific gear deployed at a specific place in time is rare, but by mapping known locations of gear that led to the entanglement of a right whale, one can see that there is no place within the fished area along the East Coast of North America for which entanglement risk is zero (Fig 5).

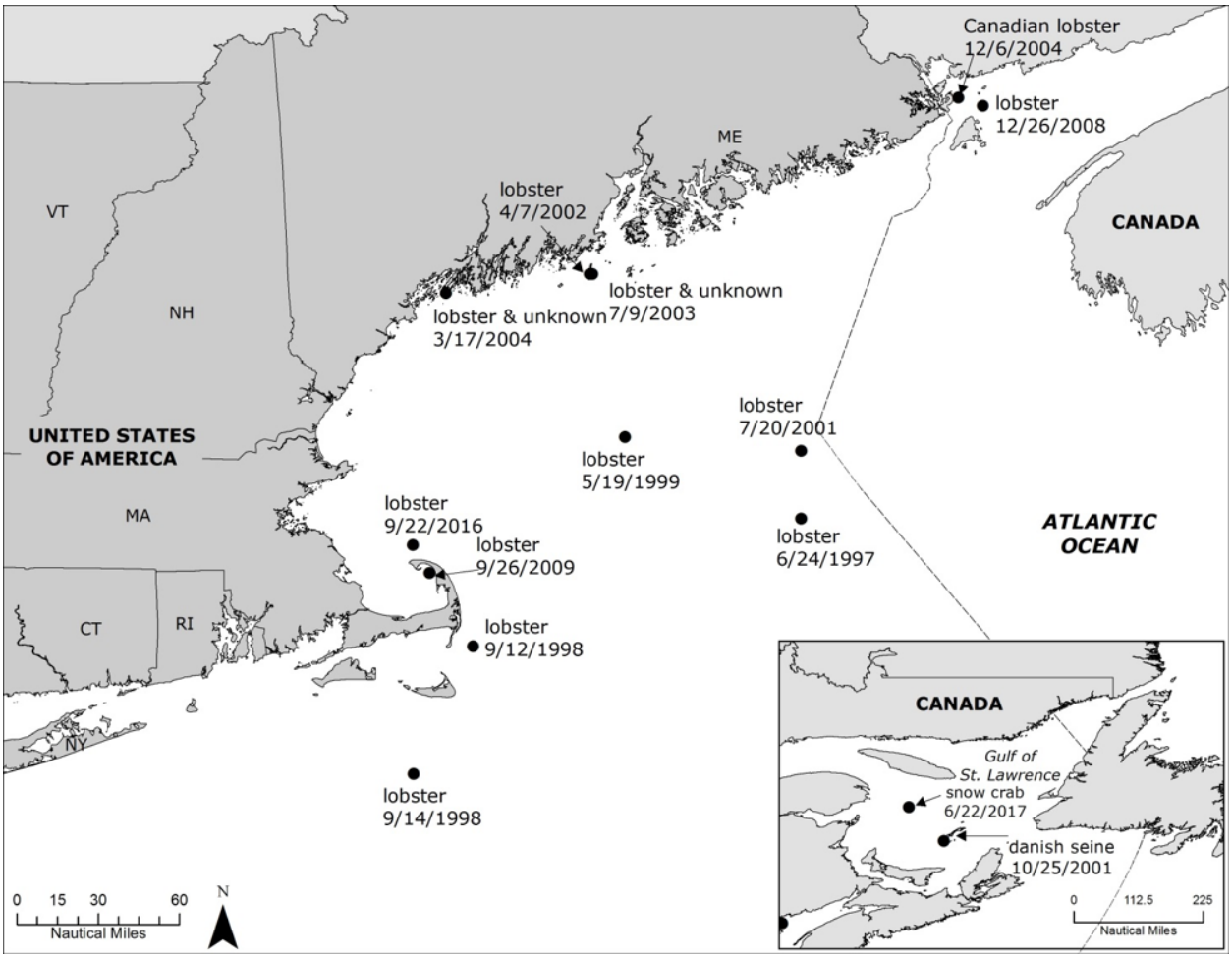

Fig 5. Right whale entanglements from 1997 through 2017 for which the set location and type of gear are known, and gear was recovered from a whale.

Sublethal Challenges- Skinny Whales and Few Calves

Fundamentally, a population increases when there are more births than deaths. Much attention has been paid to direct mortality caused by ship strikes and entanglement, but less focus has been put on the secondary effects of these and other variables where animals survive but fail to thrive because of the harm done. This is particularly evident in calving among mature females.

Biological Cost of Stressors

The abundance of photographs of known individual right whales taken over several decades have been used to develop health indicators associated with natural and human-caused stressors (Schick et al. 2013). This has been refined into a quantitative health score, including a predictive threshold below which females seem incapable of having a calf (Miller et al. 2012; Rolland et al. 2016).

We understand that right whales are exposed to numerous sublethal stressors, including fluctuating food resources (Meyer-Gutbrod and Greene 2014) and even underwater noise (Rolland et al. 2012). Several recent studies have also focused on sublethal effects of entanglement, the first of which includes increased swimming energy costs from dragging gear (van der Hoop et al. 2016). Even if disentangled, there are several injuries that can have costs lasting long after disentanglement. These include trauma wounds from rope cuts that may or may not eventually heal, and damage to baleen plates that can prevent efficient filter feeding for many years since these plates grow slowly.

Recent studies have also shown that even without accounting for injury, the drag from carrying rope and other gear for long periods of time can be energetically more expensive for a female than the migratory and developmental costs of a pregnancy (van der Hoop et al. 2017a; van der Hoop et al. 2017b; van der Hoop et al. 2017c).

Biological Demands of Right Whale Pregnancy

While serious injuries represent 1.2% of all entanglements, there are often sublethal costs to less severe entanglements. Should an entanglement occur but the female somehow disentangles and recovers, it still has the potential to reset the clock for this "capital" breeder. She now has to spend several years acquiring sufficient resources to get pregnant and carry a calf to term, the probability of a subsequent entanglement is fairly high, and this will create a negative feedback loop over time, where the interval between calving becomes longer. This is certainly a contributing factor in the longer calving interval for females, which has now grown from 4 to 10 years (Pettis et al. 2017).

Figure 6 demonstrates a simple model for estimating the probability that an animal will NOT become entangled over time. Similar to asking what are the odds of NOT getting 'heads' in 10 coin tosses, this model simply asks what are the odds of not getting entangled over time if there is a 74% chance of not getting entangled each year (Knowlton et al. 2012). Historically the median calving interval of a female right whale is 3 to 4 years (Pettis et al. 2017). The model estimates that animals have a about a 30 to 40% chance of not getting entangled during that period, or, conversely, a 60 to 70% chance of getting entangled.

With the calving interval now nearly twice as long as in the past, half as many calves are being born. So while entanglements often do not kill an animal, they may have a large impact by reducing or preventing births in the population. There is an additional variable, stress, which is much harder to quantify but known to have costs in mammals that are foraging in an environment with some mortality threat (Hernández and Laundré 2005).

It is difficult to tease out the relative effects of poor foraging conditions and the energetic costs of entanglement on the increased frequency of thin whales and the subsequent decrease in calving. Both are likely having some influence. While there are dozens of documented cases of

ship strikes and entanglement linked to right whale mortality, to date there is no confirmed observation of a right whale starving to death from poor forage.

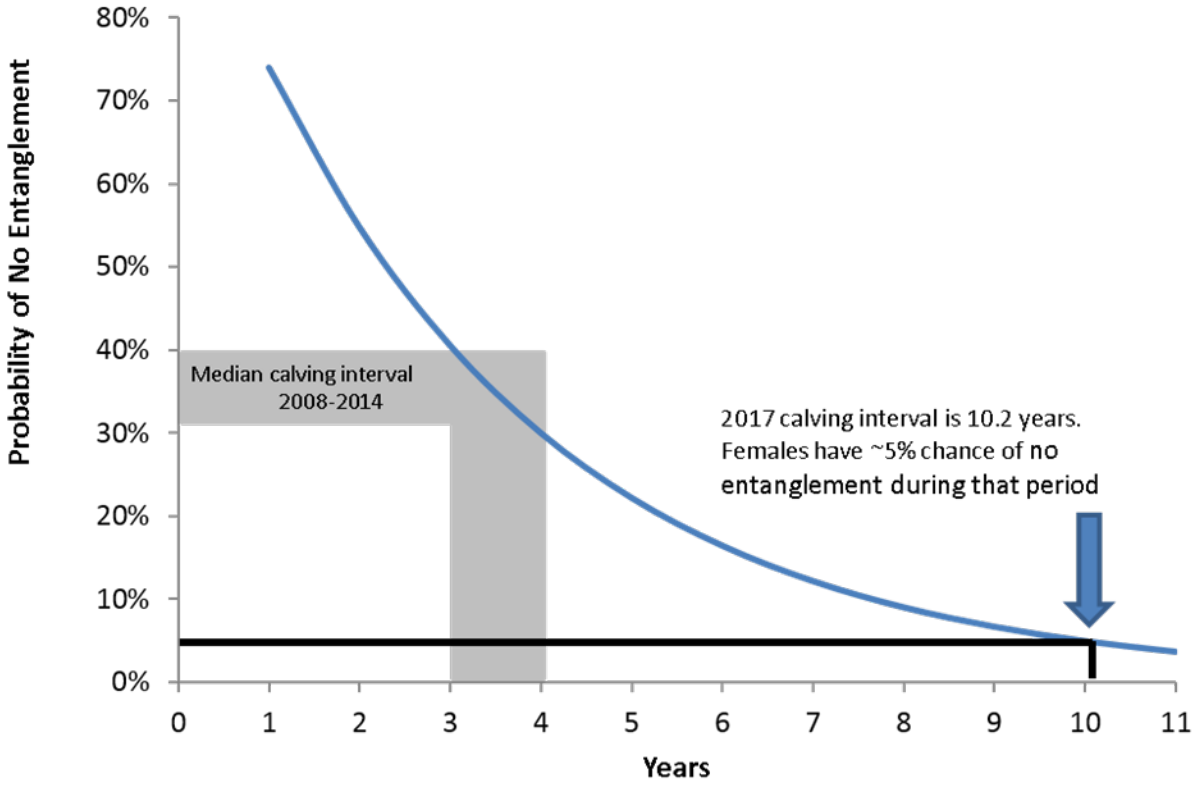

Fig 6. Cumulative annual probability of no entanglement (annual rate = 74%)

HOW LONG DO NORTH ATLANTIC RIGHT WHALES HAVE?

A Long-Lived Animal

Right whales have the potential to be a very long-lived species. In the southern hemisphere where shipping and fishing pressures are much lower, there is little evidence of human activities causing right whale mortality. There is also little evidence of natural mortality in adult animals (Corkeron et al. *Accepted with revision*). Since the ban on commercial whaling of Southern right whales in 1935 (Gambell 1993) these animals have not yet lived long enough to die of natural causes.

Meyer-Gutbrod and Greene (2018) demonstrated that even under poor foraging conditions, right whales should be able to recover if annual human-caused mortality is kept somewhere below 8-10 deaths per year. This means that in the absence of human-caused mortalities, right whales could potentially endure several decades under poor foraging conditions and still recover once environmental conditions improve. However, in the current situation in the northern hemisphere,

where animals are living much shorter lives, there is great cause for concern that the risk of extinction is much higher than in the southern hemisphere, where animals are not regularly subject to human caused mortality.

An Illustration of Potential Decline, 2017-2067

A Matrix Model

In order to measure current population trends, we used a three-stage (calf, juvenile, adult) matrix population projection model (Caswell 2006) for female right whales, derived from Corkeron et al. (*Accepted with revision*), to project the future abundance of right whales. Survival values used for input into the population projection model were calculated using a Cormack-Jolly-Seber (Pace et al. 2017) variant of a mark-resight model (see Appendix 2 for details) and determined the population is declining at 2.33% per year.

We started the model estimating an abundance of 160 females alive at the end of 2017. With approximately 1.5 males per female (Pace et al. 2017), 160 females would result in an overall species abundance of about 400. It is possible that this abundance estimate may be marginally low, but since the model overestimates calving success, we assumed that these biases should cancel each other out.

Using the stage derived from the matrix model, we assumed that the 2017 starting population of 160 females was composed of 10 calves, 60 juveniles, and 90 adults. We ran 1000 stochastic projections forward 50 years (Fig. 7).We then extracted median and 95% quantile estimates of projected abundance from those projections, and estimates of the number of adult females remaining, for 5, 10, 15, 20, 25 and 50 years. Results are shown in the Table.

Results

The model projects that in 2067, 50 years from 2017, there would be 49 female North Atlantic right whales remaining, of which only 32 would be adults. In 20 to 25 years (2037-2042) there would be fewer than 50 adult females. In the near term, at the current rate of decline, all recovery in the population over the past 3 decades will be lost by 2029, with the population returning to the 1990 estimate of 123 females.

Notably, the model does not adjust for varying environmental conditions, which are known to fluctuate on a decadal time scale for North Atlantic Ecosystems (Nye et al. 2014) and are presently unfavorable. This approach may overestimate the rate of population decline but not the overall trajectory.

