Atlantic States Marine Fisheries Commission

American Lobster Management Board

February 2, 2016
9:00 a.m. – 12:00 p.m.
Alexandria, Virginia

Draft Agenda

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

1. Welcome/Call to Order *(D. Borden)*	9:00 a.m.
2. Board Consent • Approval of Agenda • Approval of Proceedings from November 2015	9:00 a.m.
3. Public Comment	9:05 a.m.
4. Discuss Future Management of Southern New England Lobster Stock **Possible Action** • Report from Technical Committee *(B. Glenn)*	9:15 a.m.
5. Review and Discuss Catch and Landings Records for Jonah Crab-Only Trap Fishermen *(M. Ware)*	10:20 a.m.
6. Consider Draft Addendum I to the Jonah Crab Fishery Management Plan (FMP) for Public Comment *(M. Ware)* **Action**	10:30 a.m.
7. Review Catch Records from Jonah Crab Claw Fishermen and Discuss Action to Create a Standard for Claw Landings *(M. Ware)* **Possible Action**	11:00 a.m.
8. Approve Implementation Plans for the Jonah Crab FMP *(M. Ware)* **Action**	11:30 a.m.
9. Update on NEFMC Deep Sea Coral Habitat Amendment *(D. Grout)*	11:40 a.m.
10. Update on State/Federal American Lobster Observer Programs *(M. Ware)*	11:50 a.m.
11. Elect Vice-Chair *(D. Borden)* **Action**	11:55 a.m.
12. Other Business/Adjourn	12:00 p.m.

The meeting will be held at the Westin Alexandria; 400 Courthouse Square, Alexandria, VA; 703.253.8600

MEETING OVERVIEW

American Lobster Species Management Board Meeting
Tuesday, February 2, 2016
9:00 a.m. – 12:00 p.m.
Alexandria, VA

Chair: David Borden Assumed Chairmanship: 02/16	Technical Committee Chair: Bob Glenn (MA)	Law Enforcement Committee Representative: John Cornish (ME)
Vice Chair: vacant	Advisory Panel Chair: Grant Moore (MA)	Previous Board Meeting: November 2, 2015
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 November 2015

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. Discuss Future Management of Southern New England Lobster Stock
(9:15 – 10:20 a.m.) Possible Action

Background

- The 2015 Stock Assessment showed the SNE stock is at record low abundance and experiencing recruitment failure.
- At the November meeting, the Board charged the TC with several tasks to further investigate the condition of the stock and potential management options moving forward. These included a review of preliminary projections and a recalculation of reference points.
- The TC met twice via conference call and in-person on December 8th to complete these tasks.

Presentations

- Technical Committee Report by B. Glenn (**Briefing Materials**)

Board actions for consideration at this meeting

- Initiate an addendum to address the poor condition of the SNE stock.

5. Review and Discuss Catch and Landings Records for Jonah Crab-Only Trap Fishermen
(10:20 a.m.-10:30 a.m.)

Background

- The Jonah Crab FMP allows for crab-only trap fishermen to participate in the fishery; however, no effort controls are specified for these fishermen.
- At the November meeting, the Board requested a review of catch and landings records to determine the size of the fishery.
- A review of data shows that there are 4 Jonah crab only trap fishermen from Rhode Island. There are no Jonah crab only trap fishermen from Maryland or New York.

Presentations

- Overview of Jonah crab only trap fishermen data by M. Ware

6. Draft Addendum I to the Jonah Crab FMP (10:30-11:00 a.m.) Action

Background

- At the November meeting, Board members expressed concern that the incidental bycatch limit does not capture all current harvesters in the Jonah crab fishery.
- The Board initiated Addendum I to consider increasing or removing the bycatch limit.
- The PDT is recommending a second issue be added to the Addendum prior to public comment which sets a bycatch limit for non-lobster trap gear. (**Briefing Materials**)

Presentations

- Overview of Draft Addendum I for public comment by M. Ware (**Briefing Materials)**

Board actions for consideration at this meeting

- Approve draft Addendum I for public comment.

7. Review Catch Records from Jonah Crab Claw Fishermen (11:00 – 11:30 a.m.) Possible Action

Background

- Exemptions were made in the Jonah Crab FMP for claw fishermen from NJ, DE, MD, and VA; however, a preliminary review of data showed that there are more claw fishermen than previously expected and that other states, including New York, also have participants in the claw fishery.
- At the November meeting, the Board requested a review of catch and landings records from the claw fishery.
- The PRT reviewed state submitted data via conference call and compiled a report on the Jonah crab claw fishery. (**Briefing Materials**)

Presentations

- Overview of data on the Jonah crab claw fishery by M. Ware

Board actions for consideration at this meeting

- Initiate an addendum to create a standard for claw landings.

8. Approve Implementation Plans for the Jonah Crab Fishery Management Plan (11:30 a.m. -11:40 a.m.) Action

Background

- Implementation plans for the Jonah Crab FMP were due January 1, 2016.
- The Jonah Crab PRT reviewed the plans via conference call is forwarding the plans as well as their concerns to the Board. (**Supplemental Materials)**

- Since some regulations in the Jonah Crab FMP may change through the addenda process, the Board needs to discuss if these measures should be implemented as they currently stand in the FMP or if they should be implemented following final action on associated addenda.

Presentations

- Overview of Jonah Crab Implementation Plans by M. Ware

Board actions for consideration at this meeting

- Approve state implementation plans.

9. Update on NEFMC Deep Sea Coral Habitat Amendment (11:40 – 11:50 a.m.)

Background

- NEFMC is currently working on a Deep Sea Coral Habitat Amendment which seeks to protect discrete coral zones.
- It is currently unclear if these actions will impact the lobster traps; ASMFC manages the lobster fishery but NEFMC has the authority to protect corals from fishing gear.
- ASMFC is working with the Council to collect data on the distribution of lobster fishing effort in order to determine potential impacts to lobster fishermen. (**Briefing Materials)**

Presentations

- Update on the NEFMC Deep Sea Coral Habitat Amendment by D. Grout

10. Update on State/Federal American Lobster Observer Programs (11:50 – 11:55 a.m.)

Background

- In October 2015, members from the federal and state observer programs met to discuss concerns with the federal observer program. A primary concern was the sampling frame of the federal program which only included lobster fishermen who report with VTRs.
- In December, members of the federal observer program presented an expanded sampling frame which includes all lobster fishermen with federal licenses.
- This expanded and more realistic sampling frame took effect January 1, 2016.

Presentations

- Update on the federal observer program by M. Ware

11. Elect Vice Chair (11:55 a.m. – 12:00 p.m.) Action

Background

- David Borden's chairmanship began February 2016.
- The vice chair seat is now empty.

Board actions for consideration at this meeting

- Elect Vice Chair

12. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

AMERICAN LOBSTER MANAGEMENT BOARD

World Golf Village Renaissance
St. Augustine, Florida
November 2, 2015

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

TABLE OF CONTENTS

INDEX OF MOTIONS

ATTENDENCE

Board Members

Pat Keliher, ME (AA)
Terry Stockwell, Administrative proxy
Sen. Brian Langley, ME (LA)
Douglas Grout, NH (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
G. Ritchie White, NH (GA)
William Adler, MA (GA)
Rep. Sarah Peake, MA (LA)
Dan McKiernan, MA, proxy for D. Pierce (AA)
Jason McNamee, RI, proxy for J. Coit (AA)
David Borden, RI (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
David Simpson, CT (AA)
Mark Alexander, CT, Administrative proxy
Rep. Craig Miner, CT (LA)
Lance Stewart, CT (GA)
James Gilmore, NY (AA)
Steve Heins, NY, Administrative proxy
Emerson Hasbrouck, NY (GA)
Pat Augustine, NY, proxy for Sen. Boyle (LA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Tom Fote, NJ (GA)
Tom Baum, NJ, proxy for D. Chanda (AA)
Roy Miller, DE (GA)
John Clark, DE, proxy for D. Saveikis (AA)
David Blazer, MD (AA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Peter Burns, NMFS

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

Ex-Officio Members

Rene Cloutier, LEC Representative

Staff

Megan Ware
Toni Kerns
Robert Beal
Jeff Kipp

Guests

Allison Murphy, NMFS GARFO
Chip Lynch, NOAA
Kelly Denit, NOAA
Chris Wright, NOAA
Danielle Rioux, NOAA
Brandon Muffley, NJ DFW
John Bullard, NMFS GARFO
Michael Petony, NMFS GARFO
Derek Orner, NMFS
Mike Armstrong, MA DMF
Tom Hoopes, MA DMF
Michael Luisi, MD DNR
Bob Ballou, RI DEM
Mark Gibson, RI DEM
Marin Hawk, MSC
David Bush, NCFA
Arnold Leo, E. Hampton, NY
Abden Simmons, MEFA
George Peterson, MA

The American Lobster Management Board of the Atlantic States Marine Fisheries Commission convened in the St. Augustine Ballroom of the World Golf Village Renaissance, St. Augustine, Florida, November 2, 2015, and was called to order at 8:00 o'clock a.m. by Chairman Dan McKiernan.

CALL TO ORDER

CHAIRMAN DANIEL McKIERNAN: Let's start the Lobster Board Meeting. My name is Daniel McKiernan from the state of Massachusetts, on behalf of Director David Pierce, as his proxy.

APPROVAL OF AGENDA

CHAIRMAN McKIERNAN: First on the agenda is the approval of the agenda. Are there any additions to the agenda? I see none; we're going to accept the agenda as is.

APPROVAL OF PROCEEDINGS

CHAIRMAN McKIERNAN: Second is the proceedings. Are there any comment, additions, or edits to the proceedings? Seeing none; we'll accept the proceedings. Next on the agenda, I'd like to just recognize Terry Stockwell. Terry wanted to inform us about his role today.

MR. TERRY STOCKWELL: Mr. Chairman, I did want to clarify for the record that I'm sitting at the table as the representative of the New England Fishery Management Council. I will only be voting on the Jonah Crab related issues and abstaining on all the other actions brought forth by the board.

CHAIRMAN McKIERNAN: Thank you, Terry. I want to add as well under Number 9, Other Business, Megan is going to give a short presentation on the outcome of the state/federal meeting concerning the Lobster Observer Program that was held in early October up in our Gloucester office.

MANAGEMENT RESPONSE TO THE 2015 AMERICAN LOBSTER STOCK ASSESSMENT

CHAIRMAN McKIERNAN: Moving on to Agenda Item Number 4, discuss the management response to the 2015 American Lobster Stock Assessment, I think you folks are well aware from the last presentation the status of the stock was considered quite robust everywhere except Southern New England. This board and the commission does face a conundrum of how to deal with this particular component of the lobster population in this changing environmental situation.

Did you have any slides you wanted to show on that?

PUBLIC COMMENT

CHAIRMAN McKIERNAN: I was informed that there wasn't any requests for public comment.

REPORT FROM SNE SUBCOMMITTEE

CHAIRMAN McKIERNAN: At the request of this board, a subcommittee was convened on October 2nd, hosted by David Simpson in Connecticut. We brought together the heads of the LCMTs, some of the leading state agency officials, and the technical committee members and discussed in depth, over about seven or eight hours, the conundrum and the challenges that we all have in Southern New England.

We were tasked with trying to come up with management objectives for taking on the dire condition of the stock. It was a very challenging meeting, a very challenging discussion. It fell along somewhat predictable lines in terms of the industry's concerns about impacts of conservation measures on their business plans. The technical committee presented a number of projections suggesting that under a whole array of natural mortality levels the stock is unlikely to recover certainly to the historic levels that the current plan requires in terms of targets and

thresholds but even to arrest the decline of this stock may take some pretty dramatic actions and pretty dramatic conservation.

The group really struggled with trying to come up with various objectives, and everyone in the room certainly agreed that doing nothing is certainly inappropriate, but at the same time the moratorium option or something close to a moratorium is extremely difficult. Certainly, no one in the room had an interest to do that as well.

There are a number of possible competing objectives in the document on Pages 2 and 3; and they include rebuilding the Southern New England stock, which we all agreed couldn't be done to historic levels; prevent further declines in spawning stock biomass, which could have a devastating effect on the economics of the fishery, which is for many of the guys pretty marginal.

Another objective would be to slow the rate of decline in the spawning stock biomass as well as preventing the loss of fishery infrastructure. I'd like to have some discussion with you this morning about what we as a group should lay out as objectives for this area. I think we are in a very unique situation. Everybody talks about climate change and ocean warming; I think in some ways this is really the poster child for the effects of the environment on these fish stocks.

The press has picked up on a lot of other environmental fishery stories like cod in the Gulf of Maine; but we laid the groundwork for this argument about six or seven years ago with some of the work that folks in Rhode Island and Massachusetts did and described the mechanism for which the stock seemed to be failing in terms of reproductive potential and the loss of optimal habitat because of warming waters. I'd like to open up the discussion around the room, especially to those who participated in the meeting, and get your thoughts on how we should move forward.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Just real quickly before the board jumps into the meat of that conversation, I just wanted to introduce three people that are at the table. They're generally familiar faces to the commission, but they are new to the Lobster Board or back to the Lobster Board.

Senator Brian Langley is here. He was a commission before and now he is back as a commissioner. We've got Ed O'Brien from Maryland. Ed is familiar to a lot of you that have been with commission working on striped bass. He has been on the advisory panel for a long time. Then we've got a gentleman named Pat Augustine that is back at the table once more from New York.

CHAIRMAN McKIERNAN: I'd like to add Rene Cloutier is here from the Maine Marine Patrol representing the Law Enforcement Committee as well. I'm looking for my colleagues from Southern New England to start the discussion. David.

MR. DAVID SIMPSON: I wish I had the answer and then we could just kind of go toward that; but I think the central question we've been struggling with for quite some time now is understanding that in all likelihood it is the warming waters that we've experienced since about 1998 that is at the heart of the change in prospects for lobster.

Do we subscribe to a climate change theory that says it is bad and it is going to get worse; so it is a hopeless cause for lobster; let the fishery just go ahead and catch the last one; and when it is over, hopefully something will replace it; or, do we look at it and say, yes, it is a much more stressful environment that they're in, but there remains some productivity in this stock and maybe we can achieve the level of productivity and harvest that we once enjoyed; but is there a new lower level of productivity that could be sustainably managed and harvested?

I think that's the central question. I haven't decided myself. I think it comes down to whether you're just a pessimist or believe that there might be something worth holding onto. Then I always go back to our coastal policy in Connecticut, which says one of my jobs is to prevent the depletion of indigenous species.

If there is something that could be done to stem the decline in this stock, which has been consistent for 15 years, then we have a responsibility to do it. I think that, to me, kind of sets the frame for the conversation. Do we just give up or do we acknowledge that there is a lower level productivity and try to manage toward that?

MR. THOMAS FOTE: Again, when I'm talking about the Mid-Atlantic with the New England interloper's district or what you call Southern New England, I look at this the same way as Dave does, but I also look at it as a business model. Lobstermen are not going to go out unless they can make a living. It is an expensive business. They lose traps. They have boats that are heavy on gas or diesel, whatever they use.

You're probably going to see a thinning out of the lobster fishermen. It is a real shame because it is such a historical fishery, but some of that is going to be self-regulating. If you can't make a living and if it is not going to be profitable, you're going to stop doing that. We should be looking at how do we address that; how do we basically help the industry get through this tough period b besides basically with lobster.

I think no matter what we're going to do, it is going to go down and the industry is going to need some help to either adjust to another industry or maybe to look at some kind of kind federal buyout for the program.

I'm not positive right now if we did something we were going to going to make a big difference on that. I'm just not sure. Do we let it self-regulate itself down; because as I said when they stop making a profit, they are going to stop fishing? It just perplexes me and I'm really interested in what lobstermen have to say about some of that.

CHAIRMAN McKIERNAN: Tom, to your point about a federal buyout, it was about ten years ago when the stock was declining significantly and some of the Rhode Island folks and some of the Massachusetts folks, I think both went to congress looking for some kind of federal support and failed. There was an interest in doing that.

What has been taking place in the Area 2, which is the Rhode Island/Massachusetts, a little bit of Connecticut, and the Area 3 gang is a self-funded buyout, so a lot of those vessel owners are kind of cannibalizing other businesses in order to prepare for the trap cuts that they have agreed to. It would certainly be a different outcome to see federal support for this, but I guess it is not out of the question.

MR. FOTE: You only had two states involved. When you have more states involved, you've got more congressmen and more senators, so it might be more politically advantages.

CHAIRMAN McKIERNAN: Fair point. Mark Gibson.

MR. MARK GIBSON: First, thanks to David for hosting a very difficult meeting. I tend to agree with him that I think there needs to be some reassessment of the reference points, what is realistic given the conditions of stock productivity, environmental change and ecological challenges that lobsters face.

The difficulty is we don't have any estimations of a reference point. If they didn't come out of this last stock assessment, we're probably not going to see those anytime soon. I think a pivotal issue here is we have some stock projections. We had some at that meeting. I don't know if they're revisions or just refinements from Burton Shank of the Fisheries Service.

I think those are pivotal on this question; and I'm not really sure of the status of those. They're in our briefing material, but I don't know if they've been endorsed by the technical committee or the PDT. I think that's critically important because some of those projections, as you noted, Mr. Chairman, are quite pessimistic.

Just stabilize biomass at its current level required a substantial cut in mortality, either cutting M, which we really don't know how to do, or cutting fishing mortality, which we think we know how to do are reluctant to do so. I think I need to understand what the status of those is in terms of their peer review and their acceptance by the technical committee. Maybe that's a charge we need to make to the technical committee in terms of reviewing of those projections and giving us some insight into how reliable they think they are and then what do they tell us about a potential reference point adjustment.