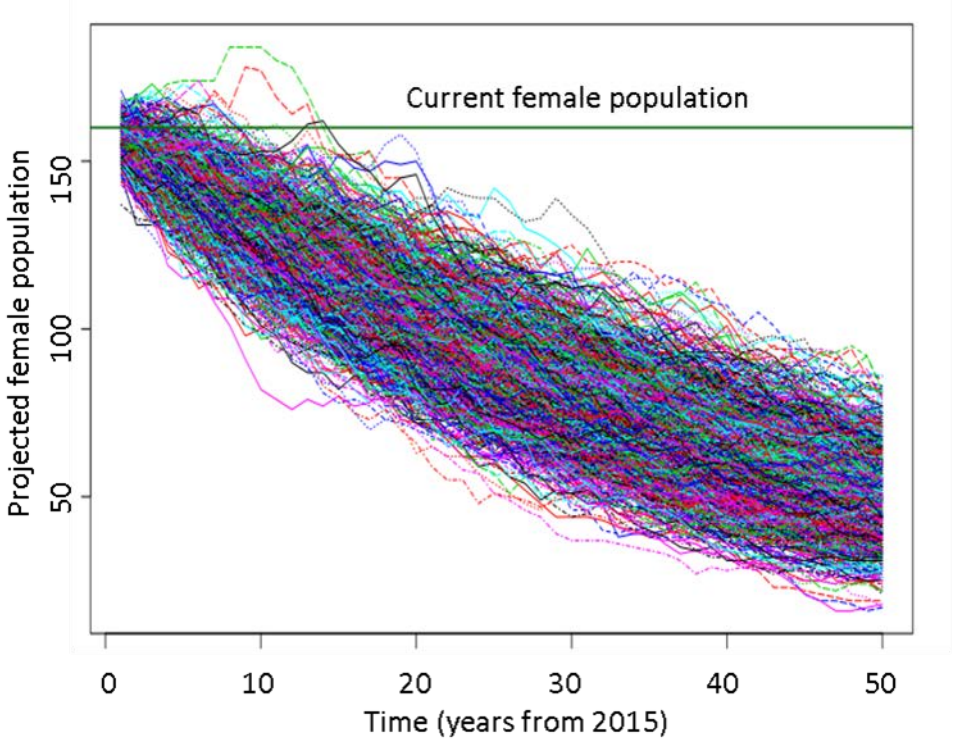

Fig. 7 Matrix population projection model output of North Atlantic right whale female population trend under current population conditions.

Table of matrix projection model output of female North Atlantic population trends for 5-year intervals, 2017-2067

Years from 2017	Number of females	Cis	Number of adult females
5	144	126 to 161	75
10	129	107 to 150	67
15	114	91 to 141	59
20	102	77 to 130	53
25	90	66 to 119	47
50	49	27 to 76	32

The threshold for functional extinction is very hard to define and likely varies by species. If the population declines to the 1990 level, there is a new threat: a repeated genetic bottleneck. Genetic bottlenecks happen when a population is so small that the genetic make-up of remaining group is not the same as that of the initial population. The effect of repeated bottlenecks is likely to mean that if the population returned to the 1990 level, that group would have less genetic diversity than the group that existed in1990. This can lead to reduced resilience and contribute to increased risk of extinction (Amos and Harwood 1998; Melbourne and Hastings 2008).

INDICATORS OF SUCCESSFUL MANAGEMENT MEASURES

Determining the management actions necessary to reverse the current population trend is beyond the scope of this document. However, the scale of the actions will need to be quite significant to be successful. Entanglement has increased dramatically and ship strikes continue to occur.

The population decline began in 2010 (Fig. 1), when entanglement was occurring at a rate of 26% among sited animals per year (Knowlton et al. 2012). Since then, the right whale range expansion has put them in the path of more shipping and more fishing gear – encountering almost twice the amount of gear owing to expansion of more fishing farther offshore in US waters and northward into Canadian waters (Fig. 4).

It is logical to conclude that to reverse the right whale decline, it may be necessary to reduce the impacts of entanglements and other harmful human interactions with right whales across their expanded range to pre-2010 levels. For recovery it may be necessary to go further, considering more modifications to fishing and shipping practices to compensate for potentially reduced forage opportunity and increased migratory costs.

Several biological indicators can be recommended for monitoring the short- and long-term effectiveness of any management actions that might be put in place to reduce the rate of both ship strikes and fishing gear entanglement.

Short-term indicators include fewer observed numbers of ship strikes and entanglements. These could be noticeable within 6 months to 1 year, but there is considerable variation around detectability of these events and the results will initially have a great deal of uncertainty. It takes approximately 1 year to conduct a population assessment and determine any changes in abundance. The assessment will alleviate some the uncertainty in detecting mortality risks that that might be mitigated by management actions. It should be noted that number of mortalities is the bluntest indicator of management success.

However, teasing the relative effects of management actions and natural variability on population size and condition will take several years of data and analysis. Metrics such as the frequency of scarring, improvements in body condition, and overall health scores could be detectable under stable environmental conditions in 2 to 3 years. Similarly, if environmental conditions are adequate for females to accumulate enough resources to calve, it will likely take at least 2 to 4 years to separate the impact of management action that reduced the frequency of, say, costly entanglements from the impact of natural variability. Ultimately, confidence in any estimate of population trajectory will emerge over 5 to 10 years.

In an ideal situation, evidence of human-caused injuries and mortality decreases, body condition improves, and the birth rate exceeds the death rate, resulting in more North Atlantic right whales.

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APPENDIX 1 Data Sources for Figure 4

Several data sources were used to construct Fig 4. All vertical line estimates in 4A were provided by Industrial Economics. Trap counts provided in 4B were acquired from a variety of sources. Raw trap counts were provided for Maine and Massachusetts. Trap counts for New Hampshire and all Canadian provinces were generated by multiplying license counts by trap limits. These were quite variable across regions, in which case the multiplier used is reported in the Table in the report.

Table 2. Data sources for trap counts and license numbers by country and regions.

Location	species	# traps	data year	Source
Maine	Lobster	2,901,000	2016	https://www.maine.gov/dmr/commercial-fishing/landings/documents/lobster.table.pdf
New Hampshire	Lobster	133,700	2010	https://www.greateratlantic.fisheries.noaa.gov/protected/whaletrp/trt/meetings/2012 meeting/Day%202/day_2_1c_new_hampshire_alwtrp_proposal.pdf
Massachussetts	Lobster	383,447	2011	http://www.lobstermen.com/wp-content/uploads/2009/10/MASS-LOBSTER-INDUSTRY-2012.pdf
Canada	**species**	**# license**	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
Nova Scotia	lobster	3,249	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
	crab	748	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
New Brunswick	lobster	1,460	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
	crab	123	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
Prince Edward Island	lobster	1,245	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
	crab	39	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
Quebec	lobster	591	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
	crab	382	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
Newfoundland	lobster	2,353	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
	crab	3,379	2016	http://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/species-especes/se16-eng.htm?
Canada	**species**	trap limit range	trap multiplier used	**Source**
Nova Scotia- GOSL	lobster	225-300	275	http://dfo-mpo.gc.ca/fm-gp/peches-fisheries/comm/atl-arc/lobster-notice-avis-homard-neiges-en.html
Nova Scotia- GOSL	crab	75-150	150	
Nova Scotia- east	crab	30-60		http://dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/snow-crab-neige/snow-crab-neiges2013-eng.htm
New Brunswick	lobster	240-300	275	http://dfo-mpo.gc.ca/fm-gp/peches-fisheries/comm/atl-arc/lobster-notice-avis-homard-neiges-en.html
	crab	75-150	150	
Prince Edward Island	lobster	240-300	275	http://dfo-mpo.gc.ca/fm-gp/peches-fisheries/comm/atl-arc/lobster-notice-avis-homard-neiges-en.html
	crab	75-150	150	
Quebec	lobster	235	235	http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/lobster-homard/index-eng.htm
	crab		200	
Newfoundland	lobster	185	235	https://thisfish.info/fishery/atlantic-lobster-canada-lfa11/
		100-425		http://waves-vagues.dfo-mpo.gc.ca/Library/282426.pdf
	crab	200	200	http://dfo-mpo.gc.ca/decisions/fm-2018-gp/atl-07-eng.htm

APPENDIX 2 Model Inputs and Methods used for Population Projection

In order to determine current rate of population decline we used a simple, three-stage matrix population projection model (Caswell 2006) for female right whales, derived from Corkeron et

al. (*Accepted with revision*), to project the future abundance of North Atlantic right whales. The model's three stages are: calf, juvenile and adult. Survival values used for input into the population projection model are derived from survival estimates calculated using a Cormack-Jolly-Seber (as opposed to the published Jolly-Seber, Pace et al 2017) variant of a mark-resight model (see Appendix 1 for details). We used the lower 95% credibility intervals of the median estimates of survival for 2011-2015 from the model. These were: calves: 0.86137, juveniles: 0.92684, and adult females: 0.92684. The matrix projections also assume: a calving interval of 4.75 years (the mean of median inter-calf intervals for calving females 2011-2017, from the 2017 North Atlantic Right Whale Report Card (Pettis et al. 2017), ; females maturing at 11; and a current maximum longevity of 50. With no calves born this year, this calving estimate is arguably optimistic, but the inter-calf interval estimate for 2018 would be undefined, and so is unusable. Survival and transition probabilities for stages were calculated as described in Corkeron et al. (*Accepted with revision*).The model was run in R 3.4.3 (R_Core_Team 2017), using the libraries *diagram* (Soetaert 2017), *popbio* (Stubben and Milligan 2007) and *popdemo* (Stott et al. 2016).

The matrix used for analyses is:

	calf	immat	adlt
calf	0.00000	0.00000	0.10526
immat	0.86137	0.86254	0.00000
adlt	0.00000	0.06430	0.92443

This gives an intrinsic rate of increase of 0.9767, or a decline of 2.33% per year.

To develop a stochastic projection from this model, we took a starting abundance estimate of 160 females alive at the end of 2017, as the unusually high observed mortality of right whales that year (Meyer-Gutbrod and Greene 2018) meant that starting earlier would not capture one important recent anthropogenic impact on this species. With approximately 1.5 males per female North Atlantic right whale now (Pace et al. 2017), 160 females would give an overall species abundance of ~400. It is possible that this abundance estimate may prove to be marginally low, but as the model overestimates calving success, we assume that these biases should cancel each other out. When an abundance estimate for 2017 is available (by October-November 2018) the model can be revised.

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Authors must submit separate digital files of the manuscript text, tables, and figures. The manuscript must have cleared NEFSC's online internal review system. Non-NEFSC authors who are not federal employees will be required to sign a "Release of Copyright" form.

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Publications and Reports of the Northeast Fisheries Science Center

The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "conducting ecosystem-based research and assessments of living marine resources, with a focus on the Northeast Shelf, to promote the recovery and long-term sustainability of these resources and to generate social and economic opportunities and benefits from their use." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Currently, there are three such media:

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Summary of Regulation of Use of Lobster Bait by Maine DMR
Prepared for ASMFC Discussion 10/1/18

History

- In summer 2011, based on concerns regarding the potential risks posed by the importation of marine and freshwater fish from various parts of the world for lobster bait in Maine, DMR convened a meeting of Department staff, bait dealers, lobstermen, and fish health experts from the University of Maine.
- Bait was being imported from many locations globally, often as full shipping container loads in the frozen form. Although freezing will mitigate the risk of many parasites and aquatic nuisance species, it is not effective against many viral agents. Some distant bait sources were being imported in volumes measured in the millions of pounds on an annual basis and the risk of viral import was a factor for regulating bait import.
- There was consensus that, if left unchecked, imported bait was a vector that could endanger the lobster resource and/or Maine's other wild and farmed resources.
- In the winter of 2012, DMR introduced legislation giving the Commissioner authority to create "approved" and "prohibited" lists of freshwater and marine baits. The law was passed, and authorized the Department to develop regulations for the process of reviewing and approving or prohibiting specific baits.
- In 2013, DMR adopted the regulations governing the review process (attached).
- Under the original regulations, it was unlawful to <u>sell</u> a bait that had not been reviewed, or was on the prohibited list. Following a second law change in 2017, it became unlawful to <u>use</u> such a bait.

Process

- To make determinations regarding the safety of existing bait sources in 2013, DMR surveyed bait dealers to develop a comprehensive list of the species being used and their origin. This resulted in a list of ~35 baits for review.
- Due to scope of the review, DMR contracted out the initial review under the state RFP process.
- Kennebec River Biosciences conducted a qualitative and quantitative data driven risk assessment and provided the results to DMR in 2015. Their work included a literature review and information gathering, hazard identification and analysis, and risk evaluation. DMR engaged a USDA epidemiologist working in Maine in the design of the risk evaluation process.
- Since the initial review, DMR has used a committee comprised of governmental, university, and private industry aquatic animal health professionals to conduct risk assessments and provide recommendations to the Commissioner.
- Prospective bait sources are assessed in regards to their risk for introducing pathogens of regulatory concern using a multi-point assessment process, after which a recommendation for approval or disapproval is presented to the Commissioner for making a final decision. Climate match, species susceptibility, presence of susceptible species or hosts in the Gulf of Maine, pathogen status in the source region and the Gulf of Maine, source proximity and migratory connectivity to the Gulf of Maine, and bait treatment are some risk factors utilized in the current assessment model.
- Current lists of approved and prohibited baits are attached.

Current Status

- The existing process has been challenging. Requests for reviews may come in from any source, and DMR has little ability to evaluate the feasibility of the proposed bait source, or the likelihood that it will be of interest to the fishery (i.e. the Department could devote significant time to an analysis, for little benefit). It is a significant time commitment to research often obscure species and sources and accessible information is often limited. The review committee is mainly composed of non-DMR and non-State employees, who are providing the risk evaluation as a courtesy. DMR does not have the authority under the existing law to charge a fee for the evaluation to compensate these experts for their time.
- DMR is exploring an alternate model which would require the bait dealer to obtain the risk analysis from a qualified entity, for review by the Committee and a recommendation to the Commissioner.

Summary of Regulation of Use of Lobster Bait by Maine DMR
Prepared for ASMFC Discussion 10/1/18

Current Regulation

25.11 Lobster and Crab Bait Review Process

It shall be unlawful to sell or use any marine or freshwater organism as bait to fish for or take lobsters or crabs that has not been reviewed and approved by the Department of Marine Resources.

An individual may apply for the review of a bait source to the Department of Marine Resources on forms supplied by the Commissioner. The Department will provide a written response within 60 days, whether the bait will be placed on the "approved" freshwater list or "prohibited" marine list. A freshwater organism that has been reviewed and not listed as "approved" is prohibited as bait. A marine organism that has been listed as "prohibited" is also prohibited as bait.

Application forms and lists of "approved" freshwater and "prohibited" marine bait will be made available on the Department's website at http://www.maine.gov/dmr/rm/lobster/index.htm or by contacting the DMR Lobster Resource Coordinator at (207) 624-6550.

A. Application Process

Applications for approval shall contain the following information about the bait source:

- Name, address, email, and phone number of the applicant;
- Species including scientific name;
- Life cycle stage;
- Body part;
- Farm raised or wild;
- Relevant certifications (disease or pest free, hazard analysis & critical control point, etc.);
- Area of origin;
- Proposed date(s) of removal;
- Intermediate processing location(s) and contact information of processing facility, if applicable and
- Additional information necessary to determine if a bait source is safe for aquatic and human populations.

B. Review

The Commissioner shall evaluate the level of risk associated with the proposed introduction of a bait source into the marine environment by considering the potential impacts to the marine ecosystem and consumers. Each evaluation shall consider the probable effects of the introduction of the bait into the recipient area, including, but not limited to:

1. The effects of any previous introduction of the same or a similar species in Maine or other areas;
2. The relationship of the species of aquatic organism to be introduced with other members of the recipient area ecosystem; and
3. The potential effects of infectious or contagious pathogens, pests, parasites, or invasive species that might be associated with the species of aquatic organism to be introduced upon other members of the ecosystem of the recipient area.

The Commissioner may conditionally approve a bait source by establishing conditions necessary to prevent the spread of infectious or contagious pathogens, pests, parasites, or invasive species to aquatic or human populations. The Commissioner may remove a bait source from either list at any time in response to changed conditions or additional information that merits reconsideration of the initial review.

If a species/location is placed on the "prohibited" marine list or not included on the "approved" freshwater list, the applicant may petition for a permit to import the bait, subject to testing requirements, proof of chain of custody and/or other information as requested by the Commissioner.

The Department shall annually review and update the "approved" freshwater and "prohibited" marine bait lists.

C. Lobster/Crab Bait Dealer
Any person who purchases lobster or crab bait for other than their own use and then sells the bait as a wholesale or retail bait product, and a harvester who sells lobster or crab bait to an individual(s) for personal use as bait are considered a lobster/crab bait dealer.

D. Lobster/Crab Wholesale Bait Dealer Permit
All lobster/crab bait dealers shall obtain a wholesale dealer license with bait endorsement issued by the Department of Marine Resources. There will be no additional charge for the lobster endorsement.

Lobster/crab bait dealers are required to provide a list of baits sold the previous year and a list of baits that they plan to sell the following year, by February 1 annually. Detailed records of each shipment of bait imported into the State of Maine shall be maintained by the purchasing dealer for a minimum of 2 years. These records shall be made available to the Department upon request.

E. Effective Date
This rule shall become effective upon the issuance of approved and prohibited bait lists following an initial review by the Commissioner of marine or freshwater organisms for use as bait to fish for or take lobster or crabs. The approved and prohibited bait lists will be posted on the Department's web site. Copies of the lists will also be available from the Department.

MAINE DEPARTMENT OF MARINE RESOURCES
2018 MARINE LOBSTER AND CRAB
BAIT CLASSIFICATION

The following list includes all marine species that have been reviewed by the Department of Marine Resources. **Beginning June 1, 2015,** it is illegal to sell or use any marine or freshwater organism as bait to fish for or take lobsters or crabs that is classified as "prohibited", or that has not been reviewed by the Department. Bait dealers may be granted an exemption that allows them to sell a "prohibited" bait if they agree to follow specific procedures that the Department considers sufficient to remediate the risks of introduction (e.g. establishing a chain of custody, pre-importation testing, processing). **Individuals may apply for review of a non-listed bait source, or petition for use of a prohibited bait source by completing the "Lobster and Crab Bait Review Form".** If you have questions regarding the use or sale of a bait source, contact Sarah Cotnoir sarah.cotnoir@maine.gov or (207) 624-6596. Applications and additional information about the use of lobster and crab bait is available at http://www.maine.gov/dmr/rm/lobster/index.htm under "Commercial Fishing, Lobsters, Maine Lobster Management".

Marine Approved		
Species	**Restrictions**	**Region of Origin**
Any Species in the NEFMC Groundfish Complex		Gulf of Maine or Georges Bank
Atlantic Cod		US East Coast & Canada East Coast
Atlantic Herring		US East Coast & Canada East Coast
Croaker		US East Coast
Halibut		Atlantic & Pacific Ocean
Jamaican Weakfish (*Cynoscion jamaicensis)*	Wild caught, frozen, racks only	Suriname
King Weakfish (*Macrodon ancylodon*)	Wild caught, frozen, racks only	Suriname
Kinky (aka rockfish, long/short spinyhead, idiotfish) (Genus *Sebastolobus*)	Must be frozen	US West Coast & Canada West Coast
Lingcod		Atlantic & Pacific Ocean
Mackerel	Must be frozen if from China	US East Coast, Japan, Portugal and China
Mullet (Genus *Mugilidae)*		US & Canada
Orange Roughy		Australia & New Zealand
Menhaden (aka Pogie, Bunker)		US East Coast
Patagonian toothfish	Must be frozen	Australia and Argentina
Pollock		Atlantic Ocean *only*
Redfish		N. Atlantic Ocean & Pacific Ocean
Red Alphonsino		NE Atlantic Ocean
Roundnose Grenadier		NE Atlantic Ocean
River herring (alewife, blueback herring)		Maine
Rockfish (Genus *Sebastes*)	Must be frozen	US West Coast & Canada West Coast
Sablefish		Alaska & Western Canada
Skate		US Northeast Coast
Shad		Maine
Sole		US West Coast
Southern Kingfish (*Menticirrhus americanus)*	Wild caught, frozen, racks only	Suriname
Tuna		North Pacific Ocean
Any species that was legally caught in Maine coastal waters		

Revised July 23, 2018

Marine Prohibited		
Species	**Region of Origin**	**Unacceptable Risk**
Any salmonid fish species (prohibited pursuant to DMR Chapter 24.23)		
Alphonsino	New Zealand	Exotic pathogens
Bonito	Panama West Coast	Exotic pathogens
Cobia	South Atlantic Ocean, Caribbean Sea	Unknown pathogen status
Cod	US West Coast & Canada West Coast	Possibility of exotic agent
Flatfish	Pacific Ocean	Possibility of exotic agent
Hake	US West Coast	Exotic pathogens
Horseshoe Crab	Asia	Possibility of invasives
Pollock	Pacific Ocean	Exotic pathogens
Pacific Sardine (South American Pilchard)	US West Coast & Canada West Coast	Exotic pathogens
Snapper	Panama West Coast	Exotic pathogens
Tilapia	Panama West Coast	Exotic pathogens

MAINE DEPARTMENT OF MARINE RESOURCES
2018 FRESHWATER LOBSTER AND CRAB BAIT CLASSIFICATION

The following list includes all freshwater species that have been reviewed by the Department of Marine Resources. **Beginning June 1, 2015**, it is illegal to sell or use any marine or freshwater organism as bait to fish for or take lobsters or crabs that is classified as "prohibited", or that has not been reviewed by the Department. Bait dealers may be granted an exemption that allows them to sell a "prohibited" bait if they agree to follow specific procedures that the Department considers sufficient to remediate the risks of introduction (e.g. establishing a chain of custody, pre-importation testing, processing). **Individuals may apply for review of a non-listed bait source, or petition for use of a prohibited bait source by completing the "Lobster and Crab Bait Review Form"**. If you have questions regarding the use or sale of a bait source, contact Sarah Cotnoir sarah.cotnoir@maine.gov or (207) 624-6596. Applications and additional information about the use of lobster and crab bait is available at http://www.maine.gov/dmr/rm/lobster/index.htm under "Commercial Fishing, Lobsters, Maine Lobster Management".

Freshwater Approved	
Species	**Region of Origin**
Carp	Maine
Pickerel	Central Canada
Suckerfish	Maine, Canadian provinces of Manitoba &, Saskatchewan
Any freshwater species that was legally harvested in Maine	

Freshwater Prohibited		
Species	**Region of Origin**	**Unacceptable Risk**
All Carp, including Asian Carp (grass carp, common carp, Amur carp, silver carp, largescale silver carp, bighead carp, black carp, goldfish, crucian carp, mud carp)	Asia, US (caught outside of Maine) & Canada. ***Carp caught in Maine ARE approved.***	Exotic pathogens
Catfish	Asia	Exotic pathogens
Mudshad	Central US & Virginia	Unknown pathogen status
Northern Pike	Central Canada	Exotic pathogens
Sheepshead (Freshwater Drum)	US & Canada	Exotic pathogens
Farmed or Wild Tilapia	Africa, Asia, Florida, Latin America and Vietnam	Exotic pathogens

2018 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN

For Jonah Crab
(*Cancer borealis*)

2017 FISHING YEAR

Prepared by the Plan Review Team

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2018 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR JONAH CRAB (*Cancer borealis*)

2017 FISHING YEAR

1.0 Status of the Fishery Management Plan

Year of ASMFC Plan's Adoption:	FMP (2015)
Framework Adjustments:	Addendum I (2016) Addendum II (2017) Addendum III (2018)
Management Unit:	Maine through North Carolina
States with a Declared Interest:	Maine through Virginia (Excluding Pennsylvania and DC)
Active Committees:	American Lobster Management Board, Technical Committee, Plan Review Team, Advisory Panel, Electronic Reporting Subcommittee, Electronic Tracking Subcommittee

2.0 Status of the Fishery

2.1 Commercial Fishery

Historically, Jonah crab was taken as bycatch in the lobster fishery; however, in recent years a directed fishery has emerged causing landings to rapidly increase. Throughout the 1990's, landings fluctuated between approximately 2 and 3 million pounds, and the overall value of the fishery was low. In the early 2000's landings began to increase, with over 7 million pounds landed in 2005. By 2014, landings had almost tripled to 17 million pounds and a value of nearly $13 million dollars. This rapid increase in landings can be attributed to an increase in the price of other crab (such as Dungeness), creating a substitute market for Jonah crab, as well as a decrease in the abundance of lobsters in Southern New England, causing fishermen to redirect effort on Jonah crab.

Today, Jonah crab and lobster are considered a mixed crustacean fishery in which fishermen can target lobster or crab at different times of the year based on slight gear modifications and small shifts in the areas in which the traps are fished. While the majority of Jonah crab is harvested as whole crabs, fishermen from several states, including New York, Maryland and Virginia, land claws. Jonah crab claws are relatively large and can be an inexpensive substitute for stone crab claws. As a result, they can provide an important source of income for fishermen. A historic claw fishery takes place along the Delmarva Peninsula where small boat fishermen harvest Jonah crab claws because they do not have a seawater storage tank on board to store whole crabs.

In 2017, 17.4 million pounds of Jonah crab were landed along the Atlantic Coast, representing $16.3 million in ex-vessel value. The states of Massachusetts (66%) and Rhode Island (23%) were the largest contributors to landings in the fishery. Landings in descending order also occurred in Maine, New Jersey, New York, New Hampshire, Maryland, Delaware, Virginia, and Connecticut. 99% of coastwide landings in 2017 came from trap gear.

2.2 Recreational Fishery

The magnitude of the Jonah crab recreational fishery is unknown at this time; however, it is believed to be quite small as compared to the size of the commercial fishery.