MS. MEGAN WARE: Just to clarify, the projections in the meeting materials were from Burton, and it was a request from the subcommittee that the units be changed from spawning stock biomass to reference abundance; so that is what is shown there. In terms of them being reviewed by the technical committee or peer reviewed, they have not. If that's something the board would like to do, then that should be tasked to the technical committee.

DR. LANCE STEWART: My concerns have been the concerns that have been expressed tome for the last two or three months from the Western Long Island Lobstermen's Association and several others that are involved in that kind of restricted area for habitat. Through the fifteen years of different levels of mortality that we've had, I don't think we've really mounted a good scientific study across the board inclusively that deal with temperature and pesticides at the same time lobsters are fading or what is affecting them.

I think we need an ultimate synchronated, organized through the technical committee, a study of one of the greatest populations that are going through mortality along the east coast. This would be alarming and should be alarming as any other that the federal government and the states have coordinated in the past.

All I'm doing is asking and appeal, as all the fishermen have expressed to me, to get this data together. I have bits and pieces of DO and temperature that don't really correlate with a site station with a fixed number of lobsters in the traps that are really enumerated over and over again as far as how far they have died or whether they do die. They may have a weakened condition and not die.

I don't think we've done the science justice for this largely important animal, and that's what I'm asking the board inclusively, all of the Chesapeake, whatever, to take the attitude that this is one of the major stocks on the eastern border and we haven't given it a definitive study yet. We're looking at shutting down the fishermen and closing a traditional fishery.

Those are the words that I get by phone; and as a biologist this was my animal for 40 years. I have these subtle ideas and they're real by a lot of scuba studies that some lobsters in traps that come up and they may or may not die, but they have to be really verified to be in the condition that causes mortality.

But, in the environment there are tremendous numbers of mud burrows in these grottoes that go into the sediment of Long Island Sound where lobsters that are free and are able to roam to avoid a two degree or three degree temperature for a week or two – they could; I don't know whether they do, but it is certainly a possibility.

These sorts of subtle things that affect this multimillion dollar species or industry should be laid out and studied. It is a close geographical area. It is not like studying the whole continental

shelf; so it is an easy study to do. The funding would be generated from congress, we feel, instantaneously, but I think we need to have the urgency and the appeal made a little more prominent than we have in the last 15 years.

MR. WILLIAM A. ADLER: First of all, I mirror the other comments on new reference points. I think that's important to lower the bar a little and the expectation. As far as the – I think the fishermen are still reducing, I believe, traps and, of course, also the number of fishermen are being reduced as well as you just mentioned.

There is something going on, which is reducing mortality. I do recognize what the subcommittee had done, and I read the material. What can we do? I don't think closing the fishery; I don't think that even reducing it by 75 percent – you know, I don't think that's working or going to work. We do have the natural mortality. What do you do?

Well, I think that we bring an iceberg down and put it in Buzzards Bay and it might cool the water a little. We could up the predator count so that we can catch more of those; because those things were also listed as a problem. Now, that's not going to bring all the lobsters back. I also think that the ventless study; there should be a ventless study done outside where these fishermen are saying, yes, we're doing fine; where are you?

Deeper, colder water, south of Vineyard; un huh, that's what the biologists said, the lobsters leave town when it gets too warm; and then when they have their eggs, they don't come back into Buzzards Bar or Narragansett Bay. They go somewhere else. So, anyway, a ventless study I think should be done out there just to put more information into our hands.

CHAIRMAN McKIERNAN: Bill, to that point, I know that the Massachusetts Ventless Trap Survey is going into the EEZ. Mark, did the Rhode Island Ventless Trap Survey go out there?

MR. GIBSON: Go where?

CHAIRMAN McKIERNAN: The Rhode Island Ventless Trap Survey; does it put traps in federal waters or just state waters? All right, next I have David Borden.

MR. DAVID V.D. BORDEN: I attended the subcommittee meeting, and my take-away message from that is this a really difficult issue for all of us to deal with. I think we've got to be right up front about the circumstance we find ourselves in. The will of that group was we can't envision doing the two extremes, which to me the take-away conclusion of that is we need to do something.

I favor that type of approach. I think we've got to be fairly deliberate in terms of what we do. Once again this is in the mode of big picture. I think we should identify a whole number of taskings and at this meeting ask the technical committee or whatever the appropriate committee is to review it and bring action items back to the commission so that in fact we can take action.

I don't think that we should ask the technical committee, which the commission did the last time they found themselves in this situation, what is the most effective way of conserving this stock? There is a simple answer for that; close the fishery. If you ask that question; that is what the response is going to be, and we all know that.

I think the message from the subcommittee was don't go there; that's not the appropriate message. I think we've got to be up front with ourselves and all the commissioners and the public that we're not going to close the fishery, but personally I don't think we should give up on the fishery. I think there is a whole series of potential actions we can take to try to buffer the lobster resource if Southern New England.

If you were to look at – and this is all out of the scientific reports. If you were to look at some of

the condition of the fishery, it is horrible. There is no other way to describe it. The recruitment is down, the landings are down, but there are some positive things that are going on in the fishery. The fishing mortality is one of the lowest in the time series. The effective exploitation is one of the lowest in the time series.

In terms of Area 2 and 3, the number of traps fished is one of the lowest in the time series. Just using Rhode Island and Massachusetts on traps fished, in the heyday of the resource, 1999, those two states were fishing about 300,000 traps. After the trap cuts the commission has approved, those two states will be fishing about 60,000 traps. At some point those trap cuts are going to bite into the fishing mortality.

My position on this is I think we should walk away from this meeting today with a whole series of taskings and have the technical staff and even the LCMTs actually work on some issues. I think one of the strategies should be to try to increase egg production. I'm not personally convinced that environmental change was the sole reason that this stock has gone down. I think it is a function of many factors, one of which is natural mortality and predators in the environment.

There are ways to put more eggs into the water and increase the recruitment level with minor tweaks. The PRT looked at a whole series of recommendations, one of which was to look at consistency in some of the regulations and the impacts – I think a better way of saying it the impacts of inconstancy on the regulations. I think that should be one of the taskings we should task the committee. I've got a number of other suggestions, but I'd like to hear other members of the board first.

MR. EMERSON C. HASBROUCK: The other speakers have said much of what I wanted to comment on. We really need to reexamine the reference points. The reference points are being driven by that peak of the population, Long Island Sound, Block Island Sound, Buzzards Bay, back in the eighties and nineties. That is what is driving this. That's what those reference points are based on. I don't think we're ever going to get there again.

In fact, even the staff memo indicates that we may never get there again. We can't be in a situation where reference points are being driven by a situation that we're never going to achieve again. If we look at abundance, abundance now is about where it was back in the late seventies. If we were having this conversation back in the late seventies, we'd say, well, things aren't too bad; but we're having this conversation now after that peak in the eighties and nineties and we're saying, well, things might be pretty bad. As the other speakers have said, we need to reexamine that.

In terms of effort, we've had a significant reduction in effort already. During the peak of this Southern New England inshore fishery, there were almost 600,000 pots being fished. Now we're down to about 150,000; so there has been a significant reduction in effort already. Some of the issue, though, is that the number of pots being actively fished is significantly reduced again from about 600,000 down to about 150,000; but a lot of that gear is still out there.

It is still out there in the water; it is still fishing. We received some funding through NFWF and NOAA to remove some of these derelict pots; and so far we've retrieved 14,000 abandoned pots. Nearly half of them have the escape vent – I'm going say compromised; and when I say compromised, I mean that the escape vent is either still attached, the hard rings haven't deteriorated so that escape panel is still in the pot; or, that end of the pot where the escape vent is has either sunk into the mud or partially sunk into the mud.

Even though the active number of pots being fished is less, there is still a lot of ghost fishing going on. Again, we've removed 14,000 pots,

there is still a lot of abandoned gear out there, it is still fishing, the escape panels aren't coming off, and they're still catching lobsters. Probably about at least a third of the gear that we're retrieving have lobsters in them.

MR. MIKE LUISI: I'll keep my comments on one specific point that I think is going to be an issue that is going to be a difficult one to try to fix, and that has to do with this concept of ending the fishery. Ending the fishery I think means different things to different areas and the different fished areas of the Southern New England area.

What I'm getting to is that south of the Delaware Bay the Lobster Fishery is not an inshore fishery. The Lobster Fishery is a deepwater offshore fishery that requires enormous efforts to get to, prosecute, return home with a profit margin hopefully large enough to make the day worth it or make the trip worth it over a course of a couple days.

When I read through the documents and hear the suggestions that reductions on the order of 75 percent, even if it was 25 percent, if we were to even consider something around 15 percent, I'm not sure that the fishermen that I represent would be able to continue operating due to where this fishery is being prosecuted south of Delaware Bay.

I'm also hearing from them that offshore stock – and I know that this issue was discussed at the subcommittee, but that offshore stock in the deep waters and the canyons, they're not experiencing the same declines – they're not seeing the same declines in their catch-per-unit effort over this period of the last five or ten years. It is just not there; they're not seeing it. It is a challenge when talking with them and explaining to them what the science is saying when they're not experiencing that themselves. We don't collect a lot of information south of the Delaware Bay on lobster. We've begun a sampling program in that sea-sampling program to try to start gathering information; but in my mind I think we might need to think about the science of the stock and looking at these different areas and determining whether or not these reductions are absolutely necessary with the inshore versus the offshore fishery. I'll just leave it with that.

CHAIRMAN McKIERNAN: Toni, can I ask you a quick question about funding opportunities or attempts at getting funding to look at the offshore stock? Didn't the technical committee try to pursue that to no avail; do you remember?

MS. TONI KERNS: Like, for example, doing the ventless trap survey in the offshore fishery or just general data collection in the offshore fishery?

CHAIRMAN McKIERNAN: I think they were trying to do some tagging studies to determine the linkages between the nearshore and offshore and some of the movement of lobsters in the deeper water.

MS. KERNS: I believe that someone may have applied for a couple of funding projects and they were not successful.

CHAIRMAN McKIERNAN: That's my recollection as well. Do you want to speak to that, Doug?

MR. DOUGLAS E. GROUT: Yes; I know there was an ACCSP grant that my staff got involved with and going out and having the AOLA do at-sea monitoring. I thought they were going to try and add some tagging to that particular study, too. I can find out from my staff if they did indeed start doing the tagging, if you'd like.

CHAIRMAN McKIERNAN: I only raise that because I think that is the conundrum that we're all facing. When you think about it, we have nearshore areas that don't produce lobsters like they used to. We have offshore areas that appear to be producing lobsters at a much higher level. The technical committee I think espouses

the traditional linkages of nearshore shallow habitat produces young lobsters and those lobsters are eventually taken as adults offshore.

That is the traditional thinking and yet to Mike's point there seems to be this reservoir of older lobsters that continues to be available to the offshore fleet; and that's the disconnect. Nobody is going to deny that the landings haven't plummeted in Long Island Sound or in Buzzards Bay; but how we manage this stock as a whole is really, really challenging.

EXECUTIVE DIRECTOR BEAL: Dan, is there an estimate of what this would cost just so we can put that into the priorities of the commission. As funding opportunities are available, how much would this work cost and we can get a sense of where that is on the commission's priorities and start weaving that into our process.

CHAIRMAN McKIERNAN: I don't have it, but I'd be happy to produce it subsequent to this meeting. I'll talk to Bob Glenn about that.

EXECUTIVE DIRECTOR BEAL: Yes, I think it would be helpful just to know what ballpark we're working in and then we can see if there is SK funds or whatever it might available that we can latch onto and then fund this work. It sounds pretty important to the discussion and sorting through the Southern New England issue.

MR. PATRICK C. KELIHER: Mr. Chairman, I wanted to lend some support to the concepts that Dave Borden brought forward as far as tasking the technical committee. However, I do want to encourage the board to consider not looking only at Southern New England if we are going to be tasking the technical committee.

My staff has just completed or are in the process of completing the settlement survey for our state. It looks like we're going to be well below average for settlement for this year. This will be four out of five years we're continuing to see some reductions within Western Maine within our fisheries compared to what we're seeing in mid-coast and Downeast Maine where landings are still quite high.

However, I want to make sure that we as a board take lessons and learn some lessons from Southern New England about being ready to react to a changing stock. I think the signs are starting to show that we will see a changing stock in the Gulf of Maine. We know there is relationships from the Gulf of Maine stock back to Georges as far as tagging studies that have been done. I would encourage the board to consider adding some tasks to the technical committee that would look at some of those relationships and some of the differences with regulations between those areas.

MR. G. RITCHIE WHITE: Mr. Chairman, we started this ten years ago, fifteen, whatever, with the recommendation of a moratorium. We did, what, a 10 percent cut. I think we're to the point now where it is clear that the problem is environmental. We can't solve it with reducing fisheries' mortality. It seems that a moratorium is not an option.

I think the commission, though, needs to call what we're going to do what it is. I think it is important that we don't take some steps as it seems like we're going to take and call it that we're trying to restore the stock. I think we need to call it that we don't think the stock is probably recoverable based on peer-reviewed science; and we want to maintain a fishing industry and fishing infrastructure; and that's our goal. I think we've danced around this for 15 years, and I think we need to come out publicly and describe what we're going to do as what it is.

MR. PETER BURNS: Mr. Chairman, it is certainly a very difficult problem; and I think that Ritchie makes a good point. I think what we have to really do is find some definitive goals on how we want to move forward and not just a 10 percent or some kind of a number that we're going to use.

I think we need to look at if we can't look at the reference points, then maybe it is Burton Shank's revised projections that we can use. I think it was Mark Gibson that suggested that and I thought that was a good idea to maybe give us some kind of benchmark of where we're headed on this; so that we can think about how we want the fishery to look, both the fishery and the stock, and what our expectations are going to be. Then from there we can decide what kind of measures are going to work so that we can maximize the opportunities for the industry and do what we can for the stock within the limits of natural mortality and other problems there. I think as far as taskings go, one thing that comes to mind is to keep in mind that we have a trap transferability program that we just unveiled; and fishermen are taking advantage of that in Southern New England, mostly in Area 2 and 3.

Moving forward that may be a very important tool for these fishermen to use to be able to mitigate through whatever measures that we end up having to put in place for this fishery moving forward. I would recommend that any kind of tasking or any kind of development of measures would consider banking and the aggregate trap limits that we have in place in Addenda 21 and 22 – we're looking at that right now, our agency, as part of changes to the trap transferability program.

It there is going to be any significant changes to how perhaps we do trap reductions, maybe the timing of those, those are going to impact some of the measures that have already been adopted into the plan; and if those need to be adjusted, then I think we should take all the things into consideration that we already have in place now to deal with Southern New England that we've done already.

MR. PATRICK AUGUSTINE: I'm going to try not to babble, but listening to what we've heard around the table, all the points are very salient and very important. Ritchie hit it right on target. Let's face the facts. We're either going to close the fishery or not. We're either going to hurt the fishermen economically and put them out of business or not.

The real problem is not the fishermen. We keep thinking that we can solve our problems by reducing fishing effort; and that's not the answer. The answer is a different approach, what is the mortality being caused by. No matter what the stock assessment is on black sea bass, for instance, and porgies, for that matter, the SSC is a day late and about three years short.

What is really happening on the water, we are doing single-species management to try to save a species; so we're going to try to save lobsters by wiping out the fishermen. What are we doing with black sea bass? We're reducing the quota. If you're a fisherman and have been out on the water for the last three years, you're saying, my, God, what are we going to do with these things; and yet the SSC is reducing the quota because we're worried about the stock, because we don't know what the status is.

The same way with porgies; what are we doing with striped bass? We reduced the take on striped bass by fishermen and what is happening? You're seeing a resurgence in one year. I guess the point I'm making is in listening to things that Emerson said, getting ghost traps out of the water, they've done 14 or 15,000 already, quietly going on about their business.

If you were to drive out on Long Island and look at some of the ports where the ghost pots are packed and stacked, you would say, oh, my God, they'd fill this room; and yet the average person doesn't realize that. Has Connecticut had any funding to do the same thing? Would they do it if they had it?

Yes; they probably would. I haven't talked to Mr. Simpson about it, but I would think that would be another approach rather than wiping out the fishery and killing off an industry that is very viable. We know that habitat is an issue; water

conditions have changed. Connecticut has put in place a reduction – I'm sorry, not being able to use certain chemicals in their waters, methoprene and some other things. They feel that has been very beneficial to lobsters. That in addition to New York is still using it, and maybe we have to look at that.

We're looking at trying to reduce the fishing effort and not what is causing natural mortality. Why don't we look at ecosystem management for those major species of fish that are attacking lobsters? If they're black sea bass, let's get a real number. You cannot fish for black sea bass on Long Island Sound without pulling up a black sea bass, eight or ten inches long, that doesn't spit out baby lobsters; and that's throughout the whole of Long Island Sound.

Now they've expanded up into the New England area. If you think you have a problem now, you have no idea. We thought we had a problem with spiny dogfish. These things are worse than spiny dogfish. The assessment is dragging its feet. I don't want to blame the SSC, but none of them want to make a mistake and say, "Oh, gee whiz, we gave you too much quota; you're killing them off."

They're like ants. They produce the way they have to produce to sustain their species. It seems to me that we need to review the reference points. They were moved up based on how the status of the stock was changing. As Emerson said, if we look at where the baseline was in the seventies and to what it is right now, it is about the same.

If you look at the active fishermen in our area, there are about the same number of pots in the water fishing that there were then. In the meantime, the stock increased so the change the threshold and the target. We've done the same thing with every species of fish. As the species come back, we increase the target and the threshold.

The real question is are we trying to bring the levels of these species up to artificial levels that will compete with each other? In the meantime, there are some species such as winter flounder are falling by the wayside. What is eating them? If you're a diver, Dr. Stewart will tell you what is eating them; everything in sight. Why don't we really take a real hard look at this?