3.0 Status of the Stock

Jonah crab are distributed in the waters of the Northwest Atlantic Ocean primarily from Newfoundland, Canada to Florida. The life cycle of Jonah crab is poorly described, and what is known is largely compiled from a patchwork of studies that have both targeted and incidentally documented the species. Female crab (and likely some males) are documented moving inshore during the late spring and summer. Motivations for this migration are unknown, but maturation, spawning, and molting have all been postulated. It is also generally accepted that these migrating crab move back offshore in the fall and winter. Due to the lack of a widespread and well-developed aging method for crustaceans, the age, growth, and maturity of Jonah crab is poorly described.

The status of the Jonah crab resource is relatively unknown and no range wide stock assessment has been conducted. Massachusetts, Rhode Island, Maine, and New Hampshire conduct inshore state water trawl surveys, and NOAA Fisheries conducts a trawl survey in federal waters which collects data on Jonah crab abundance and distribution. In addition, several studies are on-going (Section 7.0) to elucidate information on the species.

4.0 Status of Management Measures

Interstate Fishery Management Plan for Jonah Crab (2015)

Jonah crab is managed under the Interstate Fishery Management Plan (FMP) which was approved by the American Lobster Management Board in August 2015. The goal of the FMP is to promote conservation, reduce the possibility of recruitment failure, and allow for the full utilization of the resource by the industry. The plan lays out specific management measures in the commercial fishery. These include a 4.75” minimum size with zero tolerance and a prohibition on the retention of egg-bearing females. To prevent the fishery from being open access, the FMP states that participation in the directed trap fishery is limited to lobster permit holders or those who can prove a history of crab-only pot fishing. All others must obtain an incidental permit. In the recreational fishery, the FMP sets a possession limit of 50 whole crabs per person per day and prohibits the retention of egg-bearing females. Due to the lack of data on the Jonah crab fishery, the FMP implements a fishery-dependent data collection program. The Plan also requires harvester and dealer reporting along with port and sea sampling.

Addendum I (2016)

Addendum I establishes a bycatch limit of 1,000 pounds of crab/trip for non-trap gear (e.g., otter trawls, gillnets) and non-lobster trap gear (e.g., fish, crab, and whelk pots). In doing so, the Addendum caps incidental landings of Jonah crab across all non-directed gear types with a uniform bycatch allowance. While the gear types in Addendum I make minimal contributions to total landings in the fishery, the 1,000 crab limit provides a cap to potential increases in effort and trap proliferation.

Addendum II (2017)

Addendum II establishes a coastwide standard for claw harvest. Specifically, it permits Jonah crab fishermen to detach and harvest claws at sea, with a required minimum claw length (measured along the forearm of the claw) of 2.75" if the volume of claws landed is greater than five gallons. Claw landings less than five gallons do not have to meet the minimum claw length standard. The Addendum also establishes a definition of bycatch in the Jonah crab fishery, whereby the total pounds of Jonah crab caught as bycatch must weigh less than the total amount of the targeted species at all times during a fishing trip. The intent of this definition is to address concerns regarding the expansion of a small-scale fishery under the bycatch limit.

Addendum III (2018)

Addendum III improves the collection of harvester and biological data in the Jonah crab fishery. Specifically, the Addendum improves the spatial resolution of harvester data collection by requiring fishermen to report via 10 minute squares. It also expands the required harvester reporting data elements to collect greater information on gear configurations and effort. In addition, the Addendum established a deadline that within five years, states are required to implement 100% harvester reporting, with the prioritization of electronic harvester reporting development during that time. Finally, the Addendum improves the biological sampling requirements by establishing a baseline of ten sampling trips/year, and encourages states with more than 10% of coastwide landings to conduct additional sampling trips.

5.0 Fishery Monitoring

The provisions of Addendum III did not impact fishery monitoring programs in 2017. As a result, language in the FMP sets the standard for fishery monitoring. Specifically, the FMP requires that "*at a minimum, state and federal agencies shall conduct port/sea sampling to collect the following types of information on landings, where possible: carapace width, sex, discards, egg-bearing status, cull status, shell hardness, and whether the landings are whole crabs or parts*." The Plan also establishes coastwide mandatory reporting and fishery dependent sampling with 100% dealer and harvester reporting. Jurisdictions which currently require less than 100% harvester reporting in the lobster fishery are require to maintain, at a minimum, their current programs and extend them to Jonah crab. *De minimis* states are not required to conduct fishery-independent sampling or port/sea sampling. These requirements for fishery monitoring will be amended in future years to reflect implementation of Addendum III.

Overviews of the states' port and sea sampling are as follows:

- Maine: Maine conducted 8 sea sampling trips and sampled 523 Jonah crab. Sampling occurs through the Lobster Sea Sampling program, which has a sampling protocol for Jonah crab. Maine's lobster port sampling program was suspended in 2011.
- New Hampshire: Staff sampled 49 Jonah crab on 10 sea sampling trips and collected information on sex, the presence of eggs, cull condition, molt stage, and carapace length. NH initiated a quarterly port sampling program in late 2016. Sampling took place at shellfish dealers, where an interview with the captain occurred and a biological sample was taken. A total of 642 Jonah crab were sampled through this new program, of which a maximum of 250 crabs were sexed, measured for carapace length, and (when feasible) weighed.
- Massachusetts: Staff conducted 10 sea sampling trips and sampled 2,419 Jonah crab. Types of information collected include shell width, sex, egg bearing status, cull status, shell hardness, and whole crabs vs. parts. Massachusetts also inspected 19 vessels at port and sampled 11,707 Jonah crab.
- Rhode Island: Through a collaboration with URI-GSO and the state, 5 sea sampling trips measuring 3,684 Jonah crab were conducted in 2017. Due to staff and budget constraints, RI DFW did not conduct its own sea or port sampling but it hopes to continue this collaboration with URI-GSO in the future.
- Connecticut: No sea sampling or port sampling trips were conducted for Jonah crab.
- New York: Staff conducted two market sampling trips, collecting information on 25 Jonah crab. No sea sampling trips were conducted for Jonah crab.
- New Jersey: No sea or port sampling trips were conducted for Jonah crab.
- Delaware: No sea or port sampling trips were conducted for Jonah crab.
- Maryland: No sea or port sampling trips were conducted for Jonah crab.
- Virginia: No sea or port sampling trips were conducted for Jonah crab.

6.0 Status of Surveys

The Interstate Fishery Management Plan for Jonah crab encourages states to expand current lobster surveys (i.e. trawl surveys, ventless trap surveys, settlement surveys) to collection biological information on Jonah crab. The following outlines the fishery-independent surveys conducted by each state.

Maine

A. Settlement Survey

The Maine settlement survey was primarily designed to quantify lobster young-of-year (YOY), but has also collected Jonah crab data from the sites throughout the survey. Jonah crab information collected includes carapace width, sex (when large enough), ovigerous condition, claw status, shell hardness, and location. The density of Jonah crab has increased over the past two decades with high values in 2013 and 2016 (Figure 1). Similarly, the density of all Jonah crab noticeably increased in the early 2000's and has remained high since (Figure 1).

B. State Trawl Survey

The ME/NH Inshore Trawl Survey began in 2000 and is conducted biannually (spring and fall) through a random stratified sampling scheme. Jonah crab data has been collected throughout the history of this survey. The 2017 spring survey completed 122 tows and sampled a total of 339 Jonah crab. The spring abundance indices for Jonah crab have significantly increased since 2013, but noticeably decline in 2017 (Figure 2). The 2017 fall survey completed 101 tows and sampled 526 Jonah crab. Abundance indices for Jonah crab have declined in 2016 and 2017 (Figure 2).

C. Ventless Trap Survey

Maine began its Juvenile Lobster Ventless Trap Survey in 2006. Since the beginning of the survey, Jonah crab counts were recorded by the contracted fishermen, but the confidence in this data in the early years is low because of the confusion between the two *Cancer* crabs (Jonah crab vs. rock crab) and similar common names. In 2016, the survey began collecting biological data for Jonah crab including carapace width, sex, ovigerous condition, claw status, shell hardness, and location. Figure 3 shows the catch of Jonah crab per trap in 2017.

D. Sea Urchin Survey

Maine DMR conducts an annual dive survey of the sea urchin stock within state waters. Beginning in May and working through June, divers evaluated approximately 60 1-meter square quadrats at each site they visited. Beginning in 2004, the data collected on crabs was expanded to include carapace width and sex. A total of 117,337 quadrats have been evaluated for Jonah crab through 2016. Counts of Jonah crab from this survey show a marked increase from 2005-2008 (Figure 4).

New Hampshire

A. Settlement Survey

Since 2009, species information has been collected on Jonah crab in the New Hampshire Fish and Game portion of the American Lobster Settlement Index. Figure 5 depicts the CPUE (#/m^2) of Jonah crab for all NH sites combined, from 2009 through 2017. This time series shows a general upward trend to a time series high in 2017.

B. Ventless Trap Survey

Since 2009, NHF&G has been conducting the coastwide Random Stratified Ventless Trap Survey in state waters (statistical area 513). A total of six sites were surveyed twice a month from June through September in 2017. Beginning in 2016 all Jonah crab were evaluated for sex and carapace length. A total of 23 Jonah crab over 8 trips were measured during the 2017 sampling season.

Massachusetts

A. Settlement Survey

The Juvenile Lobster Suction Survey has consistently identified Jonah crab since 2011, and has identified the *Cancer* crabs to genus since 1995. Figure 6 shows that Jonah crab are generally absent from the two sampled locations in stat area 538 (Buzzards Bay and Vineyard Sound) but are present at other sampled locations. The number of Jonah crab per square mile in Cape Ann

decreased from 2016 to 2017 but remained fairly stable in Beverly/Salem, Boston Harbor, South Shore, and Cape Cod Bay.

B. Ventless Trap Survey

CPUE of Jonah crab from the MA DMF Ventless Trap Survey within NMFS statistical areas 538 and 537 has been trending downward (Figure 7). Though the survey started in 2005, Figure 7 only shows data from 2011 through 2017 due to changes in areas surveyed prior to 2011. The 2017 data point is the lowest in the time series. The MA DMF Ventless Trap Survey catches fewer Jonah crab in NMFS statistical area 514 (Figure 8) compared to 538/537. Area 514 has been on an overall downward trend, but has been fairly stable since 2009.

C. Trawl Survey

The MA DMF Trawl Survey has seen a recent increase in the number of Jonah crab in the fall survey south and east of Cape Cod (Figure 9), and in the spring and fall surveys north of Cape Cod (Figure 9). All 2017 data points were above time series medians and trending upward based on a fitted generalized additive model.

Rhode Island

A. Ventless Trap Survey

Since its inception in 2006, the RI Ventless Trap Survey (VTS) has recorded counts of Jonah crab in each pot. In 2014, carapace width and sex were also recorded for all individuals.
In 2017, the VTS was conducted during the months of June-August and over 18 sampling trips. A total of 314 Jonah crab were sampled. All sampling was conducted in LMA 2, NMFS Statistical Area 539. The stratified mean catch per ventless trap on a six pot (three ventless, three vented) trawl was 0.75 Jonah crab (Figure 10).

B. Trawl Survey

RIDEM has conducted Spring and Fall trawl surveys since 1979, and a monthly trawl survey since 1990. However, invertebrates (other than lobsters) have not been counted for much of these time series. In 2015, the survey began counting Jonah crab specifically. Given the short time series of Jonah crab data available and few Jonah crab observations by the surveys, the information is not available at this time. As the datasets for Jonah crab from these trawl surveys grow, these data will be provided as abundance indices.

Connecticut

A. Trawl Survey

Jonah crab abundance is monitored through the Long Island Sound Trawl Survey (LISTS) during the spring (April, May, June) and fall (September and October) cruises, all within NMFS statistical area 611. The survey documents the number of individuals caught and total weight per haul by survey site in Long Island Sound. The Long Island Sound Trawl Survey caught one Jonah crab in the fall 2007 survey and two in the fall 2008 survey. Both observations occurred in October at the same trawl site in eastern Long Island Sound. No Jonah crab have been observed in the survey since 2008.

New Jersey

A. Trawl Survey

An independent Ocean Trawl Survey is conducted from Sandy Hook, NJ to Cape May, NJ each year. The survey stratifies sampling in three depth gradients, inshore (18'-30'), mid-shore (30'-60'), offshore (60'-90'). The mean CPUE, which is calculated as the sum of the mean number of Jonah crab collected in each sampling area weighted by the stratum area, has remained low throughout the time series (Figure 11).

7.0 Recent and On-Going Research Projects

A. Maturity Study

MA DMF, in collaboration with CFRF, has conducted a Jonah crab maturity study. Results suggests that females mature at a smaller size than males (~88-94mm carapace width vs. ~103-117mm carapace width, depending on region sampled). Importantly, the sizes at maturity for both sexes are below the current minimum legal size for harvest (121 mm).

In addition, a graduate student at the University of Maryland Eastern Shore completed a master's thesis on the size at sexual maturity and reproductive biology of Jonah crabs in the Mid-Atlantic Bight in the spring of 2018. Jonah crabs were collected as bycatch in black sea bass and lobster pots from December 2015 to September 2017 as well as from the 2016 and 2017 Virginia Institute of Marine Science Mid-Atlantic Sea Scallop dredge survey. Measurements included: sex, weight, length, width, chela length and height, abdomen width (females), molt condition, presence/absence of egg clutches, and presence/absence of external sperm plugs. A gonadosomatic index was created for female Jonah crabs.

B. Tagging Study

MA DMF, in collaboration with AOLA, NH F&G, and ME DMR, is conducting a tagging study in the Jonah crab fishery. Preliminary data suggests that most Jonah crab are not migrating far; however, four tagged Jonah crab were recorded traveling over 100 km between Georges Bank and Southern New England. As of August 2018, 15,026 clinch tags and 17,037 t-bar tags have been deployed, and there is an overall tag return rate of 2.4%.

C. Declawing Study

NH F&G conducted a laboratory study to investigate the mortality associated with declawing of Jonah crab. 5 trials were completed over 3 seasons. Results indicate a 15% mortality rate for control crabs, a 56% mortality rate for crabs with one claw removed, and a 75% mortality rate for crabs with both claws removed. A field-based declawing study is being conducted in 2018 to see if the results are similar to those conducted in the lab.

D. Growth and Fishery Dependent Data

A graduate student at URI is completing a Master's Thesis on Jonah crab, focusing on fishery-dependent data collection and growth. From June 2016 to August 2017, a pilot sea sampling program was implemented to collect information on size distributions, length-weight relationships, sex ratios, molting condition, and shell disease levels. In addition, a laboratory study was conducted in 2016-2017 to describe the growth of Jonah crab in RI Sound. Results

include quantification of growth-per-molt in male and female Jonah crab, and a description of molting seasonality and molt probabilities in male Jonah crab. Finally, the Master's Thesis includes fifteen in-person interviews with Jonah crab fishermen to collect their knowledge concerning Jonah crab biology and fishery characteristics. Results of the interviews are anticipated to be submitted for publication this fall.

E. CFRF Research Fleet

The Commercial Fisheries Research Foundation (CFRF) has expanded their lobster commercial research fleet to sample Jonah crab. Biological data collected include carapace width, sex, shell hardness, egg status, and disposition. As of September 2018, 56,301 Jonah crab have been sampled through the program.

8.0 State Compliance

Two states have not implemented provisions of the Jonah Crab FMP and associated addenda. The implementation deadline for the Jonah Crab FMP was June 1, 2016; the implementation deadline for Addendum I was January 1, 2017; and the implementation deadline for Addendum II was January 1, 2018.

- New York has not yet implemented the full suite of management measures required under the Jonah Crab FMP or Addendum I and II. New York crab legislation currently prohibits the harvest of female crabs with eggs and recreational harvest is limited to 50 crabs. The 4.75" minimum carapace width, the 1000 crab bycatch limit, and commercial rules regarding crab part retention have not been implemented. In last year's compliance report it was expected that regulations would be implemented by early 2018.
- Delaware has not yet implemented the management measures required under the Jonah Crab FMP or Addendum I and II. Promulgation of Delaware's Jonah Crab regulations have to go through the state legislature and this has yet to occur. In last year's compliance report it was expected that regulations would be implemented by early 2018.

9.0 De Minimis Requests.

The states of Virginia, Maryland, and Delaware have requested *de minimis* status. According to the Interstate Fishery Management Plan for Jonah crab, states may qualify for *de minimis* status if, for the preceding three years for which data are available, their average commercial landings (by weight) constitute less than 1% of the average coastwide commercial catch. Delaware, Maryland, and Virginia meet the *de minimis* requirement.

10.0 Research Recommendations

The following research questions were compiled by the Jonah Crab TC and need to be answered in order to complete a coastwide stock assessment.

- ***Growth Rates*** – While there has been some research on Jonah crab growth rates, more studies are needed to determine growth rates along the entire coast. In particular, it is necessary to determine the molt frequency, molt increment, and if there is a terminal molt.
- ***Maturity and Reproduction –*** Studies are needed to determine the size at maturity of crabs in different regions, the size ratio of mating crabs, and sperm limitations.

- ***Migration –*** There are several tagging studies on-going in the Jonah crab fishery. Hopefully these studies will elucidate the migrations of Jonah crab as well as seasonal habitat preferences.
- ***Natural Mortality*** – An estimate of natural mortality must be developed for Jonah crab in order to carry out a stock assessment. In particular, it will be critical to determine the natural mortality of the adult size crabs.

11.0 Plan Review Team Recommendations

The following are recommendations from the Plan Review Team:

- The PRT recommends the Board approve the *de minimis* requests of DE, MD, and VA.
- The PRT raises concerns about the lack of Jonah crab regulations in NY and DE, particularly in regard to the lack of minimum carapace width and commercial bycatch limit. Similar issues were raised in the 2017 compliance reports and have not been addressed within the last year.
- The PRT recommends that jurisdictions with crab-only fishermen report on the number of these fishermen, their collective number of traps fished, and the rules governing their fishing activity.
- The PRT recommends continued research of the Jonah crab species so that a coastwide stock assessment can be completed in the near future.
- The PRT recommends the LEC review compliance in the Jonah crab fishery, given it is a fairly new fishery management plan and lessons may be learned.

12.0 Tables

Table 1. Landings (in pounds) of Jonah crab by the states of Maine through Virginia. 2010-2016 landings were provided by ACCSP based on state data submissions. 2017 landings were submitted by the states as a part of the compliance reports and should be considered preliminary. *C= confidential data*

	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total
2010	1,093,962	C	5,689,431	2,922,404	C	968,122	28,400		18,045	C	10,890,910
2011	1,096,592	C	5,379,792	2,540,337	C	69,440	26,286		92,401	C	9,273,622
2012	556,675	C	7,540,510	3,286,569	2,349	410,349	68,252		C	C	12,072,452
2013	379,073	340,751	10,087,443	4,397,734	51,462	C	7,803		C	C	15,798,919
2014	344,290	404,703	11,858,702	4,123,040	49,998	C	33,104	C	153,714	C	17,050,643
2015	309,715	C	9,096,374	3,861,260	C	207,437	68,116	C	39,750	C	13,780,846
2016	604,023	150,342	10,657,785	3,669,939	C	165,427	260,856	C	C	C	15,527,171
2017	1,167,833	114,155	11,425,083	4,082,252	C	158,179	432,754	C	C	C	17,403,526

13.0 Figures

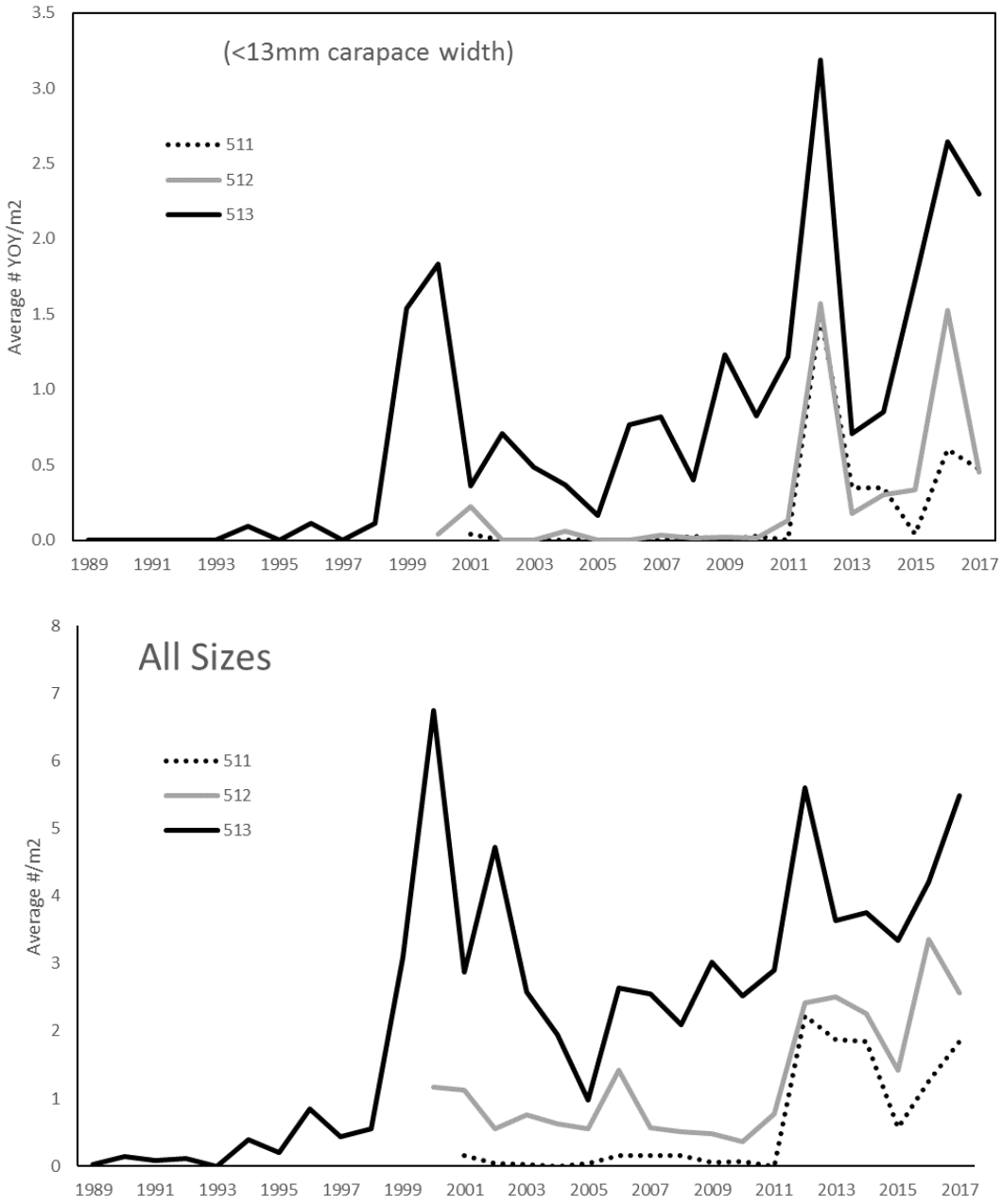

Figure 1: The density of Jonah crab measured over time in the Maine Settlement Survey by statistical area. The top graph shows the density of Jonah crab less than 13mm in carapace width and the bottom graph shows the density of all Jonah crab.

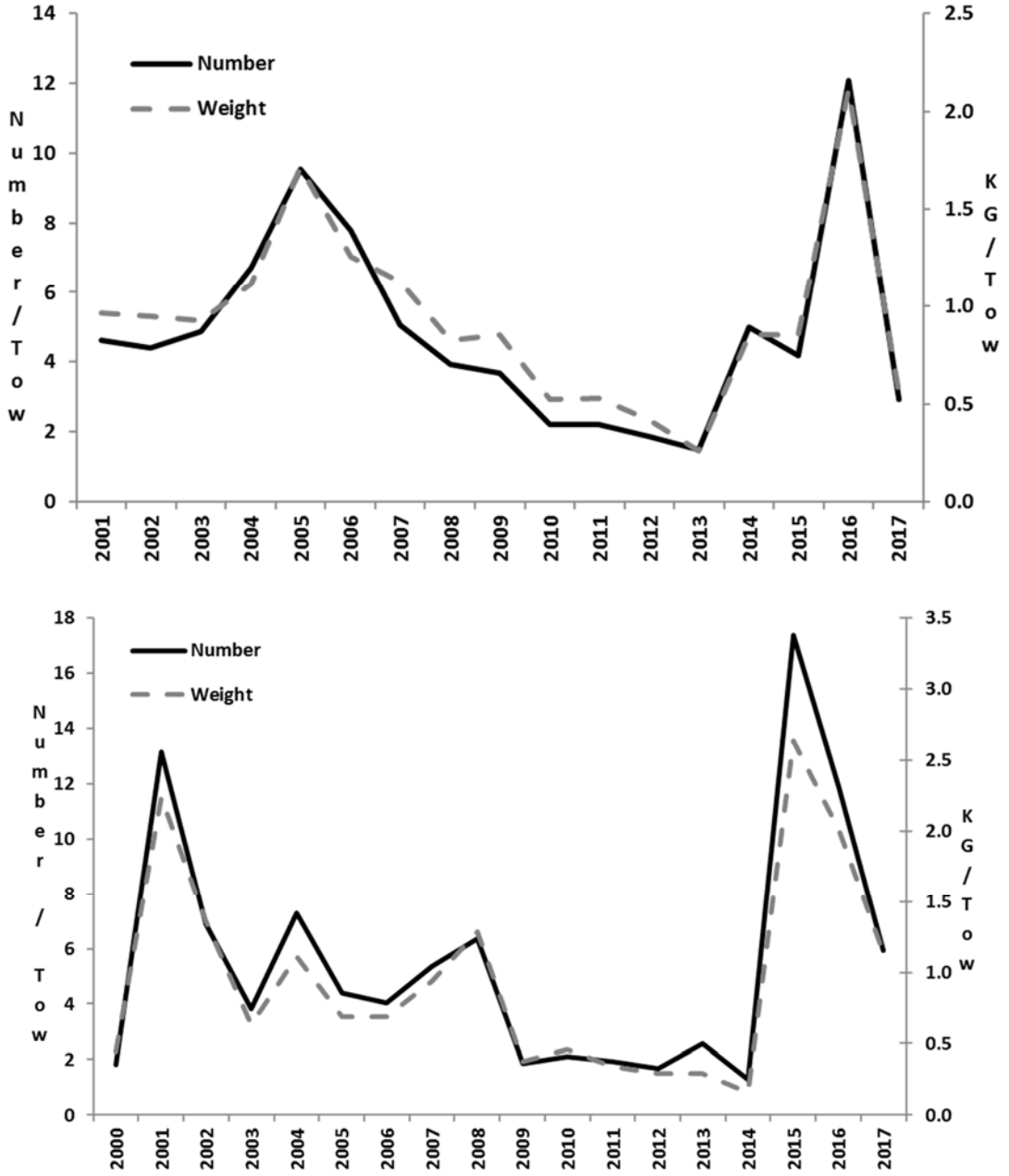

Figure 2: Maine-New Hampshire survey abundance indices for Jonah crab, 2001-2017. Results of the spring survey are on the top and results from the fall survey are on the bottom.