If we decide we're going to do anything other than send this back to the technical committee with advice as to what other studies they should perform, we are admitting that we don't know how to come up with a solution. With all the brains around this table, we don't know how to come up with a solution other than hurting the fishermen.

I would think if there is funding available, one of the first things that we might look at is awarding grant money to those states that feel they can support removing ghost pots. That's an active move. You talk to Emerson about it and he will tell you the number of lobsters they found in the pots that they've taken out. They continue to fish.

Go back and review the reference points as Mark Gibson has mentioned. We need to look at the economic value of other species of fish versus lobsters; which one is the most important? It just so happens around this table the most important species is the one we're talking about that affects your community. If it is striped bass, oh, boy, we've got to save striped bass. In this case lobsters, which are very important. Those are the points I'd like to make. Single-species management is good to a certain point only if it works in our behalf.

CHAIRMAN McKIERNAN: Thank you, Pat. I've got Craig and Dennis. I want to come back to Dave Borden after that and talk about the multispecies aspect of fishing. We took a substantial action at the last meeting to basically co-manage the Jonah Fishery with the Lobster

Fishery, so I think in some regards we're heading there.

REPRESENTATIVE CRAIG A. MINER: Mr. Chairman, I gave a lot of thought to this meeting on the way down here; and having read the passage number three where it says, "In particular, human changes to the coastal ecosystem"; it seemed to be something that people agreed was of great importance to this species.

I'm concerned that we might reach the conclusion that we have so damaged the ecosystem that it isn't recoverable or at least isn't recoverable at some very low level. I've been in the constituent business probably for 25 years; and one thing that I will tell this board is that when you lose a constituency, you lose the interest and you will lose the money.

If we have any interest in trying to find out what the drivers might be, whether it is predation, damage to the ecosystem, water temperature, an imbalance between effort and what this animal can sustain as a population, then I would suggest that the time to do it now. If we make a determination that this is a done deal, congress isn't going to appropriate a nickel. I can tell the Connecticut government isn't going to appropriate a nickel.

This is an area that has been cut from the budget more times in the last five years than I care to admit. It is not because some people don't care; it is because a majority of people don't care. My suggestion would be that we're very careful in how we craft whatever the guidance is; because if the guidance comes back with a determination that a moratorium, and this is done, is the direction we need to proceed, I can't imagine the state of Connecticut appropriating fifty cents to figure out why this fishery has gone away. That isn't where I want to be.

MR. DENNIS ABBOTT: I think the biggest problem facing us today is, first of all, whether Pat Augustine's voice will last the full week. He is off to a shaky start this morning. Good to see you, Pat. To this issue, we're heard an awful lot of good comments; and I think for every point that is made, there can be a counterpoint made in another direction.

Bill Adler would have us looking at predators. He has always been against the striped bass and now the sea bass have entered the equation. Lance Stewart would like us to do more studies on the biology of the lobsters, which would be a good idea. The problem facing us has grown past just Southern New England.

Pat Keliher alluded to issues going on or beginning to go on in Maine; and I've been reading in the papers and in the clippings of things that are happening. I think whatever study that might be proposed really should be looking at a more global – this being a more global issue; is it going to spread north of Cape Cod? Is it heading for Maine?

The fact is it is climate change and we have to realize that climate change is a big driver. It is changing what is going on in the ocean. As far as trying to limit the Southern New England fishermen, I'm reminded of a governor's appointee that I rode to a number of meetings with when I first started. It was Steve Driscoll who was a commercial fisherman. He said trying to restrict us to catching certain things isn't going to do a lot.

If they're not there, we're not going to go catch them; and I think Tom Fote alluded to that; that if it is not economically viable, they're not going to go fishing. Trying to change the amount of fishermen or place restrictions on them; they'll place their own restrictions. Do we want to have the responsibility of imposing a moratorium on Southern New England and be the bad guys?

Do we want to be the ones sticking our finger in the dike trying to solve a problem that is really unsolvable? We have to acknowledge that the

environment is changing; and if any study is to take place, we have to look at the bigger problem of what is happening and try and ask the technical committee to look at reference points and whatever is peeing into the wind.

As Ritchie said and I've said, we've been looking at this for over 15 years and fooling with the reference points and whatever is not going to change a darned thing. Surely, I don't know the answer, but I think our problem is much bigger and growing and we really have to pay attention to that problem.

MR. BORDEN: Mr. Chairman, just to kind of move this along, I'm not going to make this as a motion, but I'd like to just read what I think the strategy should be and then let people make comments. I think there have been a lot of good comments here. I think the way forward is to do some tasking for the technical committee; and I'll just read a list of items that I think are appropriate and anybody can offer suggestions otherwise.

I think we should task the technical committee with looking at the projections that were done by Burton. While I'm on that issue, I'd like to compliment Burton for the work that he and the Center staff are doing on this. They've really gotten engaged on the issue; and I think it is really helpful. That would be one item on the list.

The next item on the list is I think we should ask the technical committee to look at different ways of increasing egg production. Some of you have no doubt seen it, but there was a recent paper that published in the Canadian Journal of Science on the Bay of Fundy, which basically indicates that egg production between 2008 and 2013 in the Bay of Fundy has decreased 8 to 10 percent per year; and they attribute that to environmental change.

I think we need to look at ways to keep the egg production going. Pat Keliher made the point that the recruitment indices are falling in the Gulf of Maine and has been a continuous recent trend that way. One way to react is to figure out strategies that increase egg production. I think we need to look at it in a holistic form in all areas.

We need to examine the cost and benefits and implications of our existing regulations. That does not mean standardizing all those regulations. I think it means – nor does it mean doing the most restrictive. I have spoken to this point in the past, we have a situation where we have two sets of regulations in some areas. We two different minimum sizes, two different maximum sizes. We have areas that have four different v-notch definitions.

At some point these have negative consequences, and I think we need some technical advice on that. I think the technical committee should recalculate the targets and thresholds. I don't want to delude anyone that you're going to get the same conclusion out of that analysis, but there will be an order of magnitude difference between the results. The resource is still going to be overfished. I think we need, which I've been trying to get, a table of egg production by size for each one of the LMAs. I just note the sexual maturity is very different. If you look at sexual maturity in Long Island Sound, it is completely different than it is out on Georges Bank.

I think we need to look – and Bob Beal raised this point before – I think we need to look at this whole relationship of the inshore and the offshore stock. Most of the tagging studies that were done date back to the period of time when I was tagging lobsters, which was 35 years ago. I think there would be a lot of merit in having the technical committee look at those tagging studies and basically come back to us with some recommendations.

I also think that the technical committee, as part of that review, should go back – Toni Kerns, when she was just doing staff work on lobsters,

wrote what I viewed as a superb summary of the problems in the lobster fishery. This was kind of a holistic summary of the problems in terms of data collection, reporting systems and so forth. I think we need to dig those documents out.

I think it was Addendum XII or whatever, and Toni can correct that if that's wrong, but I think we need to dig those out and have the technical people look at that and then bring us recommendations on how to solve some of those problems. I think my conclusion is we have to get on with solving some of these problems and kind of standardizing some of the systems in place.

Above all, I think we've got to figure out ways and strategies to increase egg production. I also think that any strategy going forward should include the strategy of capping effort in these fisheries. I understand that we don't have a perfect relationship between effort and fishing mortality; but the one thing that I would point out to everybody is that lacking such a strategy in all areas, you can be assured that the fishing industry will redeploy effort as we rebuild this population.

Somehow we have to have a strategy that caps fishing mortality or not fishing mortality but fishing effort in all of these areas. Otherwise, we're going to take steps – and I would point out Bob Glenn has pretty much documented this in Massachusetts. He did an analysis of what is happening in the Massachusetts fishery in the last year, and what you find is that the landings are going down and the catch per unit is going up; and so the perspective from the industry is things are getting better, but it is a smaller and smaller industry is what is happening.

The people that are still surviving in the industry in Massachusetts are actually seeing the benefits of less traps in the water. Personally I think we need a strategy to effectively cap the effort; and for Long Island Sound, as an example, that may mean starting – I think they're down 96 percent from their record high amount of effort, but that may mean just capping it at 4 percent or something like that. On my list those would be the taskings for the technical committee.

CHAIRMAN McKIERNAN: Can I get some feedback? David Simpson.

MR. SIMPSON: I think Craig and I are on the same page in terms of the need for a constituency to have anyone out there who cares about an issue. Whatever Area 2 is doing, that's fine. I think it is a very expensive way for people to stay in business to have to pay somebody else to leave; so I'm not an advocate.

All of the conversation and a lot of our conversation about lobster and effort controls to me is reminiscent of the 1980's and groundfish management; and we know what that did; not much. I think if you want to manage a fishery, we learned with every other species you have to manage output and not input; and you would need some kind of quota and cap and let individual areas decide how to manage that fishing mortality rate.

The idea that cutting traps is going to do anything for conservation I think is faulty logic; and some of the results that are shown in the report I think support that. We hear that over and over from fishermen, you know, effort has been reduced 90 percent, there isn't a problem anymore. I look at this room and somehow it reminds me – it makes me think of Long Island Sound, the western two-thirds, and I think of the center as being the center of the Sound and down in the corner being the west.

There used to be 750,000 pounds of landings out of this space right here between us. Last year there were 2,000 pounds. What good did it do that all that effort went away? It means nothing. The effort remains down where Steve and Bob are sitting where there is a couple of pockets where lobsters are left and that's where the pots will go.

We've had tremendous contraction in this stock, from 75 to 85 percent occurrence in our trawl survey of lobsters down to as little as 10 percent occurrence; so 10 percent of sites left are producing lobsters. Well, guess where fishermen set their traps – in the places that still have viable concentrations of lobster; so it is a losing cause to engage in this conversation about trap limits and conservation. If you want to do it for economic reasons, that's fine. I think that is for governments to decide. If our mission here is conservation, then it is a misplaced conversation.

I think again we get that from every angle; effort is down 90 percent, so there shouldn't be a problem. It is concentrated where any remaining stock of lobsters are; so I'm very wary of the Area 2 approach of make remaining fishermen buy each other out, being exported to Long Island where I frankly have a little different view of how many constituents we can support with small numbers of traps versus a few big players that concentrate their traps, which will then be concentrated in remaining pockets of viable concentrations of lobsters. I'm all for conservation, but let's be clear and distinct whether we're talking about economic and social engineering or whether we're actually talking about lobster population conservation.

CHAIRMAN McKIERNAN: Let me circle back to the document. There is a number of possible objectives and one of them is to slow the rate of decline in the spawning stock biomass. David, that seems to capture what you're attempting to do with that motion. The second one is to prevent loss of fishery infrastructure, and that's what you're trying to do.

Then I think you mentioned looking at regulations, and I'm interpreting that to mean you want to improve compliance and enforceability with the existing rules and not have one LMA's fishermen undermine another – especially in overlap zone, and that you want to make these rules cleaner and maybe some conservation comes out of that at the end of the day because some lobsters get put back in the water because you have consistent rules. Is that accurate?

Okay, does that get us towards some objectives among the others that you put on your list that we could ask the technical committee for help? David objects to the formula of sort of a self-funded buyout among participants, but I think you have some nuggets here of trying to slow the rate of decline, prevent a loss of fishery infrastructure, improve compliance and then some of your other measures which you mentioned could even go north, looking at improving egg production.

MR. BORDEN: Yes; that the general direction. I honestly don't think we have the information at this point that we need to make the decisions on where we want to go. David Simpson's point, I totally agree with his point. I was not suggesting that Long Island Sound adopt an Area 2 or Area 3 type trap program. What I was suggesting is if you don't do something about the traps in the traps in water, then they're going to come back. The population increases unless you have output controls. I think it is just a way of making the other measures actually work.

CHAIRMAN McKIERNAN: David, why don't we do this? Why don't we try to make that list up and give to staff? Why don't we move on to some of the Jonah crab issues and then come back to this one and we'll all sort of see if we can come to consensus on your list of ideas. Does that make sense? Are you good with that? Toni, are you good with that?

INITIATION OF ADDENDUM TO SET EFFORT CONTROLS FOR JONAH CRAB-ONLY TRAP FISHERMEN

CHAIRMAN McKIERNAN: All right, we're going to suspend discussion on that for now and let's go to a discussion of a future addendum to set effort controls for the Jonah crab-only trap

fishermen. Megan, did you want to speak a little bit to that as background.

MS. WARE: At the last meeting we passed the Jonah Crab FMP. Since that time, we've been trying to go back and learn a little bit more about the fishery to make sure we had made the right decisions. There are three areas that we would like to discuss today to just kind of open it up and see what thoughts are.

I'll start with the first one, which is the Jonah crab-only trap fishermen. I'm going to pass it over to Jim Gilmore, who is going to talk about this. The last board meeting we said we would create an addendum for effort control measures on these fishermen; so that is following through with what we said we were going to do.

MR. JAMES J. GILMORE, JR.: Just a quick refresher. At the last meeting we had an issue with state-only fishermen in that they were sort of kept out of the fishery. The motion on the board that was passed allowed for them to participate in it, but we needed some sort of effort control. The point back at the August meeting was that we really didn't have any data to figure out what that would be; so we agreed to look into that and maybe initiate an addendum today, which we actually may have to delay a little bit longer as we get into this.

First off, the data that we have compiled to the fishery – we'll go through the slides in a minute; but the data is a little bit inconsistent, for lack of a better term. We also looked at the claw fishery, which we'll get to in a little bit, and the data is kind of poor on that. What I thought we would do is maybe first go through just the crab-only fishery in state waters, give you the data we've got and then show you what some of the problems are and then maybe have some discussion about it.

I think we need to get consistent data before we start initiating an addendum because the solution may be different depending upon the data we have. If go through our slide presentation that Megan did a great job putting together, what we know so far is there are fishermen in Rhode Island, New York and Maryland. There are about 15 state-only fishermen in total that fish both in state and federal waters and the total landing of about 143,000 pounds.

Again, the data, I think even up until the middle of last week we were getting different numbers depending upon – Megan was sending out e-mails and then we get responses; and even from New York we were getting just different information. We still need to get the data correct, but we really came up with a few questions.

First off is the goal to cap the effort at the current levels and what is an effective effort control? Is it trap allocations? What data is needed to establish the effort control? What criteria can be used to identify these fishermen and is it necessary to identify these traps differently from the lobster traps? What seemed to be a little simple thing back in August got a little bit more complicated.

The recommendation we really have is maybe to send this back to get the baseline data so that we can then more effectively answer these questions, but we figured it would be a good time to talk about them at this point so we maybe focus our efforts with the PDT as we move forward. Then the plan would be to initiate an addendum at the February meeting once we get all the data and the approach that we think is the most logical. At this point, I'll hand it back to you, Mr. Chairman, for any discussion. Thank you.

CHAIRMAN McKIERNAN: I think some of the key questions that I can bring out at this point would be the eligibility time period; what window of time does the board want to consider to qualify a boat to participate in the Jonah crab trap

fishery? What data would be accepted? Is it side-catch reports, would it be logbooks?

I look at Peter Burns; NMFS have had a lot of experience with these limited access programs and sometimes we have to get creative and be flexible in terms of what data are going to be accepted. Then how do you determine the number of traps fished if the data is kind of squirrely? I did have a question for you where you talked about state-only fishermen who fish in state and federal waters.

I guess we have to try to determine through the investigations of the individual fishermen did they fish in state waters and did they also fish in federal waters; because ultimately NMFS is going to have to qualify them as well if that's the intent to do some something in the federal zone. Is there any discussion on some of these points among the board?

MR. ROB O'REILLY: I was in touch with Megan and I'm just making sure I'm not out of step, but at the previous meeting there was some discussion about non-lobster gear and specifically gear that was set for sea bass, for example. I think it would be partly state but mostly federal waters. There was a recognition that there would be some type of landings' records that would be needed in order to allow continued participation for it is really a bycatch of Jonah crabs.

What has changed on that compared to August? I did not attend the last Jonah crab meeting; so I'm not really sure what the next step is, but it sounds like it is going to fall similarly to what Jim is talking about at least for the federal waters. For the state waters, if you can prove there has been state landings in whatever the amount of years is or recent time, how will that play forward?

MS. WARE: My understanding from the wording of the permit section from the FMP review is that those fishermen you are talking about would require an incidental permit from the state to be able to land Jonah crab; and right now what we're talking about is Jonah crab-only trap fishermen who do not have a lobster permit. I don't believe anything has changed from the last meeting in regards to those fishermen.

CHAIRMAN McKIERNAN: But I think it would be very useful to delineate the level of landings and the participation because I think that's an important part of what we want to capture in this addendum is to institutionalize that fishing opportunity for the guys who have been doing it, especially if they were doing it in a sea bass trap. Maybe a trip limit would make sense for that fleet as opposed to what appears to be more of a directed fishery on the part of the lobster pot fishermen, which in a lot of areas is kind of a lobster and Jonah crab target fishery. I think it is valuable to get that out; and so we'll make sure that when we pursue this between now and the next meeting that we reach out to you and you can bring that data forward. Would they be on VTRs?

MR. O'REILLY: Yes; but also there is a little bit of state access, too; not a lot, but as you go further north in the state, there is some.

CHAIRMAN McKIERNAN: And would those data be captured in trip-level reporting of some kind?

MR. O'REILLY: They would be captured in mandatory reporting for the state.

CHAIRMAN McKIERNAN: That's great! Ritchie White.

MR. WHITE: Dan, can you remind me for these 15 fishermen why we can't just require them to have a lobster license?

CHAIRMAN McKIERNAN: What was passed in the previous meeting was to accommodate these folks; and I know that my colleagues at the National Marine Fisheries Service were sensitive to this because there was no federal requirement for vessels that did not have a

lobster permit to report or to participate. The rules are very clear. If you had a lobster permit, you had to account for all of your traps.