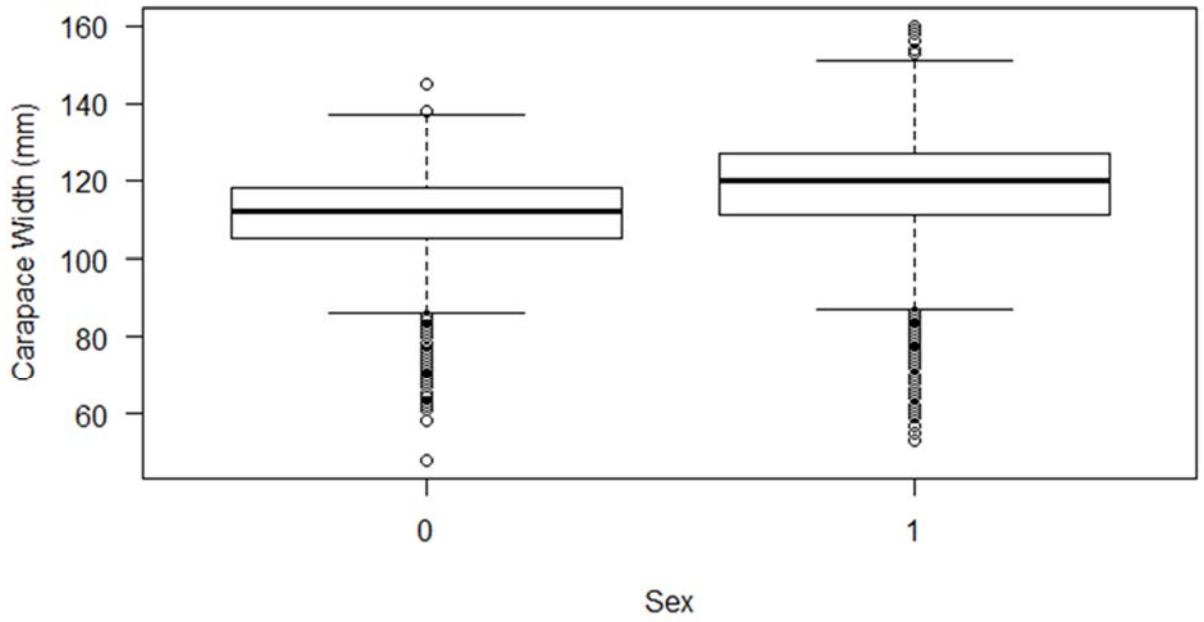

Figure 3: Female (0) and male (1) Jonah crab size from the 2017 Maine Ventless Trap Survey.

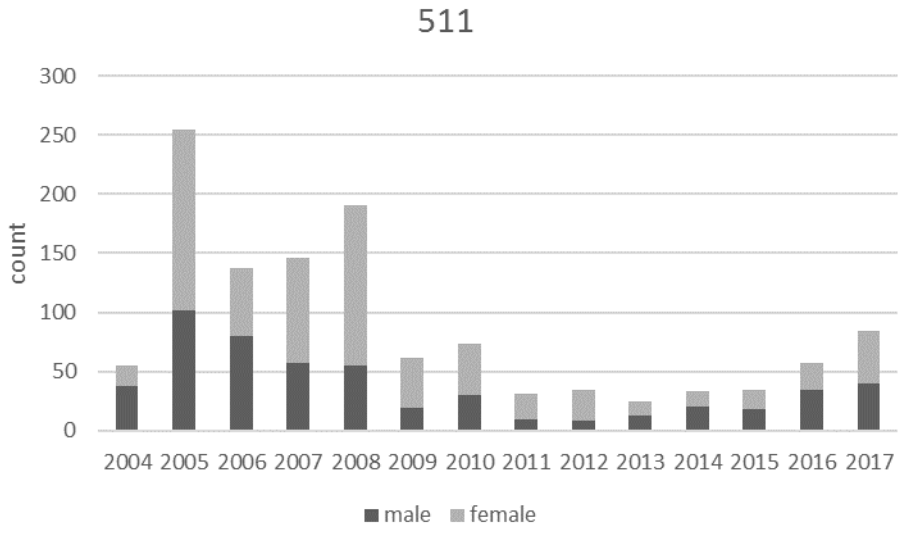

Figure 4: Observed crab from the Maine Sea Urchin Survey (statistical area 511).

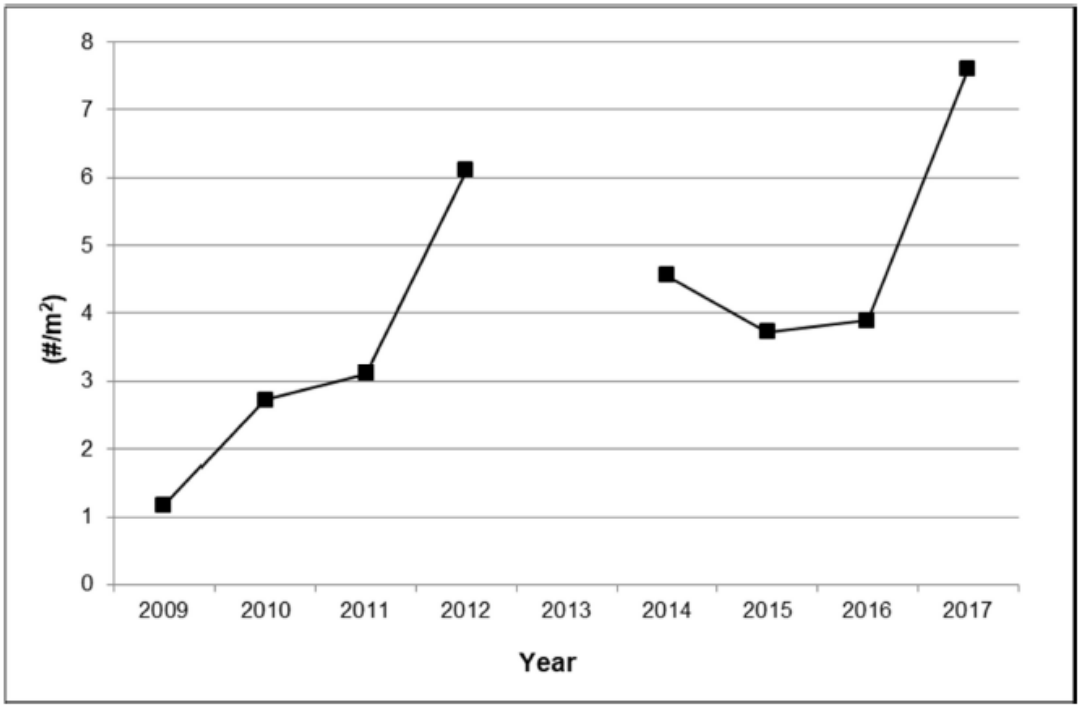

Figure 5: Catch per unit effort (#/m^2) of Jonah crab during the American Lobster Settlement Index Survey, in New Hampshire, from 2009 through 2017.

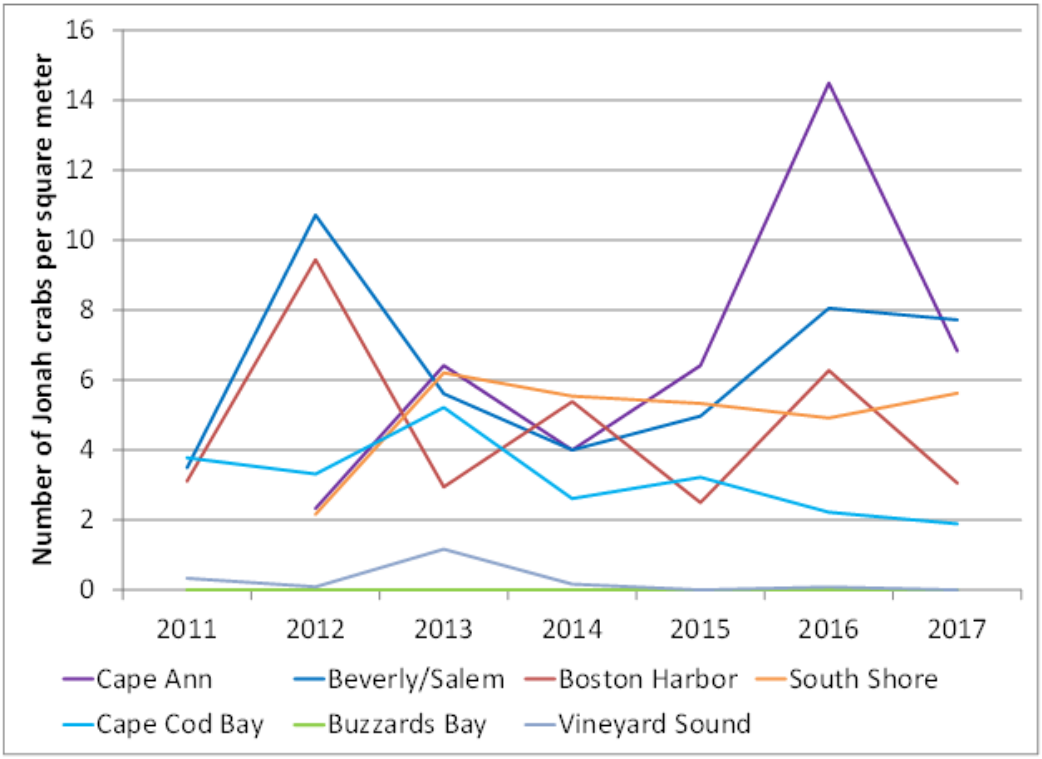

Figure 6: Number of Jonah crab per square meter from the MA DMF juvenile lobster suction survey. Cape Ann, Beverly/Salem, Boston Harbor, South Shore, and Cape Cod Bay are in NMFS statistical area 514; Buzzards Bay and Vineyard Sound are in statistical area 538.

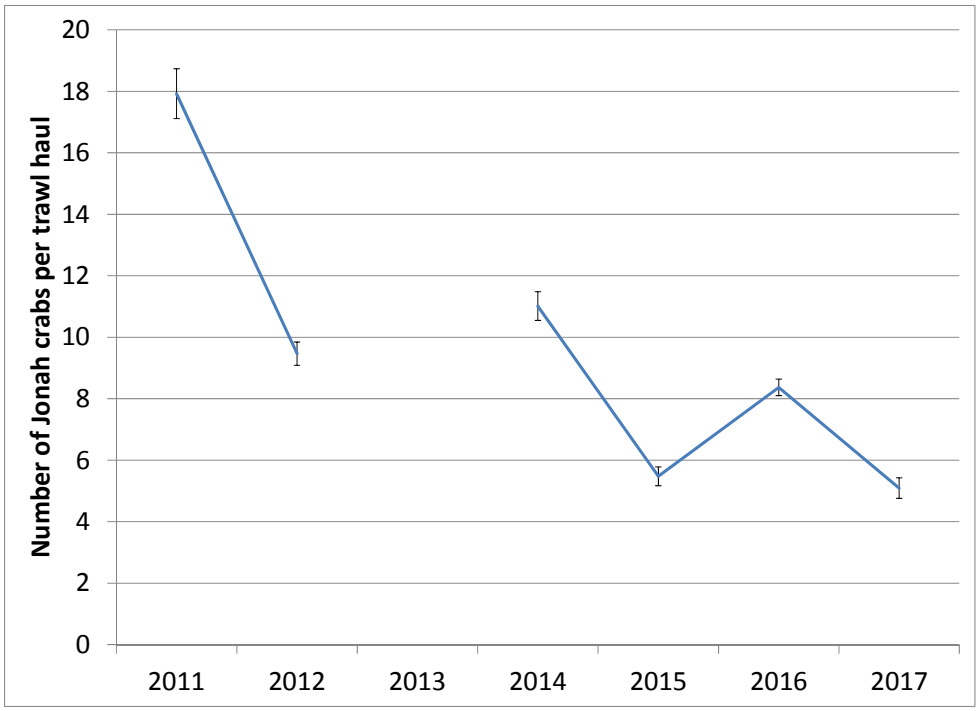

Figure 7. Number of Jonah crab per trawl haul from NMFS stat area 538 and 537 from the MA DMF Ventless Trap Survey. CPUE is standardized to a 6 pot trawl with three vented and three ventless traps. Error bars are ± two times the standard error. The survey did not occur in 2013.