If you had no federal lobster permit whatsoever, you were free to set gear, period. That differs from New England and the Gulf of Maine where Maine, your state, and Massachusetts all require the landing of Jonah crabs to be done by only those who hold a commercial lobster permit; but once you get west of Massachusetts, the rules were not as clean; and so we're trying to capture the historical participation of some number of vessels, and that has been the challenge for me is to try to really get a handle on this.

That's what we're hoping to do between now and the next meeting. I think we're really trying to sort of kick the tires on that particular motion that was passed to see if we can capture these vessels and see if they have legitimate landings' records so that we can – not we, my state – I don't think your state would be accommodating them because of your historical laws, but maybe the states to the west would be doing that.

MR. GILMORE: Ritchie, we have a prohibition on new lobster licenses in New York; and the purpose of this was that if – yes, if I could give them the licenses, that was one way of solving it, but I can't; so therefore they would be excluded from the fishery, which was not the intent.

CHAIRMAN McKIERNAN: This population may be so small that we might decide at the end of the day that it might be the way to go; but I think we still are struggling trying to enumerate the scale in the fishery. Doug Grout.

MR. GROUT: Jim, you referred to these as 15 state-only fishermen between the three states, but you said they fish in both state and federal waters, so they can fish in federal waters for Jonah crab without any other permit or do they have – you know, how are they fishing out in federal waters if they're state-only fishermen?

MR. GILMORE: I'm not sure; Megan may have to answer this. In New York they're state-only permits, whatever, and that was actually the number we had. I thought I had about a dozen and actually a fewer than that right now; but then we get into – it seems like Rhode Island had more than we had, so that is why it started getting a little confusing. Maybe Megan can answer that better than me.

MS. WARE: From the e-mails I've had with the different states, the New York and Rhode Island fishermen are only in state waters. The Maryland fishermen are in state and federal waters, fishing in both state and federal waters.

MR. GROUT: And they have some kind of a federal permit to fish out there or they just go fishing out there?

CHAIRMAN McKIERNAN: Mike Luisi, do you want to speak to that?

MR. LUISI: Mr. Chairman, this is news to me. Seeing Maryland up on the board wasn't something – I wasn't aware that fishermen were landing Jonah crabs outside of having a lobster permit; but what I can speculate is that those fishermen have sea bass permits and they're bringing some crab claws in and landing those and reporting those, and it is showing up in somebody's data warehouse somewhere. That is a point I'd like to figure out who those folks are so that I can understand a little more how our fishery is operating. Thanks.

MR. GROUT: And so to follow up, then that really would be an issue related to the other addendum on our agenda here. It seems to me when we at least initiated this what we were just trying to do is cap the participation. We just need to figure out who is just doing Jonah crab only and just say, okay, cap the number of people participating.

I agree with you that we probably have to have some kind of a timeframe; but again we don't

know the status of this resource. We're trying to put in some basic measures here, basic conservation measures and to cap the level of effort. I don't think we should get too complicated here at least during this initial round of management.

CHAIRMAN McKIERNAN: I agree, Doug; but I think just to put this issue to bed, what we really need to do is have the states and maybe NMFS reveal in the most detail they can about these landings so that we can intelligently look at some of these records to say, aha, to Rob O'Reilly's point, this is a sea bass pot that was landing Jonah crab as bycatch.

Maybe that is resolvable by a bycatch limit for sea bass pots as opposed to creating a whole new stand-alone fishery with its own trap tags and all of that. A lot of this data I've discovered is not that reliable. I got a call from Jim Gilmore's staff that said, "Hey, you've landed 30,000 pounds of claws in your state. What do you mean nobody is landing claws in your state?"

Well, it turns out there was a dealer that was miscoding the records; and so when we called him, we said, "Do you buy claws?" He said, "No, we only buy whole crabs." You've got to get into this data and understand it in its finest level of detail before you create policies to capture all of this. I don't think we truly understand yet the scope and the specifics of this. People on my staff call it a phantom fishery; but I'm sure it is being done so let's capture it. Let's let the PDT pour through it and let's figure out what permits these vessels held and then let's come back with a really smart proposal – a set of proposals for the next addendum.

That's what we want to do; and that's what I'd like to see come out of this meeting today is an examination of the records of who is participating and under what permits did they hold it and how detailed are the records about catch and effort and also during what time period. I would suggest like a three-year window. What I would like to do is to task the PDT – Bill Adler, go ahead.

MR. ADLER: I think that's what I was going to do to move this along to task the PDT to do what? List the things to help them go off on their way; can we do that?

CHAIRMAN McKIERNAN: Yes; I would say that working through the plan coordinator the PDT would examine catch and landings' records from states and from NMFS to try to characterize the participants in the fisheries who are landing Jonah crabs with traps who did not have a lobster trap permit to understand the scale of this fishery and to determine and make recommendations for a future addendum, to be able to write an intelligent regulation, to capture them or to institutionalize that activity if possible. Toni.

MS. KERNS: Dan, just to make sure it is clear, it will be that the coordinator or the chair of the PDT, which is Megan, will be asking each state to give us your information for your individuals and how many traps they're fishing. This is not something that we can find in the data, so we will be relying on the states and the agency to tell us who these individuals are. Until the states give us that information, the PDT will not be able to begin their tasks.

CHAIRMAN McKIERNAN: And part of the challenge, Toni, is to not only look at the vessel and the landings, but to look at the permit status of that vessel during those times of landings so that we understand under what authority they were fishing and setting whatever traps. I think then it will all become clear. Right now it is just so hazy. Bill.

MR. ADLER: So is this sufficient and we don't need a motion to do this; can we just take what you have listed and Toni's response about coming after the states to get that information; is this sufficient to move this issue along?

CHAIRMAN McKIERNAN: Toni, is this sufficient just based on that discussion?

MS. KERNS: Yes.

CHAIRMAN McKIERNAN: Okay, and are there any objections? Rob O'Reilly.

MR. O'REILLY: Not an objection. I'm just trying to figure out something here. I was under the impression – which is why I asked the question earlier from Megan about the state permit, the incidental permit; and so I can understand with what Jim brought forward that you want to know the universe of those who are bringing in Jonah crab, which is a very small universe in Virginia.

It is going to be confidential data; so number of trips within the last three years, within the last five years, whatever it is, is fine. I sort of think what Doug was saying is a little bit of reality that if other states are like Virginia, really it has been the lobster permits. That's where the Jonah crab landings are coming from. You're not going to find much magnitude with the non-lobster trap folks or the non-lobster permit folks. Nonetheless, if this is now going to be an addendum, to get at that detail I just would recommend that maybe trips and participation – I'm not sure what ASMFC really would want to see. Again, I can tell you it is going to be a very, very small amount of participation coming out of Virginia.

MR. TOM BAUM: Mr. Chair, just a clarification. These tasks are for those who land Jonah crab only or is it for – you know, because most of our lobster guys do land Jonah crabs, but this is just for those who only land Jonah crabs?

CHAIRMAN McKIERNAN: Yes; the motion that was passed at the last meeting allowed states to come forward with records on the finite number of individuals that did not have a lobster permit and was setting traps for Jonah crabs. We're trying to get a handle on the number of people who did that, the scale of that fishery in terms of traps fished.

It probably means sharing some confidential records about the trip and then us being able to – or someone being able to look into the permit status to determine if in fact that was fished under the authority of the lobster permit or not. We're just trying to see how many guys there actually were. Again, this has been so frustrating because it is had been kind of a boogey man. Even during the scoping meetings, we had very few people show up.

I guess a handful of Rhode Islanders did show up and talk about that they did it in state waters; so we need to get a handle on it. If this is a state waters only issue, if so that would be great. Is this a federal waters issue; and if so, Peter Burns' group is keenly interested in finding a way to accommodate that under the plan.

NON-TRAP BYCATCH LIMIT AND CLAW EXEMPTION PROVISIONS

CHAIRMAN McKIERNAN: Okay, so let's move to the brief discussion on claws. Do you want to continue that conversation, Jim?

MR. GILMORE: We're going to continue our slide show. Actually I'll frame it a little bit. We talked about at last meeting there were some exemptions for I believe it was Maryland, Virginia, Delaware and New Jersey in terms of the claw-only fishery was – or the claw fishery. The claw fishery was looking at just a handful of participants; but as we started compiling the data on that, it turns out that was a bit of a surprise because some of the states were correct and some of them weren't.

It turns out when I got back home, in New York we had some claw fishermen. Anyway, if you look at the presentation, only whole crabs may be retained and sold with the exception if individuals can prove a history of claw landings before the June 2, 2015, control date in the

states of New Jersey, Delaware, Maryland and Virginia.

What we know so far is that there is fishermen in those states but also in New York. New York is not exempt under that motion. We kind of did that motion on the fly. We didn't have the data. Again, after we looked at the data, we were looking at – I think most of the permits, we were talking one or two per state. Some of them went up into 15 or 20, depending upon which state you were in.

There was a total of 46 fishermen, which is much more than expected in state and federal waters. Then not all the reports distinguished between the claws and the whole crabs; and there is some reporting information problems. As Dan had indicated, when we first looked at it and said, "Oh, My God, Massachusetts has got a whole lot"; but it turns out, no, it was a coding error. Are the current claw exemptions appropriate from what we passed our last motion; and it seems like if no, which I think it might not be, are other management measures more appropriate?

A minimum size or a maximum poundage might be a better way to handle this than just giving a grandfathering exemption to a handful of fishermen because it really appears like we don't have a handful of fishermen; we have a lot more. What data do we need to support these management measures? What criteria should be used to exempt the fishermen to landing claws?

Some of the information my staff found out is that even though the way they're doing the claw fishery is very different from area to area. One guy is breaking off one claw and throwing the whole crab back; one guy is keeping the whole crab, breaking the claws, but then they're doing both. They're using the claws and the whole crab. Some guy was breaking off both claws and sending them back thinking that was a conservation measure, whatever was in his brain.

But in any event, the way the fishery itself is prosecuted doesn't seem to be consistent or make a lot of sense. Again, we need some more information about this fishery. Again, what we did at the last meeting doesn't seem to be addressing the proper management of it because that exemption was not on a handful. It is actually a significantly larger number. It is still a small amount, but we still need to address it better. At that point we'll open it up for discussion on this.

CHAIRMAN McKIERNAN: Jim, in talking to some of your staff, I was told that in some cases whole crabs are landed but sometimes only the claws are sold; and so that sort of speaks to the challenge of the data reflecting reality.

MR. GILMORE: That's correct, Mr. Chairman, the way the claw fishery is done is very different even within a state.

CHAIRMAN McKIERNAN: I think it is probably going to require some personal interviews beyond what we can learn from SAFIS to try to get to the root of this. Are there any questions or comments around the table? Tom.

MR. BAUM: I just wanted to share with the board that I met with our at-sea observers that go out on the lobster trips. Most of their trips, the lobstermen will land the Jonah crabs. It looks like as far as whether they're going to land claws or whole crabs depends on the demand. Buyers will go to the dock and tell the fishermen I'm buying whole crabs, and that's when they'll bring back the whole crab.

Otherwise, it seems like they're bringing back the claws. Some observations that they have made, they've seen crabs come up with no claws and no new growth for the new claws to come in. I'm not sure about the regeneration at all. If someone wants to enlighten us, that would be

great; but it seems like as far as claws versus whole crab, it is the demand.

MR. ADLER: If we have to change this – this is technical stuff – if we have to change this to make some adjustment, this was an amendment and can you do it by an addendum or do you have to go back around amendment-wise? How does that work?

MS. WARE: We would be looking to do an addendum to change it.

MR. ADLER: Okay, so an addendum can modify the amendment? The wording is in there that will allow us to do it by addendum.

MS. WARE: Really, it is in the adaptive measures' part.

MR. GROUT: So again, certainly, the people that are landing whole crabs and then selling the claws; that really should be irrelevant to this issue, because they're landing the whole crabs. They shouldn't even be included in this analysis from my perspective. Even though they're marketing the claws at the dock, they're complying with what the intent of this plan was. I'm, again, arguing here for simplicity here as we move forward.

If you want to grab more information, but the point was let's just cap this. The other thing I'd still like to add into this if we are going to allow a claw fishery to go forward under sort of a grandfather clause, it behooves us to try and do a study to see what the impact of removing a claw is from a crab. Do they grow them back; do they survive?

If they're dying or not surviving, then why don't we just continue to require them to land them whole and then they can sell their claws and maybe figure out another use for the body as bait in a lobster trap or something like that? Let's go out and find more information, but let's not get too complex right now with it.

CHAIRMAN McKIERNAN: Megan, maybe we can ask the technical committee to do a literature review on the regeneration rates on Jonah crab claws. Again, we're going to ask the PDT to look at the same kind of records that the states are going to bring forward; and it probably means the states are going to have to do a little homework on their own informal fact-gathering because the data is so inadequate.

CHAIRMAN McKIERNAN: I think the next issue we should cover is the non-trap bycatch limit; and, Megan, did you want to speak to that?

MS. WARE: This issue was raised by both the New England Council and GARFO. They were concerned that the trip limit or the incidental bycatch limit that was set at the last meeting was inappropriate for some of these larger trawl fishermen. Just for review, this is what we have right now. We have a 200 crab per calendar day, 500 crabs per trip incidental bycatch limit for non-trap gear. I also have the lobster trip limit up there just in case we want to be consistent between the two species on trip definitions.

For lobster it is no more than a hundred lobsters per day up to a maximum of 500 lobsters per trip for trips that are five days or longer. I asked both the council and GARFO to send me data to kind of support what they were saying. This is the New England Council there. It shows the number of trips from this non-trap gear from 2010 to 2014.

The green area is those trips that are within the current ASMFC limit, and the red are the trips outside of the limit. Right now between 99 and 97 percent of trips are currently within the ASMFC limit. I also had GARFO send me data; and their data pretty much corroborated what the New England sent me. Their data went from May 1, 2013, to August 31, 2015. There were a total of 372 trips and 98 percent of those were within the current limit. 95 percent landed less than 200 crabs, which is right now our 24-hour calendar day trip limit; and only seven trips

exceeded the current limit with three trips over 900 crabs. I believe, Terry, I'm just going to pass this over to you because I think the council is still interested in increasing the bycatch limit for non-trap gear, so I'll let you speak to that.

MR. STOCKWELL: Thank you, Megan, for providing part of the summary I was going to provide. Following the summer board meeting when I objected to the non-trap landing limit based on the comments submitted by the council, as Megan said GARFO also submitted somewhat similar comments. Both the council and GARFO provided the information which is included in our supplemental materials.

In summary, as Megan presented, it is a very small but historical day boat fishery primarily based in Southern New England. At this point the data captures the number of trips but not the number of vessels; and overall the non-trap landings are only about 1 percent of the total amount of Jonah crabs landed per year.

As Megan indicated, 2 to 3 percent of these trips are greater than the commission's limit; and most of these trips were greater than 900 crabs. I will continue to argue that these vessels should be able to continue their practice of landing more than the current limit particularly given the previous discussion when other small-scale effort is being considered to be allowed as part of the FMP.

At the next board meeting or whenever we're ready and it is timely, I will make a motion to either increase and/or eliminate the non-trap limit as part of the Jonah Crab Addendum. Any board discussion today will help inform the council's discussion for the December meeting when the council will determine its 2016 priorities.

MR. BORDEN: Mr. Chairman, I support the concept that Terry is discussing. As I think everyone around the table knows, I represent an association that has the predominant landings in the Jonah crab fishery; and as such I kind of recused myself from making motions and voting, but I can speak. This is a non-issue. As far as I'm concerned the percent is so small that if we accommodate, as Terry has suggested, a liberalization, it is going to be virtually meaningless in the scheme of things. I would support that when it comes up.

CHAIRMAN McKIERNAN: David, would you support eliminating the non-trap limit or liberalizing it?

MR. BORDEN: Liberalizing it.

CHAIRMAN McKIERNAN: Terry, if the limit were liberalized; do you have a number?

MR. STOCKWELL: Not at this point; I was going to listen to the board's discussion. The numbers are so small, as David said, it is inconsequential.

MR. BORDEN: This is for everyone's edification. The Jonah crab fishery – and this is why I said what I just said – the Jonah crab fishery, the boats that are participating in that fishery now are basically offshore lobster boats. They're all equipped with RSW systems. The boats that Terry is talking about are draggers and gillnetters and so forth. Just so everyone is clear, no one in their right mind would ever go target Jonah crabs with a gillnet.

If you've ever picked a Jonah crab out of a gillnet, it is the most aggravating, dumbfounding think you could possible imagine; so this is truly is bycatch. No one is going to do this, coupled with the fact that the market then supports it by most people don't want to eat Jonah crab that have been on ice for five or seven days. They want an RSW product; so liberalizing this is fairly meaningless. It wouldn't trouble me at all to bump the limit up to a thousand crabs a trip.

CHAIRMAN McKIERNAN: I have a thousand; do I have another bid? David Simpson.

MR. SIMPSON: I frankly never understood and never supported the idea of a default dedicating a resource to a certain gear type unless there is some compelling conservation issue that I'm not aware of. I don't know why we would just adopt a restriction on a fishery that has been going on out there; so I don't see the need unless somebody told me that a targeted non-trap fishery would cause some kind of concern, getting into habitat that would be destructive or something like that. I don't see a need for separate rules.

CHAIRMAN McKIERNAN: So you'd be in favor of an addendum that repealed the non-trap limit. Doug.

MR. GROUT: Currently Terry is right and so is David; this seems to be non-consequential trying to put a cap or to try and prevent further growth of the crab industry here. The question is are we going to be able to continue to monitor this to make sure that in the future there isn't some growth of this kind of landings.

Maybe somebody starts putting it in raw sea water. There is a lot of groundfish fishermen out there looking for things to add value to their catch; and this could be something that they could be looking at in the future. I think it would behoove us if we did remove the trip limits on the; that we monitor the fishery closely on a regular basis as a part of our compliance plans.