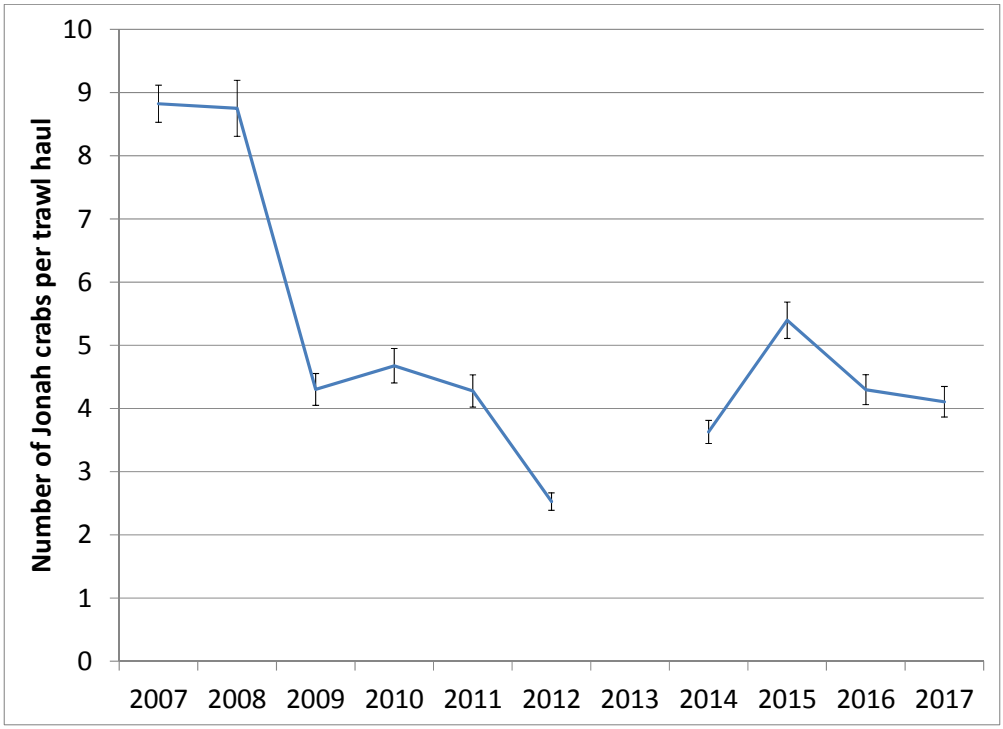

Figure 8. Number of Jonah crab per trawl haul from NMFS stat area 514 from the MA DMF Ventless Trap Survey. CPUE is standardized to a 6 pot trawl with three vented and three ventless traps. Error bars are ± two times the standard error. The survey did not occur in 2013.

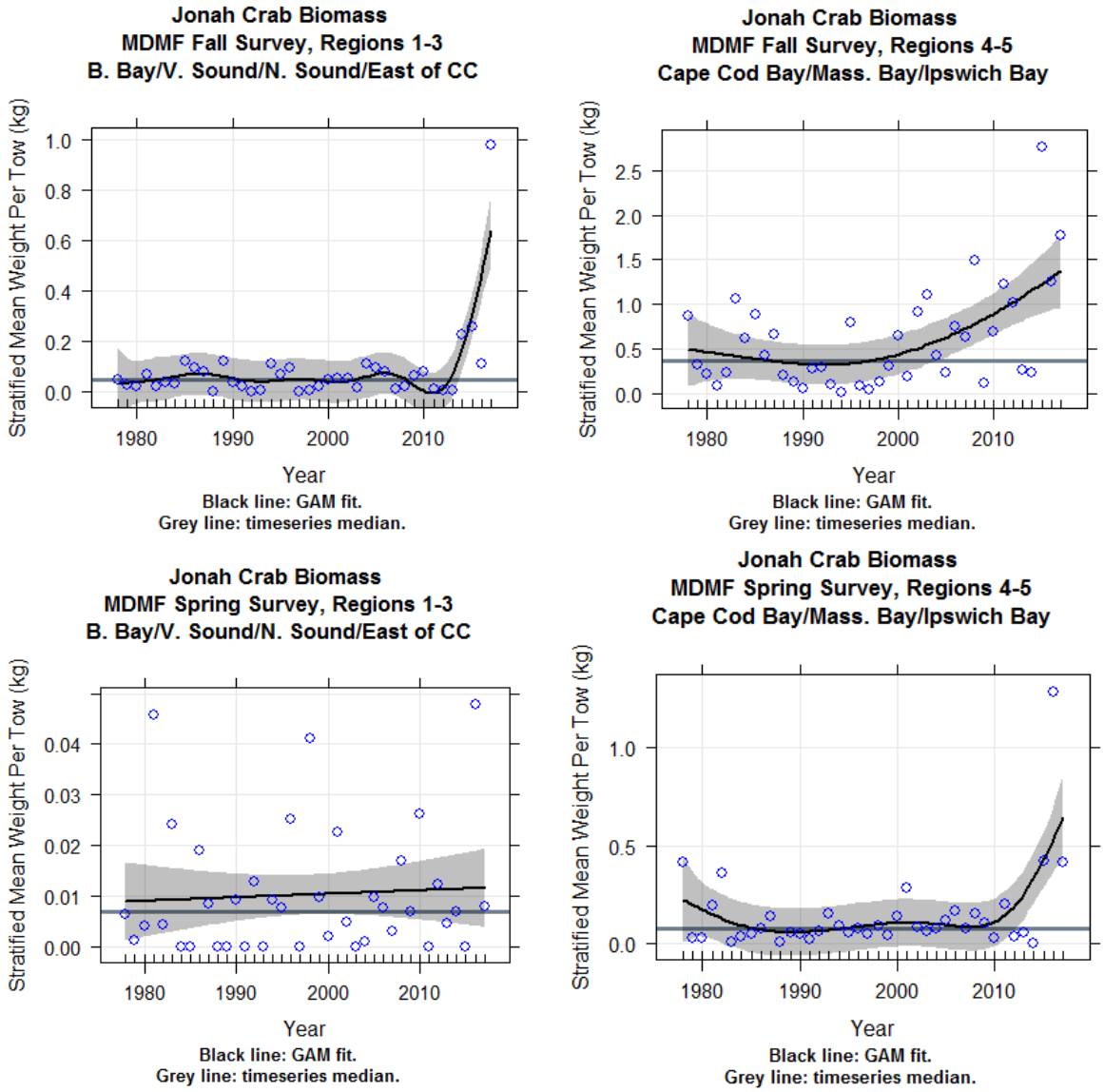

Figure 9. Jonah crab (sexes combined) stratified mean weight per tow from the MA DMF fall (top) and spring (bottom) trawl survey for regions 1–3 (south and east of Cape Cod, left) and regions 4 and 5 (north of Cape Cod, right). Black line is the generalized additive model fit, grey line is the time series median, shaded area is ± two times the standard error of the predicted value.

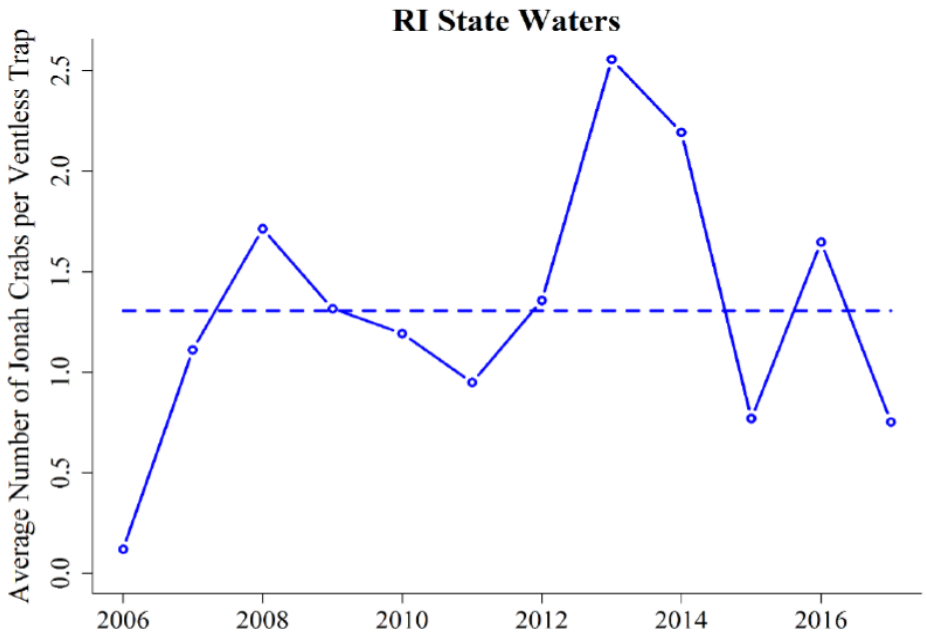

Figure 10: Stratified mean catch (#) per ventless trap in a VTS haul for Jonah crab. Dashed line indicates time series mean. (Source: RI DEM)

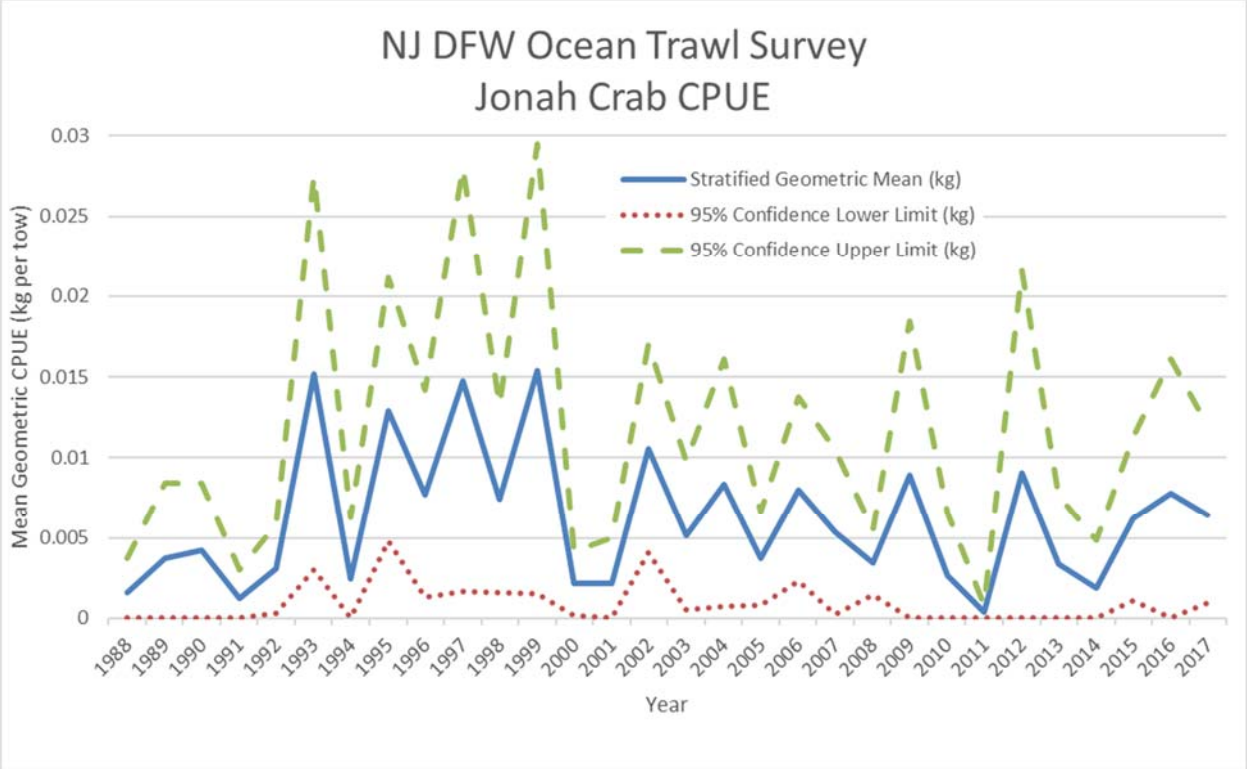

Figure 11: Stratified mean CPUE of all Jonah crab collected aboard the NJDFW Ocean Trawl Survey. The survey stratifies sampling in three depth gradients, inshore (18'-30'), mid-shore (30'-60'), offshore (60'-90'). The mean CPUE was calculated as the sum of the mean weight (in kg) of Jonah crab per size class collected in each sampling area weighted by the stratum area.