MR. STOCKWELL: Certainly, these are federal permitted vessels fishing in federal waters. As David said, they're primarily day boat draggers and gillnetters. They do daily VTRs. We have the data. Council staff can work with the commission staff to share this data. If it looks like it is going to be a runaway issue, the council will be the first to step forward to move forward with a management plan to constrain effort.

CHAIRMAN McKIERNAN: The council wouldn't ask the commission to do it?

MR. STOCKWELL: The council would be leading the charge probably requesting the commission to do it. My sense of urgency in getting some support from the board here is to circumvent the council from becoming directly involved.

CHAIRMAN McKIERNAN: Understood and if we have a viable management plan, we could make that addendum pretty quick, probably in the span of six months, so we'll work together on that. All right, I think we're done with this item. Do we want to circle back to – go ahead, Toni.

MS. KERNS: It would be great to have on the record a motion to initiate an addendum to review the components.

CHAIRMAN McKIERNAN: Do we want an addendum that would be taking on all three issues or do we want a motion that only addresses the non-trap limit?

MS. KERNS: That's the discretion of the board. I don't know how long it will take to tackle some of the other issues. If we can get all the data from the states for the Jonah crab-only trap fishermen and get that information for February, we would be happy to include it all in one document. I don't know if that is going to be a feasible timeframe for that, though. We can do these addenda probably with little hearings since it is a pretty simple document.

EXECUTIVE DIRECTOR BEAL: Mr. Chairman, I think it would be wise for this board to get a list of items you want to change through the addendum process or implement through the addendum process. We can make that either as a series of motions or you can do it all as one wrap-up motion toward the end of the meeting.

Then the staff can work with you on the timing of those and how quickly the data becomes available. If the data is slow for some of the components when you want to move forward with the trip limit issue very quickly, we can separate out some of the different items into

multiple addenda if necessary. We will need motions to initiate an addenda. It is up to your discretion if it is for each item or as sort of a catchall at the end of the process.

CHAIRMAN McKIERNAN: Well, I'm confident that the claw exemption and the Jonah-only trapping could probably take six months to resolve. Terry, do you want to comment on whether you think a modification to the non-trap limit done sooner would be desirable?

MR. STOCKWELL: **Given the timetable, I would then make a motion to initiate an addendum to remove the non-trap landing limit from the Jonah Crab FMP**.

CHAIRMAN McKIERNAN: Is there a second? Dave Simpson seconds. Any discussion? Terry, do you want to speak to it?

MR. STOCKWELL: Well, I'm comfortable with the thought of the board responding to deal with the non-trap issue in an upcoming addendum. Should the crab claw issue and the other Jonah crab issues drag out for some part of a better year, particularly as this board gets involved with Southern New England activities, I'm concerned that the non-trap issue will fall between the cracks. If it is a simple process as Bob outlined that we can move forward without public hearings, we could do it expeditiously and get it behind us.

CHAIRMAN McKIERNAN: All right, any other comments? Doug Grout.

MR. GROUT: My comment is a question based on the big picture here. We have two other issues, the Jonah crab state-only issued and then the crab claw issue. Under the amendment that we just passed, what happens on June 30th if we don't have some kind of management action in place for these fisheries; do they end? I was under the impression that when we approved that; that we were going to try and do a follow-up addendum quickly to have something in place by June 30th, because otherwise these fisheries were going to end.

MS. WARE: My understanding is for the Jonah crab-only trap fishermen; that right now they are able to fish at their will; so they are not cut out of the fishery on June 1st. They are just able to fish unlimited amounts of Jonah crab if they desired to do that; so that is why we were trying to put in the effort controls. Likely those will not be in by June 30th, so that will be what happens on June 30th. We can implement the other measures of the FMP such as the minimum size. That is something that states can implement and give me their plans by January 1st; but these other measures where we were going through addendums, the group would have to wait on those.

MR. GROUT: So it isn't going to stop either fishery right now?

MS. WARE: No.

MR. BORDEN: My assumption is this wouldn't be a one-alternative addendum. I think it would better serve the public purpose if we had like a range of options, including this option on it. I think if we're going to adopt this strategy because of the points that Doug Grout made earlier about trying to cap the effort in the fishery – in other words, not allow an expansion of effort – if for no other reason than to continue to protect the species; that it would be desirable to have some other options in here; for instance, doubling the existing bycatch limit, putting a cap on the fishery so that it would operate under this rule with no restrictions unless it exceeded a certain level, at which point it would trigger some restrictions. I'm not saying we want to do that, but there are some other alternatives I think would probably enhance this.

MR. GROUT: Yes; I would support that and maybe having even a higher trip limit in addition to the five-day trip limit. We have some data

here now which to base a trip limit on; maybe just having an option like that in there.

CHAIRMAN McKIERNAN: Do you want to offer a friendly amendment or do you want to make a substitute motion; what do you want to do?

MR. GROUT: Yes; I can offer a friendly amendment unless the maker of the motion – are you willing to take a friendly amendment to also have an option to put a higher trip limit in and to also cap the fishery at the percentage level that they are at right now?

MR. STOCKWELL: I think we could certainly be friendly to remove or increase the non-trap bycatch limit, but we have a limited fishery as it is. There is an X amount of federal permits; and I don't believe it is a trip fishery. I think the thought of having a split limit is somewhat inappropriate for this fishery.

We're not going to have boats out there on a five-day trip fishery. As David said, we're putting crabs on ice. If the board was comfortable with the technical committee coming up with a – I mean, off the top of my head I would suggest a bycatch limit of a thousand pounds as a secondary cap. It would be higher than some and lower than the maximum, but there would be at least some discussion.

CHAIRMAN McKIERNAN: Any comments? You're accepting that friendly amendment to have two options. The first is to remove the trip limit and secondly to enact a 1,000 pound limit. Dennis.

MR. STOCKWELL: It would be up to David, if you accept that, I guess, and then a subsequent board discussion.

MR. ABBOTT: Mr. Chairman, just from a parliamentary sense, I think if someone wants to modify the main motion, they should amend the motion rather than asking the principal whether he likes it or not. In most cases he may or may not, but I don't think procedurally we should be talking friendly amendments. In our parliamentary lessons, we've learned that we shouldn't be doing that; so I'd urge the members not to ask for friendlies. It is either do it or don't do it.

MS. WARE: Terry, can I ask you a clarifying question on this? Are you still looking to have the 200 a day trip limit or just one trip limit of a thousand pounds?

MR. STOCKWELL: It is a day boat fishery. I would have just one trip limit.

CHAIRMAN McKIERNAN: David Simpson, are you good with that modified motion? Eric.

MR. ERIC REID: In our last meeting we talked about 200 pounds versus 500 pounds and now we've got a thousand pounds. I was against the pounds versus pieces then and I'm against it now. I would rather see it be a thousand pieces.

CHAIRMAN McKIERNAN: It was changed.

MR. REID: It was changed, yes, but that's because we changed it from pounds to pieces because you can count pieces.

MR. ADLER: We changed it to pieces from pounds.

CHAIRMAN McKIERNAN: Yes, you're right, Eric, the current plan as enacted last meeting was pieces.

MR. REID: Yes; I'd prefer this motion to say "pieces" as well.

CHAIRMAN McKIERNAN: Terry, the issue of pounds versus pieces?

MR. STOCKWELL: I remember that discussion. My recollection is that one crab equals approximately one pound and I'm comfortable with the piece designation.

CHAIRMAN McKIERNAN: And I assume David Simpson as the seconder accepts that as well. All right, Alli.

MS. ALLISON MURPHY: Mr. Chairman, I'm just wondering if instead of "pieces" it should say "crabs"; and that was just fixed.

CHAIRMAN McKIERNAN: Fair point. Do we need to caucus? **All right, the motion is to initiate an addendum to remove the non-trap bycatch limit from the Jonah Crab FMP or increase the trip limit to 1,000 crabs. Motion by Mr. Stockwell; seconded by Mr. Simpson. All those in favor raise your right hand; opposed; null votes; abstentions. It passes unanimously**. Bob Beal.

EXECUTIVE DIRECTOR BEAL: Mr. Chairman, is the expected timeline for this board to see a draft in February and final approval in May and that will affect the June 1 start date of the fishery; is that correct?

CHAIRMAN McKIERNAN: I would say so, yes.

MANAGEMENT RESPONSE TO THE 2015 AMERICAN LOBSTER BENCHMARK STOCK ASSESSMENT

CHAIRMAN McKIERNAN: Okay, can we circle back at this time to David Borden on the list that you worked on with staff to put up on the board for the technical committee? David, do you want to review it on the record?

MR. BORDEN: **So that everyone is clear here, the technical committee after this meeting and prior to the next meeting would review the Southern New England projections; develop methods to increase egg production; examine the cost and benefits of the existing regulations; calculate targets and thresholds without the bubble years of 1988 through I think '99 is the correct number, but that could be a discussion point, and based on the existing productivity or reduced productivity; develop a table of egg production by size for each LMA; examine the relationship of the inshore versus the offshore stock and describe the budget requirements for studies on the issue; and then review statements of the problem from Addendum XII and XVII and provide recommendations on how to solve and describe the problems; and, finally, characterize the 2014 existing effort by lobster conservation management area. I would move that**, Mr. Chairman.

CHAIRMAN McKIERNAN: Is there a second; Pat Augustine. Any discussion? Doug.

MR. GROUT: When would you like to have this information back to the board; what is the timing?

MR. BORDEN: I would hope that there would be a report at the next meeting and at that point the board could have a discussion with that in hand and have a discussion on how we move forward.

MR. WHITE: Mr. Chairman, I just want to expand a little bit on the comments I made earlier. I don't disagree going forward with this. Our Northern Shrimp Fishery is under a moratorium; and when we've got science saying you should go to a moratorium, we did.

MR. ABBOTT: Three states.

MR. WHITE: That was three states. We're going to be in our third year of a moratorium this year. It is affecting fishermen; it is affecting infrastructure. If I was a shrimp fisherman and I was watching how this looks like it is going to progress, I'd be saying why aren't these two fisheries being treated the same?

I think this is an issue that the commission needs to look at that if we're maybe for good reason not following the science, we need to say that and we need to be very clear about that; because maybe since the shrimp fishery is due mostly to environmental, maybe that should be opened up and we should be fishing on that some. I just

believe that we should be very careful on how we describe what we're going to do as we go forward.

MR. KELIHER: David, I think it is explicit in your motion as you talked about this when you originally started to list these ideas, but the intent here is to include any relationships between Gulf of Maine, Georges, Area 1, Area 3. Those types of issues would be brought forward through this process; correct?

MR. BORDEN: The answer to that is yes; and the reason I say that is this issue was flagged. If anyone wants to see the cite, it is in the PRT report; the issue that Pat is raising. This whole issue of connectivity and the relationship between the regulations in the different areas has already been flagged. It wasn't something that I developed. It was something that the PRT already recommended to the board that should be done.

CHAIRMAN McKIERNAN: David, we have yet to accept that report, but that is coming up in another part of the agenda. Pat Augustine.

MR. AUGUSTINE: To Ritchie White's comments, I unfortunately apologize for not having looked at any possible status of the change in the stock of northern shrimp in the last three years. Is there any evidence that other than just habitat that they moved out of the area or is there any evidence that they're coming back in any way, shape, form or any manner?

Is there any incident of incidental catch by other fishermen? I'm not trying to put you on the spot, but I understand your point. I'm saying that the northern shrimp fishermen have taken it on the chin for this; and the real question is have we seen any net result other than the economic impact? I don't need an answer; I just want to put it on the record. Thank you.

MR. SIMPSON: I think there are some things I'd like to know more about from the technical committee, including as was discussed close to the beginning, a review of the work that Burton provided, which I think is extremely helpful, the projections that he did, the relationship between effort and exploitation rates.

I also think it is really important for those in the industry if we could provide more insight into the relationship between our inshore stocks and our offshore stocks. I think it would be really helpful, but I don't want to – we have a pretty long list there of things for the technical committee to do; and I'm not sure a lot of it is going to change a vote at the table.

I don't want to ask them to do a lot of work that isn't going to really change anyone's perspective on this in terms of whether to take action or not, kind of to Ritchie's point. Again, a review of what Burton did, which was extremely helpful, including the relationship again between effort and exploitation.

That's something we have asked for years; and to me it tells a pretty discouraging story if you want to try to reduce mortality by reducing traps. This information tells me you can't get there; and I'd like the technical committee to review it and give it some kind of peer review. I guess I'm also not certain what "recalculate targets and thresholds without the bubble years" means exactly. I guess that's meant to say that productivity since 2000 – what might our management objectives be based on recruitment since 2000; is that what that means?

CHAIRMAN McKIERNAN: I think so. David, is that your intent?

MR. BORDEN: Yes; the first bullet to review the Southern New England projections is Burton's work. The other point I would make while I've got the microphone is that this issue of the relationship between the inshore and the offshore stocks was flagged and is an issue that needs further refinement as part of the lobster

assessment and the peer review of the assessment.

The logic for doing that is pretty simple. Most of the tagging studies are fairly old and in fact the environmental conditions inshore have changed. The question is, how has the lobster resource responded to that. The other issue is that a significant portion of the offshore area, there is very limited sampling that takes place. Most of the sampling that takes place is within 25 miles of shore; so I think we need the best and the brightest minds in the room to discuss this and try to figure out a way forward. Thank you.

MR. SIMPSON: I think that is a good place to focus some extra study. If I were an offshore fisherman, I'd want to know how close Bob Glenn is to having it nailed that the faucet has been shut off inshore and the flow of water to the offshore fishery – you know, your fate is sealed.

Is that really what is going on or is there some kind of dynamic out there that makes the offshore stock self-sustaining; so I think they really need that kind of information. Right now I think a lot of them feel like it is an inshore problem; it is not our problem. I think we need more insight into that.

MR. GIBSON: Mr. Chairman, I support the motion. I might disagree with some of the elements in terms of their importance, but I won't argue about that. The technical committee will rank these and tell us what our best bang for the buck is. I just wanted to speak a little bit to what Ritchie White spoke about. My support or advocacy for strong reductions in fishing mortality is going to be contingent on the viability of the stock projections that we've seen so far.

If the technical committee were to come forward with the conclusion that they are reliable and appropriate for management use, it would be very hard for me to ignore the projections that show an abundance increase can take place in the face of very low fishing mortality. I certainly haven't written that off yet, but I need to hear more about the stock projections and what the technical committee thinks about them and whether they're appropriate for us to use in management.

MR. BURNS: I think these tasks are certainly a step in the right direction as we try to see our way forward here. I guess I'm just thinking about the process. I understand the technical committee would look at this and do these runs and get this information for us.

Would it be worthwhile in the meantime to maybe reconvene our Southern New England Working Group or perhaps the PDT to take what the technical committee comes forward with and be able to maybe do a preliminary assessment on what that might mean for subsequent management measures? That way it might preclude the board from having to come forward here in February, five months later, and trying to pick its way through a lot of different information at the meeting.

CHAIRMAN McKIERNAN: Are you suggesting the technical committee work product be reviewed by the PDT and then the PDT and the technical committee both report at the next meeting?

MR. BURNS: If the board thinks it is appropriate. I just think it might help to focus the conversation a little bit better at the next meeting.

CHAIRMAN McKIERNAN: Well, that's probably a good idea since the PDT – some of the members are also going to be convened on Jonah crabs; so maybe we could – I don't know if it would overburden them or if they can discuss it all in the three- or four-month period.

MS. KERNS: Your PDT for Jonah crab is a little bit different than your PDT for lobster. This is a fairly substantial list that you're asking the

technical committee to tackle. I don't know how much time there is going to be between when the technical committee finishes looking at this and the February meeting; so I don't know how much time there will be to have the PDT examine this list.

The majority of your PDT members that we've had in the past are mostly technical committee members. You had been on the PDT the last time and you've have to form a PDT to examine these. We would need to know who it is; but if it is just going to be technical committee members, then you're probably not going to get much different advice back from your PDT if it is a typical PDT.

CHAIRMAN McKIERNAN: So are you recommending the technical committee report back and then we task the PDT in the spring?

MS. KERNS: I'm just worried that we won't have time to get the PDT to examine these tasks or to respond from the technical committee. They won't have enough time to actually look over what the technical committee sends back because I don't think the technical committee is going to have a lot of wiggle room between when meeting materials are due for the next board meeting. We can do our best to do so, but it would also be good to identify who is on the PDT. If you don't have any non-technical committee members on the PDT, then you're just asking the technical committee to review the same thing twice.

CHAIRMAN McKIERNAN: Okay, I appreciate that. Any other discussion? David.

MR. SIMPSON: Does it help, Toni, the timeline if the technical committee focused on number one and got a response back on that in a shorter timeframe and then the subcommittee could get together? To me and it sounds like to Mark that's the crucial thing; are those projections usable in management, and then everything else I think we have more time for.

MS. KERNS: That's fine; they can focus on that and do that first. They can also work on the other things simultaneously and then we can get that to the PDT; but again if the PDT are technical committee members, then there is no reason to ask them to look at something twice.

CHAIRMAN McKIERNAN: We got sidetracked a little bit I think by Peter's hope that we could convene the PDT in advance, but it sounds like we won't be able to do that. We have the motion and we still need to vote on this motion. Are we ready to vote? Do we need to caucus? Peter.

MR. BURNS: Sorry to belabor the point, Mr. Chairman. Like I said, I think these tasks are a good way forward, but what is the expectation, I guess, when we get this? I understand that there is not a lot of time in between, and there is budgets and things like that, and I certainly understand that. In doing this, is the intent at the next meeting for the board to look at this and then move forward with management measures in response?

CHAIRMAN McKIERNAN: I would say yes.

MR. BURNS: Then does the motion need to express that or is it implicit?