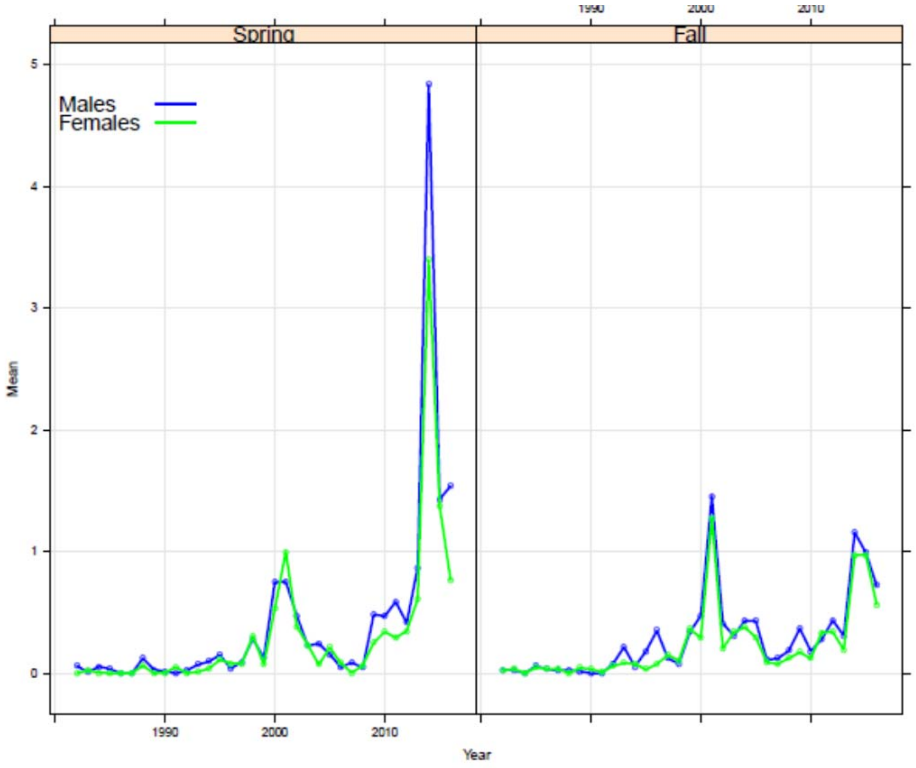

Figure 12: NMFS Jonah Crab index from the bottom trawl survey in the Gulf of Maine, through 2016.

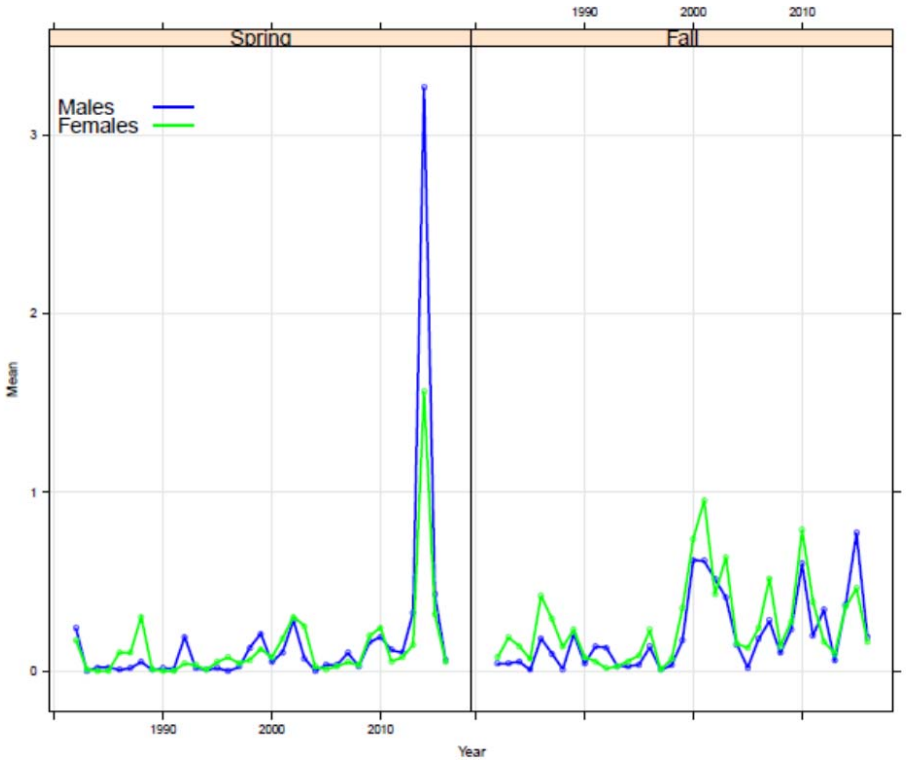

Figure 13: NMFS Jonah crab index from the bottom trawl survey in Georges Bank, through 2016.

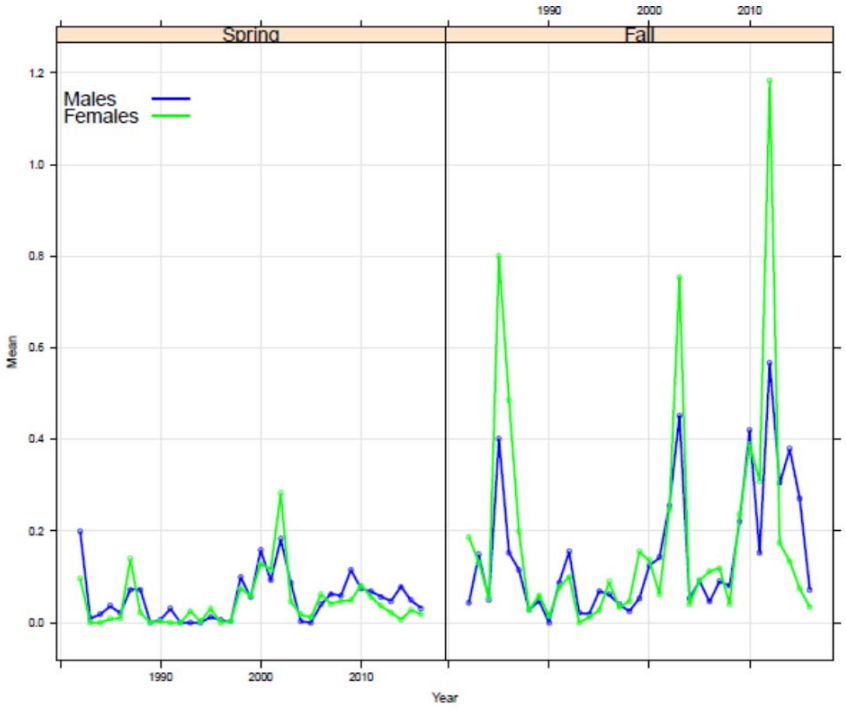

Figure 14: NMFS Jonah crab index from the bottom trawl survey in Southern New England, through 2016.

Atlantic States Marine Fisheries Commission

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MEMORANDUM

September 17, 2018

To: **American Lobster Management Board**

From: **Tina Berger, Director of Communications**

RE: **Advisory Panel Nomination**

Please find attached a new nomination to the Jonah Crab Advisory Panel – Marc Palombo, a commercial trap fisherman from Massachusetts. Please review this nomination for action at the next Board meeting.

If you have any questions, please feel free to contact me at (703) 842-0749 or tberger@asmfc.org.

Enc.

cc: Megan Ware

Jonah Crab Advisory Panel

Bolded names await Board review and approval

September 17, 2018

Maine

Chris Bates
32 Edgewood Lane
Brooksville ME 04617
cbates123@myfairpoint.net

- Awaiting confirmation from ME regarding nomination

New Hampshire

Todd Richard Ellis (manager for offshore lobster/crab boats)
4 Laurel Lane
Somersworth, NH 03878
Phone: 603.396.0993
tellis@littlebaylobster.com
Appt Confirmed 5/4/15

Massachusetts

Marc Palombo (comm. lobster traps)
4 Popes Meadow
Sandwich, MA 02563
Phone (home): 508.888.5714
Phone (cell): 508.648.0261
calicolob@comcast.net

Captain Jan Horecky (comm traps/offshore SNE)
29 France Street
Middleboro, MA 02346
Phone: 774.766.8466
jhorecky@verizon.net
Appt. Confirmed 5/4/15; 8/18

Rhode Island

David Spencer (comm lobster trap/offshore SNE/GB)
20 Friendship Street
Jamestown, RI 02835
Phone: 401.465.9669
FAX: 401.423.2120
Drspencer1@gmail.com
Appt Confirmed 5/4/15

Brian Thibeault (comm trap/inshore SNE)
40 lakeside Drive
Charleston, RI 02813
Phone: 401.932.8250
Kwe5tbos90@yahoo.com
Appt Confirmed 5/4/15

New York

Vacancy

Maryland

Earl Gwin (comm lobster trap/LCMA 5)
10448 Azalea Road
Berlin, MD 21811
Phone: 401.251.3709
jeanenegwin@verizon.net
Appt Confirmed 11/2/15

ATLANTIC STATES MARINE FISHERIES COMMISSION

Advisory Panel Nomination Form

This form is designed to help nominate Advisors to the Commission's Species Advisory Panels. The information on the returned form will be provided to the Commission's relevant species management board or section. Please answer the questions in the categories (All Nominees, Commercial Fisherman, Charter/Headboat Captain, Recreational Fisherman, Dealer/Processor, or Other Interested Parties) that pertain to the nominee's experience. If the nominee fits into more than one category, answer the questions for all categories that fit the situation. **Also, please fill in the sections which pertain to All Nominees (pages 1 and 2). In addition, nominee signatures are required to verify the provided information (page 4), and Commissioner signatures are requested to verify Commissioner consensus (page 4). Please print and use a black pen.**

Form submitted by David Pierce (your name) State: MA

Name of Nominee: Marc Palombo

Address: 4 Popes Meadow

City, State, Zip: Sandwich, Ma 02563

Please provide the appropriate numbers where the nominee can be reached:

Phone (day): 508-648-0261 (cell) Phone (evening): 508-888-5714 (Home)

FAX: _____ Email: calicolobe comcast.net

FOR ALL NOMINEES:

1. Please list, in order of preference, the Advisory Panel for which you are nominating the above person.
   1. Jonah crab
   2. _____
   3. _____
   4. _____
2. Has the nominee been found in violation of criminal or civil federal fishery law or regulation or convicted of any felony or crime over the last three years?

   ☐yes ☒no
3. Is the nominee a member of any fishermen's organizations or clubs?

   ☒yes ☐no

If "yes," please list them below by name.

Massachusetts Lobstermen's Assoc

Atlantic Offshore Lobstermen's Assoc

Gulf of Maine Lobster Foundation (Board member)

4. What kinds (species) of fish and/or shellfish has the nominee fished for during the past year?

Lobster + crabs (Jonah)

5. What kinds (species) of fish and/or shellfish has the nominee fished for in the past?

Lobster & Jonah crabs, multispecies

FOR COMMERCIAL FISHERMEN:

1. How many years has the nominee been the commercial fishing business? 40

2. Is the nominee employed only in commercial fishing? ☐yes ☒no MMA Women's Lacrosse coach - Head-coach

3. What is the predominant gear type used by the nominee? Lobster traps

FOR CHARTER/HEADBOAT CAPTAINS:

1. How long has the nominee been employed in the charter/headboat business? _____

2. Is the nominee employed only in the charter/headboat industry? ☐yes ☐no

If "no," please list other type(s) of business(es) and/occupation(s): _____

3. How many years has the nominee lived in the home port community? _____ years

If less than five years, please indicate the nominee's previous home port community.

_____

FOR RECREATIONAL FISHERMEN:

1. How long has the nominee engaged in recreational fishing? _____ years

2. Is the nominee working, or has the nominee ever worked in any area related to the fishing industry? ☐yes ☐no

   If "yes," please explain.

   _____

FOR SEAFOOD PROCESSORS & DEALERS:

1. How long has the nominee been employed in the business of seafood processing/dealing? _____ years

2. Is the nominee employed only in the business of seafood processing/dealing?

   ☐yes ☐no
   If "no," please list other type(s) of business(es) and/or occupation(s):

   _____

3. How many years has the nominee lived in the home port community? _____ years

   If less than five years, please indicate the nominee's previous home port community.

   _____

FOR OTHER INTERESTED PARTIES:

1. How long has the nominee been interested in fishing and/or fisheries management? _____ years

2. Is the nominee employed in the fishing business or the field of fisheries management?
   ☐yes ☐no

   If "no," please list other type(s) of business(es) and/or occupation(s):

   _____

FOR ALL NOMINEES:

In the space provided below, please provide the Commission with any additional information which you feel would assist us in making choosing new Advisors. You may use as many pages as needed.

Nominee Signature: Marc Palombo Date: 8/2/2018

Name: Marc Palombo
(please print)

COMMISSIONERS SIGN-OFF (not required for non-traditional stakeholders)

State Director

State Legislator

Governor's Appointee