MS. KERNS: I think you've asked for some advice back from the technical committee for the board to think about. The board then needs to give some direction to a plan development team on what type of management response you're looking from them. The document that Megan provided as an overview of how the Southern New England meeting went had a series of goals and objectives to move forward in responding to the Southern New England stock assessment results.

What we're hearing today is that we want to re-examine reference points; and so the technical committee is going to come back and give you some advice on that. I think based on that advice

this board can then probably provide a goal and objective to the plan development team and some specifics on how you're looking for that goal and objective to be reached.

Then the PDT can provide some advice back to the board based on the work that the technical committee does and the clear direction that this board gives them. I think it would be really hard for the PDT to give much substantial advice back to the board just based on what the technical committee comes back on; because we don't know what you're trying to achieve for the Southern New England stock.

Even for the technical committee, they can give you responses for each of these items because David has outlined specific tasks, characterize what is going on in certain aspects of the fishery or look at the inshore/offshore stocks; but until you give them a goal and objective, they can't tie that back to how to go forward with a plan.

CHAIRMAN McKIERNAN: Okay, Toni, thank you. Let's vote this up or down and then let's meet in February and create the objectives and task the PDT based on the technical committee's feedback. **We have the motion to have the Technical Committee examine the tasks provided today. Motion by Mr. Borden; seconded by Mr. Augustine. All in favor; opposed; abstentions; null votes. It passes unanimously. Did you abstain, Terry? Okay.**

APPROVAL OF THE 2015 LOBSTER FMP REVIEW AND STATE COMPLIANCE

CHAIRMAN McKIERNAN: All right, we have ten minutes left and we have a couple more items of business. One is the approval of the FMP review and the state compliance. Megan.

MS. WARE: Would the board be comfortable approving the FMP Review via e-mail? We do have other items on the agenda. I'm seeing a general nodding of heads.

MR. ADLER: Is it appropriate to put a motion on the floor at this point to approve this?

MS. WARE: If you would like to approve it, that would be great, sure.

MR. ADLER**: I will so move if it is appropriate.**

CHAIRMAN McKIERNAN: Bill, your motion is to approve the 2015 Lobster FMP Review and state compliance reports?

MR. ADLER: That's correct.

CHAIRMAN McKIERNAN: Do we have a second; Pat Augustine. Any discussion? Mike.

MR. LUISI: I just have a question. I know the *de minimis* status for states is part of that package of compliance. I would want to be clear whether or not – well, I'm looking at something different from what was just said a minute ago up on the board. Before we finalize any decision here on pushing this forward, I'd like to have a moment to speak to the *de minimis* status issue.

MR. WARE: I think what we're going to do is two separate motions. We will do one to approve the FMP review and then we will do one for *de minimis*.

CHAIRMAN McKIERNAN: **So we're going to amend the motion to strike the language about *de minimis*, which we've done, so the new motion is to approve the 2015 Lobster FMP Review, state compliance reports. The motion is by Mr. Adler and seconded by Pat Augustine. Any discussion needed on this? Seeing none; all in favor; opposed; abstentions – Terry abstained on behalf of the council – and no null votes. The motion carries.** Now we want to break out the *de minimis* issues.

MR. WARE: We received *de minimis* requests from Maryland, Delaware and Virginia. The current definition is that the average commercial landings have to be below 40,000 pounds.

Delaware and Virginia met that *de minimis* request, but Maryland did not so I'll let Maryland speak on that.

MR. LUISI: This isn't the first time that Maryland has had to come before this board after requesting *de minimis* status and being told that we had exceeded the threshold for that status. This issue is a concern given that we have such small landings; and it is only slightly over what the threshold of 40,000 pounds is at this current time.

We have such small landings and it is such a small part of what we do in Maryland that we would be very much challenged to put together a program that would meet the compliance requirements. We have committed over the past two years to collecting information. We have a small but hopefully it is going to become an effective at-sea sampling program that we've been working with a couple of lobstermen in our state.

However, we're just unable to produce the young of the year, the larval survey, the independent ventless trap surveys that would be required if we were not given the *de minimis* status. Now, with all of that said, between 1995 and 2012, over the 17 years of time we exceeded the threshold once. Since 2012 we have been hovering around 60,000 pounds.

What I'd like this board to understand is that in 2011 and 2012 we had somebody heavily invest in and participate in the lobster fishery in Maryland. It was the reason why landings went from 10,000 pounds in 2009 to almost 70,000 pounds in 2012. We had this spike in harvest in our state and we knew that this was going to be a concern given the *de minimis* status that we were seeking.

I want to report to this board that permit and that vessel is no longer participating in Maryland. What we anticipate is that as soon as this year landings will again go back down to the point for which we probably averaged about 20,000 pounds over the 17 years prior to this individual fishing in Maryland. I know there is not a motion on the table yet; however, when there becomes one, Mr. Chairman, I'd like to amend that motion to include Maryland. Thank you.

MR. AUGUSTINE: To that point, this would be an exception to the rule; so is this something that would have to go before the ISFMP Policy Board as an exception or do we as a board have the authority to override? I understand what you're saying, Mike. There is no question it was an anomaly by the sounds of it and that the issue has been resolved; but I would need clarification would it have to move up or could this board bypass that?

MS. KERNS: The board can grant *de minimis* to a state if they think it is appropriate.

MR. WHITE: A couple of questions. What is the state that is in compliance with the lowest landings or how far apart is 60,000 pounds with the next nearest state? Where did the 40,000 pounds come from; what was the basis for assigning that amount?

CHAIRMAN McKIERNAN: I'm looking for help from staff.

MS. WARE: I currently don't have whoever the lowest landings' value is for 2014 because it is confidential in that report and I don't have access to the landings right now. I don't have that number for you.

CHAIRMAN McKIERNAN: Question for Mike; is this an Area 3 vessel that fishes exclusively in federal waters that you were describing?

MR. LUISI: Yes, it was in Area 3; that fished in both the Area 3 and Area 3 and 5 overlap, but that particular vessel is no longer participating. What I just see is that by the time we were to try to become compliant with sampling protocols that would be required, we'd find ourselves

again below the minimum 40,000 pound threshold.

MR. HASBROUCK: A question for Mike, if I might. Is that vessel just out of the fishery completely or are they landing in a different state and may come back to Maryland in the future?

MR. LUISI: It is my understanding that the vessel and the permit were both sold off and currently it is not a participating vessel in Maryland. I don't know where it went.

MR. AUGUSTINE: With that follow-up information, I would suggest that the board – reviewing the circumstances that have been described and the cost that it would take to put a system in place, I think it would be appropriate for the dilemma that we're faced with, and I would suggest that we approve Maryland as a *de minimis* state. When you're ready for a motion, Mr. Chairman, **I would so move that the three states that were noted, Virginia, Delaware and Maryland, received *de minimis* status for 2016.**

CHAIRMAN McKIERNAN: Second from Bill Adler. Any further discussion. All in favor raise your right hand; opposed; abstentions; null votes. **The motion passes 10 to 1 to 1 to zero.** Okay, the last item in the agenda is under other business and it covers – I'm sorry, we have consider approval of the Lobster Advisory Panel membership. Megan Ware.

APPROVAL OF AMERICAN LOBSTER ADVISORY PANEL MEMBERSHIP

MS. WARE: We are currently trying to revitalize the Lobster AP so that we can get them to have more meetings and just be more integrated in the process, especially as we move through the Southern New England management. We right now have three nominations for AP members. We have Grant Moore from Massachusetts, John Godwin from New Jersey and Earl Gwin from Maryland. **We're looking for a motion to approve those individuals to the Lobster AP.**

CHAIRMAN McKIERNAN: **Bill Adler moved; second, David Borden**. Any objections to those three members being added? **I assume it is unanimous**.

OTHER BUSINESS

CHAIRMAN McKIERNAN: Under other business, there was a very important meeting held earlier in October that had to do with the relationship between the state and federal sea-sampling program, and Megan is going to present on that.

MS. WARE: I was asked to just give a brief overview of what happened at that meeting so people have an idea of what the status is on the Lobster Observer Coverage Programs. We met October 6th in Gloucester. There were 20 attendees, including technical committee members from Maine, Massachusetts and New Hampshire. We had representatives from NOAA, GARFO, New England Fishery Science Center and then members of the Northeast Fishery Observer Program.

The goal of the meeting was to understand what the actual goals are of the current observer programs, to understand what data is collected and what redundancies there are between the different programs so we can try and eliminate those. There were presentations from Maine, Massachusetts, New Hampshire and the Federal Observer Program, going over what their specific aspects for the observer programs were. That's where we tried to find these redundancies.

There were three main concerns we think that were expressed in the meeting. The first is whether or not it is mandatory for a fisherman to have observers on board. Right now for Maine and New Hampshire it is not mandatory. For Massachusetts it technically is mandatory, but they've never had to evoke that. For the federal program it actually is mandatory.

The second issue was the sampling frame of the Federal Observer Programs so right now they're

only sampling from vessels that have VTRs, which is a very small portion of the lobster fishery, and really does not capture the Maine fishery. There were questions as to whether that sampling frame could be altered or increased.

The third issue was the Federal Observer Program collects weights so it requires extra time and extra gear; whereas, a lot of the state programs do not collect weights. They just collects lengths and use a historic length/weight ratio to understand more about the fishery. There was a question as to whether those weights really need to be measured.

Some of the outcomes of the meeting are a matrix, which compares all aspects of the sampling program. That is something that we are currently finalizing. Some of the states in the Federal Observer Program, they said that they might be able to develop similar codes for shell disease, egg status, molting just to make sure that we're kind of getting on the same methods here.

NOAA also said that they would look at the length/weight relationship to see how well they could predict the weights measured if they only had lengths. They also said that they would investigate application of the SBRM Program with or without VTRs by extricating trip-level data from individual states; so that would be addressing the sampling frame issue. Then also just getting uniform safety training and fish identification findings, specifically looking at bycatch through SBRM. That was kind of the outcome of the observer meeting.

MR. ADLER: This movement into the lobster fishery people is troubling. I think the state, for instance, of Massachusetts is doing much of this monitoring of stuff that the observers are trying to do; and it is a duplicate. I think there is too much duplication here. I don't know if they're looking for jobs or what.

There was one statement made to a lobsterman that he had to fill out his vessel trip report on his way in. Of course, you don't keep the vessel trip reports like on your dashboard as you're coming into the harbor; and, of course, you shouldn't be filling things out as you're coming in the harbor, anyway. He said, "Well, when I get in, I'll find out how many pounds I have." "Well, no, take a guess and write it down before you reach your dock." The guys says, "Are these people out of their minds?"

CHAIRMAN McKIERNAN: Bill, I think this particular program, we all have some great anecdotes of how screwed up it has been. I know that this is going to be the topic of probably the next meeting as well. We are working really hard to dovetail the two programs; and I think NMFS is showing kind of a good-faith willingness to sort of meet us halfway in terms of fixing this. I think Pat had a motion or wants to make a comment.

MR. KELIHER: Yes, my comment is to the point that we do need to make sure that there is no delay associated with this; so I do have a motion to make**. I would move to continue collaboration on federal/state onboard observer programs, including a discussion at the fall Northeast Regional Coordinating Committee meeting, so that agreed-upon changes can be implemented by the start of the 2016 fishing year.**

CHAIRMAN McKIERNAN: Can we get a second? David Borden seconds. Discussion? Do you want to speak to it in any detail? No, okay. David.

MR. BORDEN: Just a quick point in support of this. This actually works very well with the task list. One of the issues on the task list is for the technical people to go back and look at all the deficiencies in the plan. These two issues work together.

CHAIRMAN McKIERNAN: Can we explain NRCC? Pat, what does NRCC stand for? Toni.

MS. KERNS: It is the Northeast Regional Coordinating Council. It is a committee of the commission, the New England Council, GARFO and the Science Center as well as the Mid-Atlantic Council. We work on issues that crosscut all of those groups or at least a portion of those groups. I think that this affects us, the New England Council, GARFO and the Science Center, so it is a great place to make sure we get those timeframes going and the commitment to those timeframes and we have it on the agenda.

CHAIRMAN McKIERNAN: All right, no further discussion, can we take a vote on the motion? **All in favor; opposed; null votes; abstentions. Terry abstained.** All right, is there any other business to come before this board? David Borden.

MR. BORDEN: Just a quick point. Was I was out of the room when you took up the PRT Report, Dan? Have you taken up the PRT Report?

MS. WARE: That was the FMP Review.

MR. BORDEN: Just so I'm clear; so the recommendation on this issue of prioritizing enforcement in the areas where there are trip limits; that will be forwarded to the Enforcement Committee, correct?

ADJOURNMENT

CHAIRMAN McKIERNAN: Certainly. Okay, we're ten minutes over and no other business, Bill Adler with a motion to adjourn.

(Whereupon, the meeting was adjourned at 10:40 o'clock a.m., November 2, 2015.)

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: American Lobster Technical Committee

DATE: January 19, 2016

SUBJECT: Projections for the SNE Lobster Stock

The American Lobster Technical Committee (TC) met on December 8th to review projections for the Southern New England (SNE) lobster stock. Below are the series of projections that the TC unanimously recommends for Board consideration. These projections represent two potential scenarios. In the first scenario, recruitment is assumed to be independent of stock biomass and stable at current estimated levels. While this can limit the potential for rebuilding, it is perhaps the more realistic of the two scenarios given that recruitment has been declining for the past couple decades.

In the second scenario, future recruitment is linked to the spawning stock via a Beverton-Holt stock-recruitment relationship. This is perhaps less realistic than the first scenario with regards to stock rebuilding but more realistic for the continued decline of the population because recruitment decreases with further depletion of the spawning stock.

Under the first scenario with fixed recruitment, an 80% to 90% reduction in harvest rate is projected to stabilize the stock at current levels, assuming natural mortality also stabilizes at current levels; even lower harvest rates show some potential for recovery. Under the second scenario with recruitment linked to spawning stock, a 75% reduction in harvest rate would be needed to stabilize the stock under current natural mortality conditions.

This memo is divided into three parts. The first section reviews the projection configurations including variations in fishing mortality, natural mortality, units (N or SSB), and recruitment relationships. The second section, which can be found on page 4, reviews the projections from the first scenario which the TC feels is most realistic given the current condition of the stock. The third section, which begins on page 15, outlines the projections from the more optimistic scenario which assumes a Beverton-Holt stock-recruit relationship. A reference table outlining all projection variations, their configurations, and associated figures can be found on page 25.

1. Stock Projection Configuration

The TC ran stock projections to examine population responses under various levels of natural mortality (M) and fishing mortality (F). It is important to note that here F is used to represent the proportion of current catch levels by weight, not a fishery removal rate as is typical. In plots where F was fixed at zero, M varied from 0.15 to 0.5. The effect of varying M on population projections is presented and highlights the sensitivity to the assumed value of M. Analysis of

model fit at different natural mortality rates showed that the most likely value of M in recent years is around 0.255 to 0.270, similar to or slightly lower than the M=0.285 used for the final model years in the 2015 Benchmark Stock Assessment (Figure 1). For consistency with the peer-reviewed assessment, an M = 0.285 was used in projection runs where M was held constant and F (catch weight) varied from 0 to 100% of current landings. These runs force the extraction of the same weight of lobsters each year until there are no legal lobsters left in the population. As a result, declining populations tend to decrease rapidly.

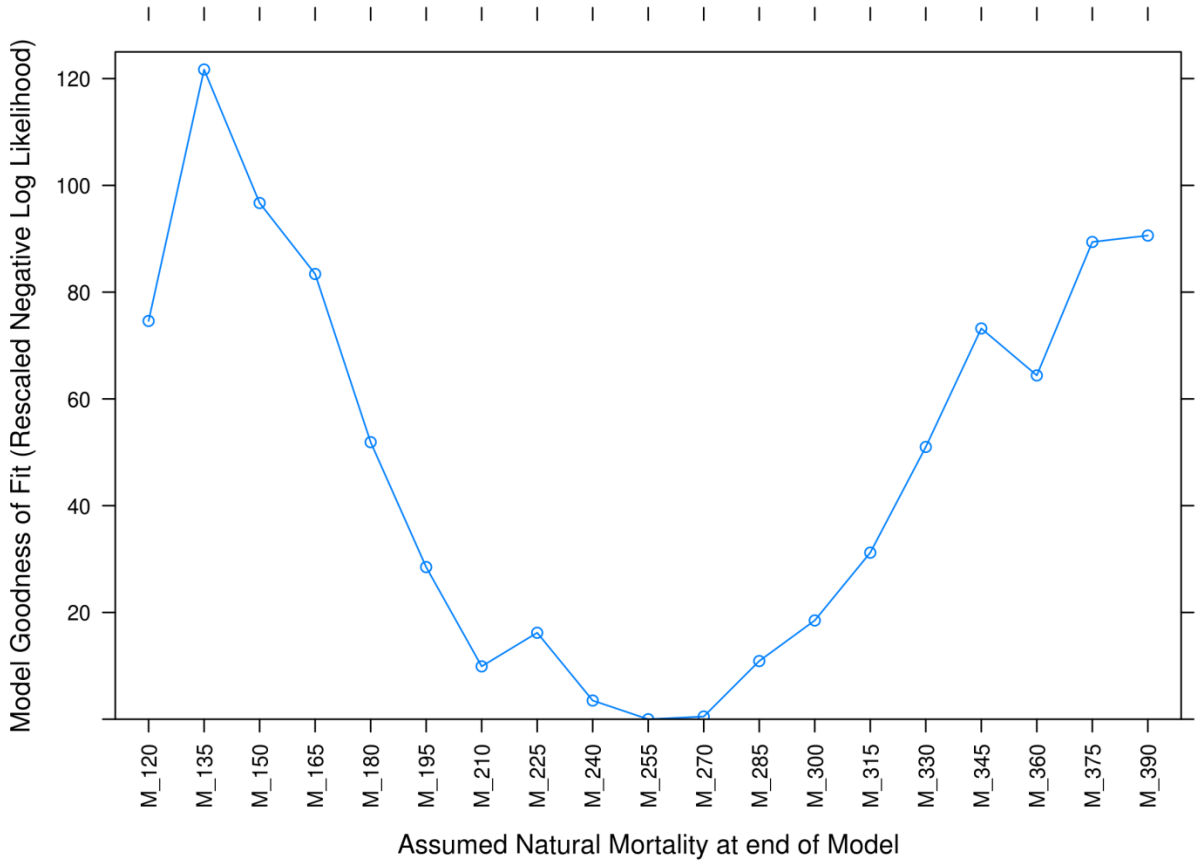


Figure 1: Rescales negative log likehoods (NLL) from model fits using different values of M, with F=0. Lower negative log likelihood values indicate better model fit to the data. Thus, the most likely value of M in recent years is around 0.255 to 0.270.

The projections are shown in two different units: reference abundance (N) and spawning stock biomass (SSB). Reference abundance is the number of lobsters 78+ mm carapace length on January 1st plus the number that will molt and recruit to the 78+ group during the year. Current reference points are also expressed in N. SSB is the total weight of mature lobsters (both sexes) in the stock. In the projections, SSB shows greater recovery potential than reference abundance because SSB is the product of abundance at-size, the probability of maturity at-size, and weight at-size. As a result, SSB increases more rapidly than N because larger individuals weigh more than smaller lobsters.

Two types of recruitment are explored in the projections. In the first scenario, the projections assume constant recruitment at levels similar to those observed from 2011-2014. In the second and most optimistic scenario, recruitment is assumed to follow the Beverton-Holt stock-recruit relationship, which models a positive relationship between spawning stock and the number of recruits. Analysis of the relationship between SSB and recruits since 1995 shows that the assumption of constant recruitment is more plausible than a Beverton-Holt relationship, but likely still represents a relatively optimistic scenario. Specifically, Figure 2 shows that after 2003, recruitment plummeted while SSB remained fairly constant. This suggests that depensatory mechanisms may be at play in the SNE lobster stock, such that recruitment drops to very low levels well before SSB reaches zero unlike a traditional Beverton-Holt assumption of recruitment dropping off rapidly only when SSB nears zero. Thus, the resulting rate of recruitment appears to now be decoupled from SSB, potentially as a result of reduced mating success, environmentally-mediated changes in survivorship of early life history stages, and/or increased predation.

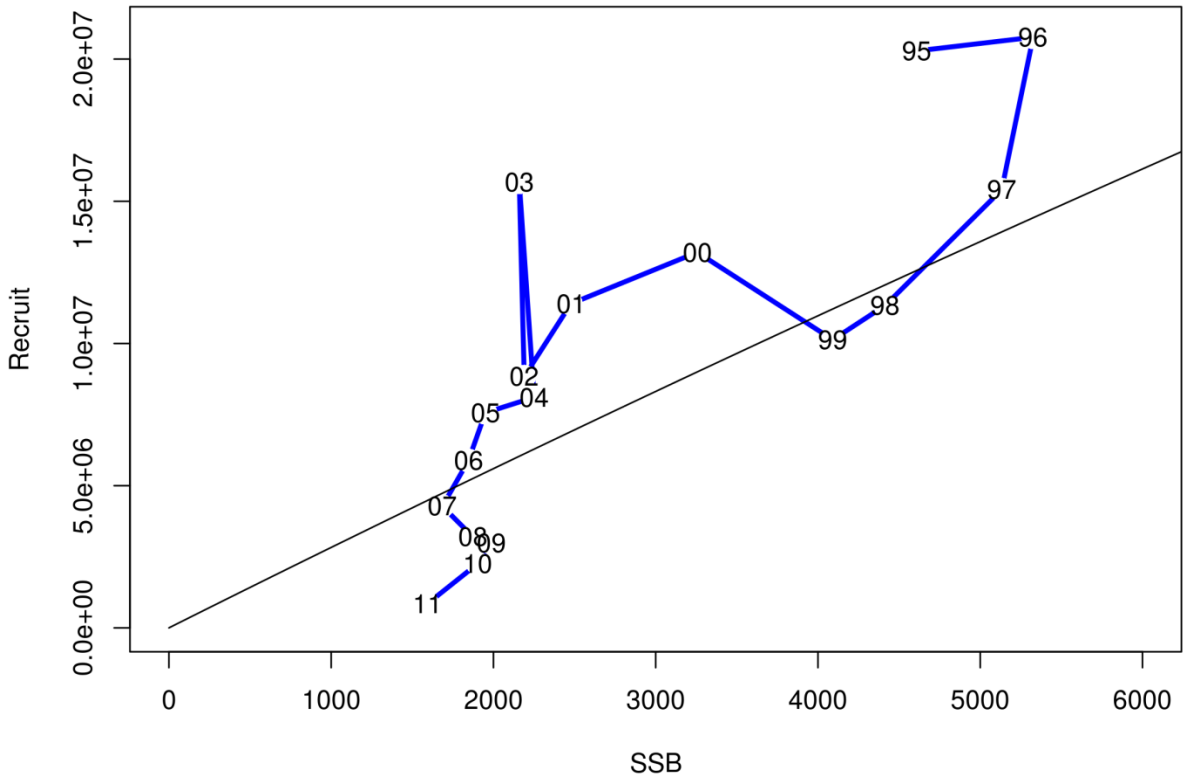


Figure 2: Relationship between model-based spawning stock biomass and recruits from 1995 to 2011. The blue line denotes the trajectory from 1995 – 2011 (recruiting to the model from 1998 to 2014). The black line represents the stock recruit relationship fit to the data with lognormal errors. Note that recruitment sharply declined to a time series low in 2011, despite relatively constant SSB.

Evidence suggests that all of these mechanisms could be occurring in SNE. As such, it should be expected that low levels of recruitment will continue in the immediate future. Furthermore the TC would like to emphasize that the "optimistic" scenarios presented within this document are highly unlikely to occur given the empirical trends in SSB/R and the additional evidence for an environmentally-driven regime shift.

2. Stock Projections Using Constant Recruitment

Figures 3 – 11 show the projection results from the first scenario, which assumes constant recruitment at levels similar to those observed from 2011 to 2014. The TC feels that this is the more realistic projection scenario for rebuilding potential given the current status of the SNE stock unless environmental conditions and lobster health improves.

Figures 3 and 4 show SNE stock projections under the assumption of no harvest (F=0) and variable M. The units are in reference abundance. These figures show that, with no harvest, populations have the potential to increase or stabilize at M less than or equal to 0.3 but increases beyond 0.3 could cause the stock abundance to further decline.

Figures 5 and 6 show the same projections as Figures 3 and 4 (constant recruitment, variable M, no F) but the units are SSB (metric tons). The projections suggest that SSB would remain stable at M =0.35 in the absence of fishing mortality, with some potential for increasing at lower levels but would further decline at higher levels.

Figures 7 and 8 show the projection results if M is held constant at 0.285 and F is allowed to vary between 0 and 95% of current harvest rate. The units are in reference abundance. Under the assumption of constant recruitment, the model runs show that a 90% reduction (to F=0.10) in harvest rate would be necessary to stabilize the stock at current levels. Reductions in harvest greater than this could result in increasing stock abundance while reductions in F of less than 90% could result in further declines in stock abundance.

Figures 9 and 10 show the same projections as Figures 7 and 8 (constant recruitment, variable F, M=0.285) but the units are SSB. In this case, the projections show that an 80% reduction in fishing mortality (F=0.2) would be needed to stabilize SSB at current levels. Reductions in fishing mortality greater than this could result in increasing SSB while reductions in F of less than 80% could result in further stock declines.

Figure 11 shows the weight of spawning stock in the population at the end of each projection year and the weight removed by harvesting or natural mortality, assuming M=0.285. Currently, more spawning stock is being removed by harvesting than is estimated to remain at the end of a calendar year. At F>0.20, more spawning stock is being removed by harvesting than natural mortality while natural mortality is the larger source of biomass removal for F<0.20.

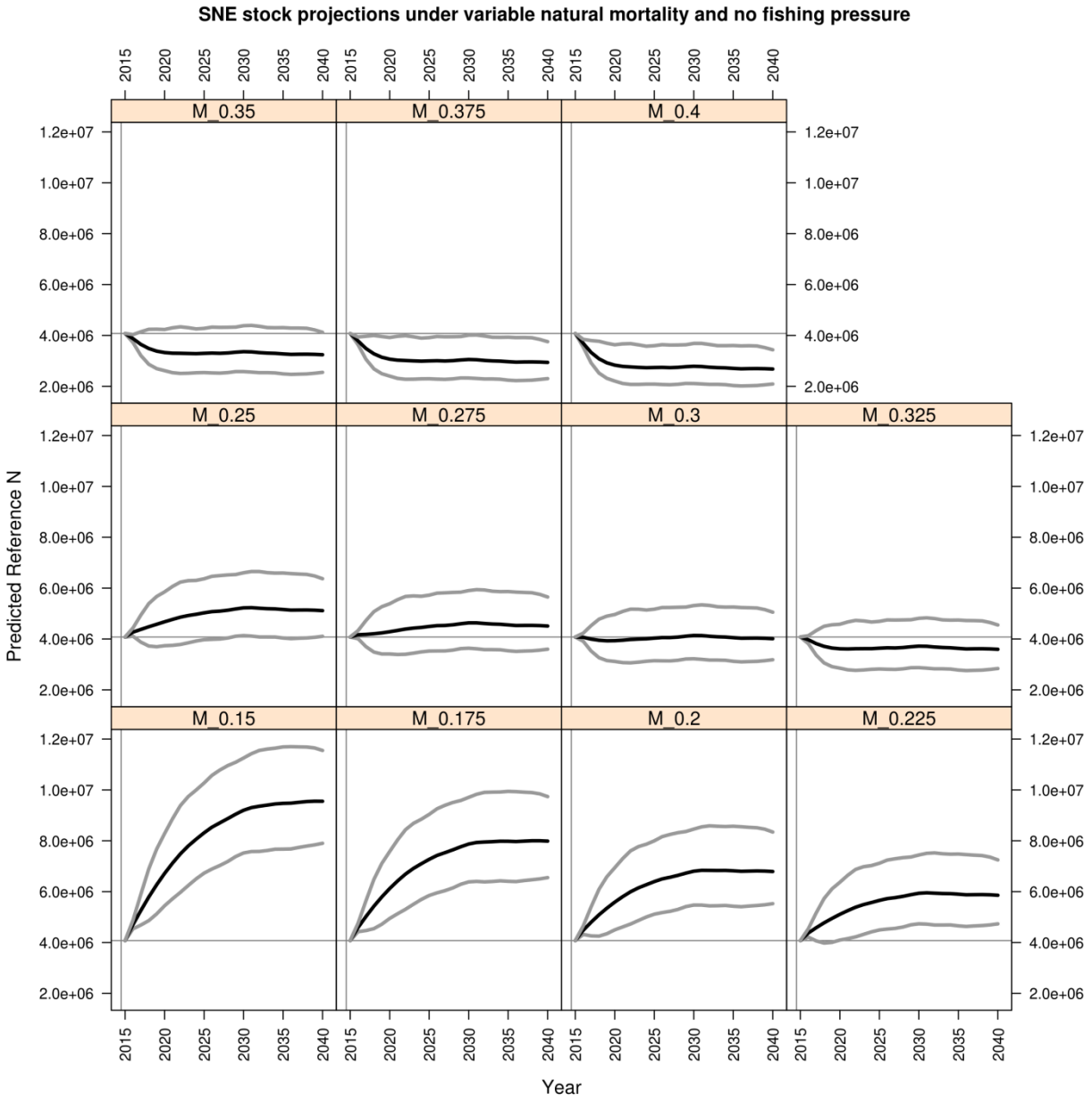


Figure 3: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) under various levels of M. F is fixed at zero. The units are reference abundance. Black line is the mean trend +/- 2SD (gray lines).

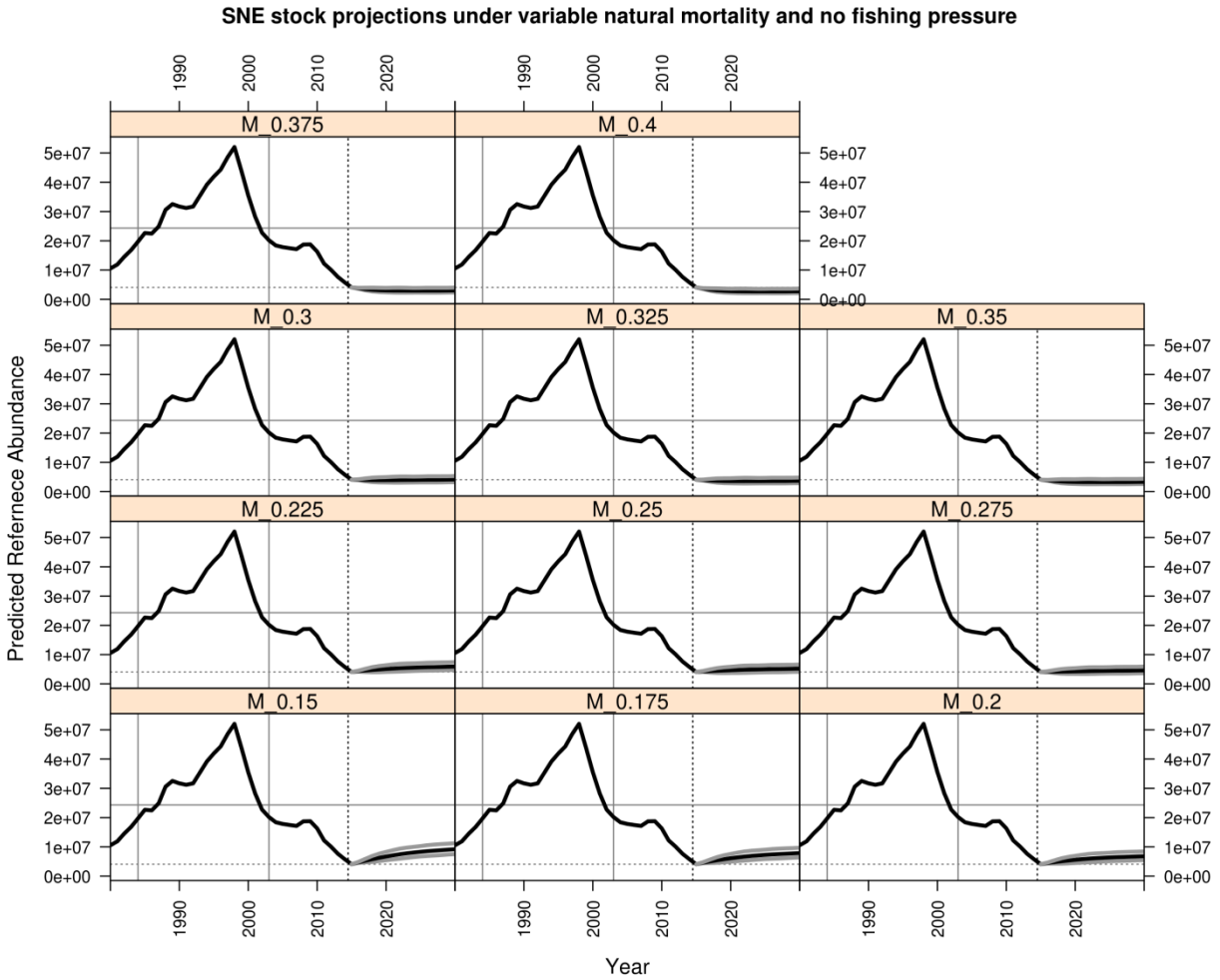


Figure 4: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) with an expanded time series from 1980 to 2040. Various levels of M are shown under fixed F=0. The units are reference abundance. The reference period and trend-based reference point are shown in solid gray lines.

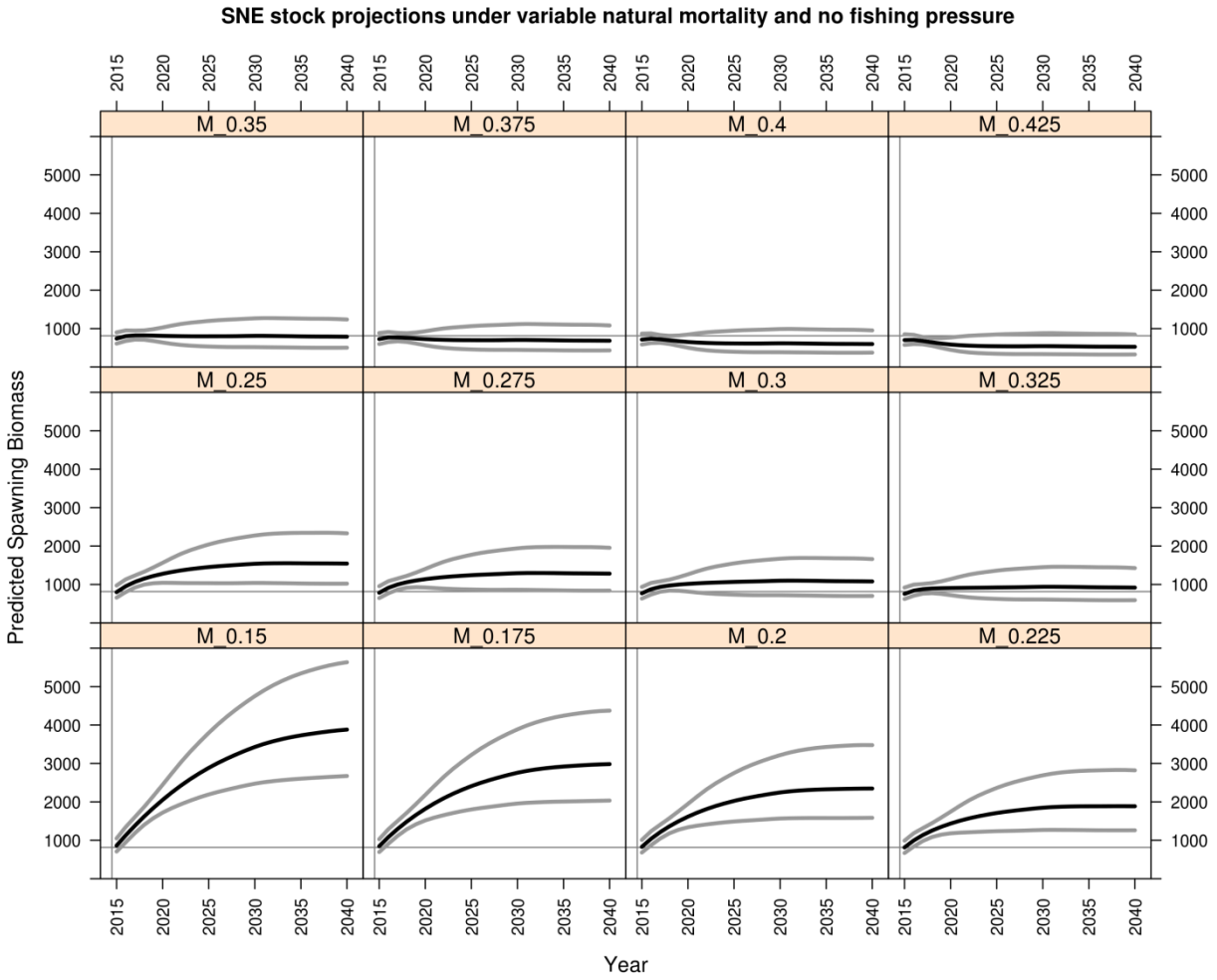


Figure 5: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) under various levels of M. F is fixed at zero. The units are SSB. Black line is the mean trend +/- 2SD (gray lines).

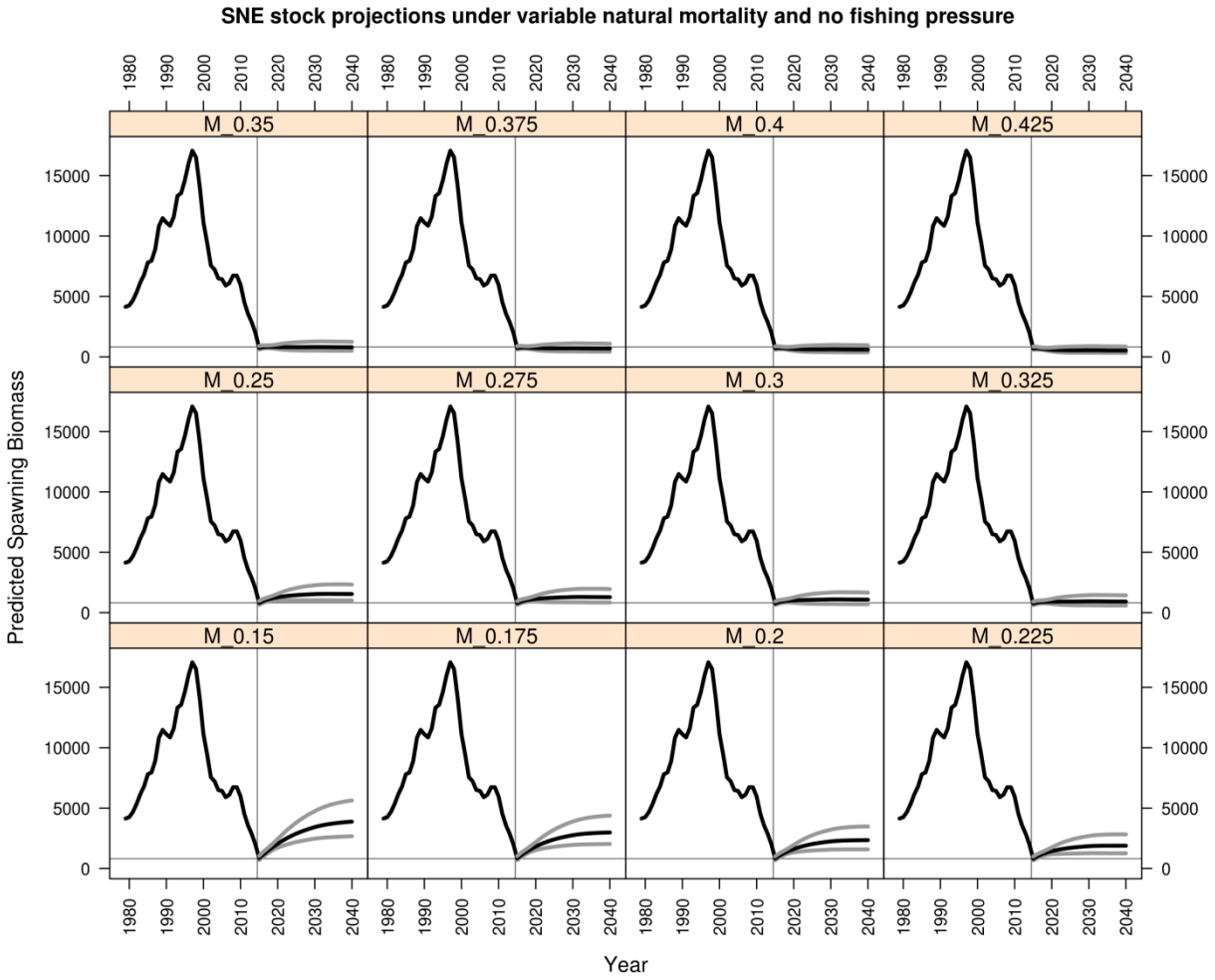


Figure 6: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) with an expanded time series from 1980 to 2040. Various levels of M are shown under fixed F=0. The units are SSB.

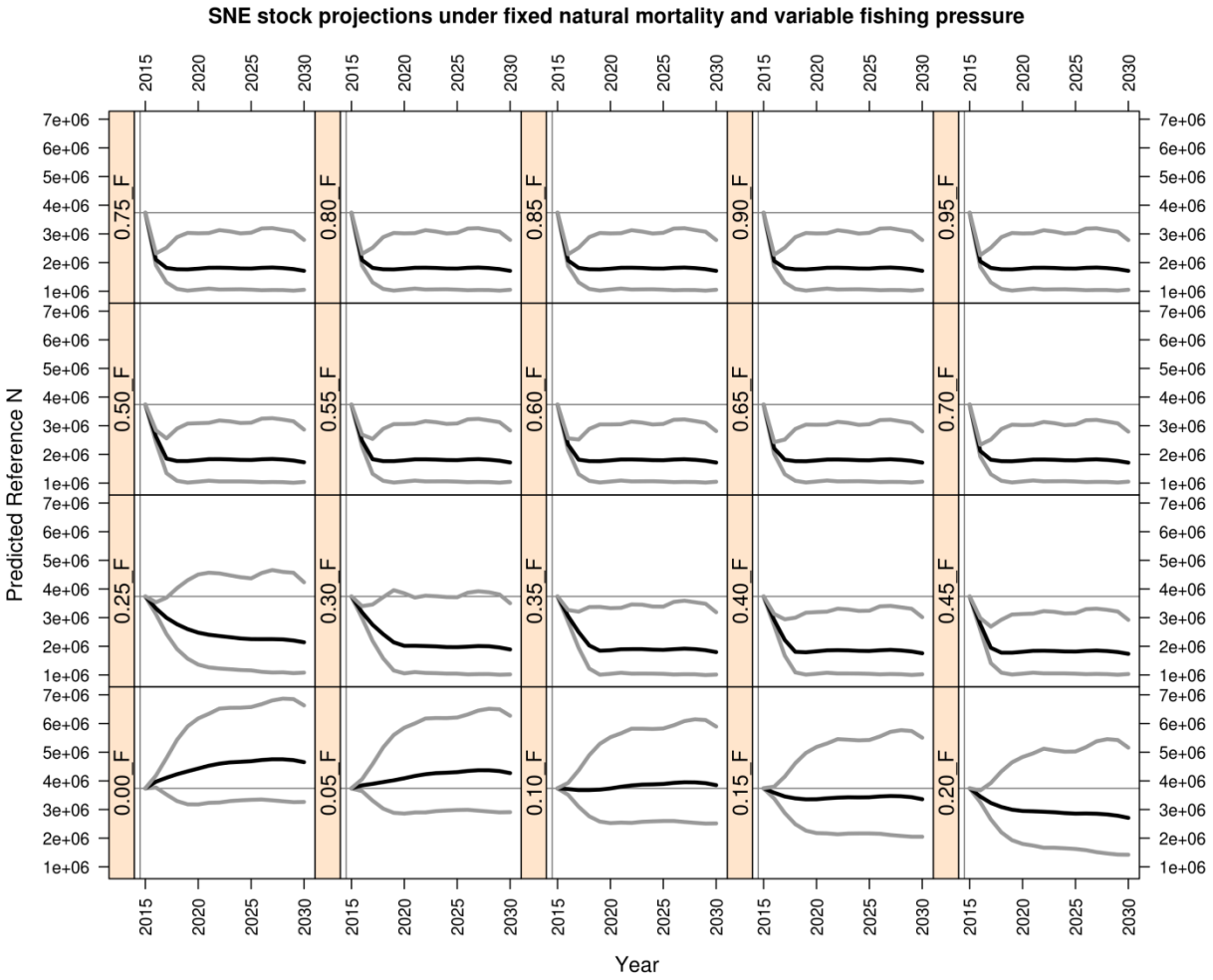


Figure 7: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) under various levels of F. M is fixed at 0.285. The units are reference abundance. Black line is the mean trend +/- 2SD (gray lines).

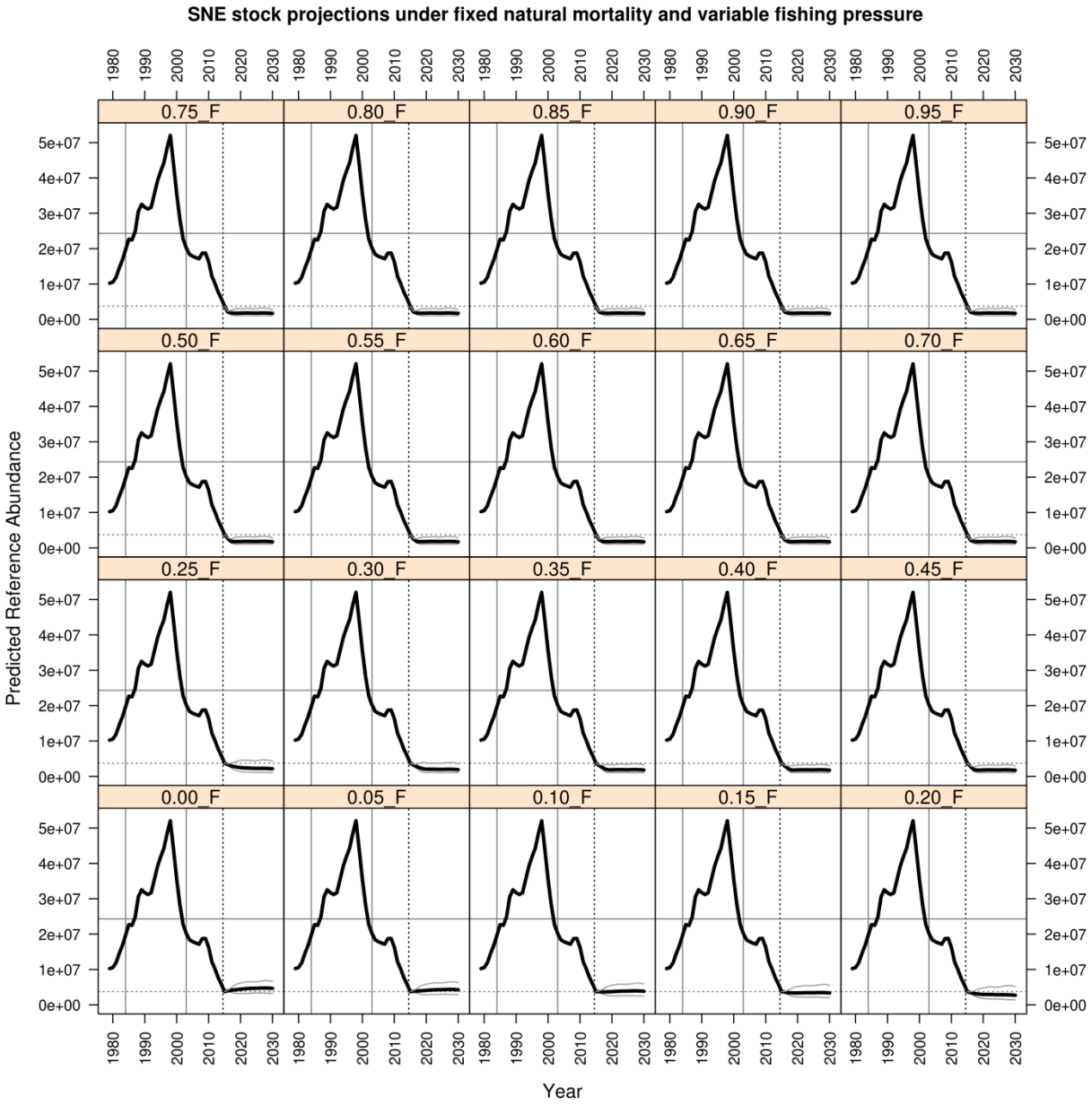


Figure 8: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) with an expanded time series from 1980 to 2040. Various levels of F are shown under fixed M=0.285. The units are reference abundance. The reference period and trend-based reference point are shown in solid gray lines.

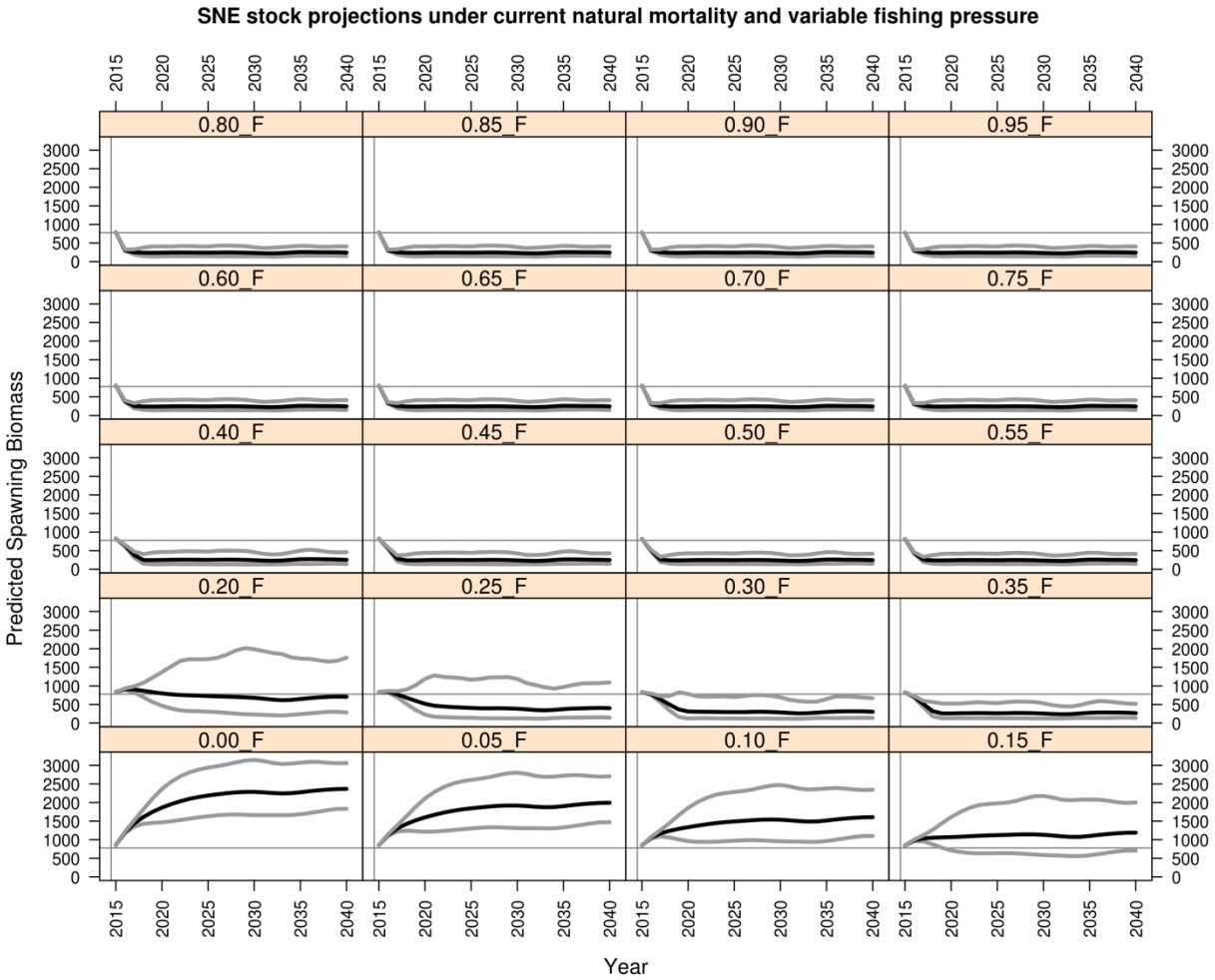


Figure 9: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) under various levels of F. M is fixed at 0.285. The units are SSB. Black line is the mean trend +/- 2SD (gray lines).

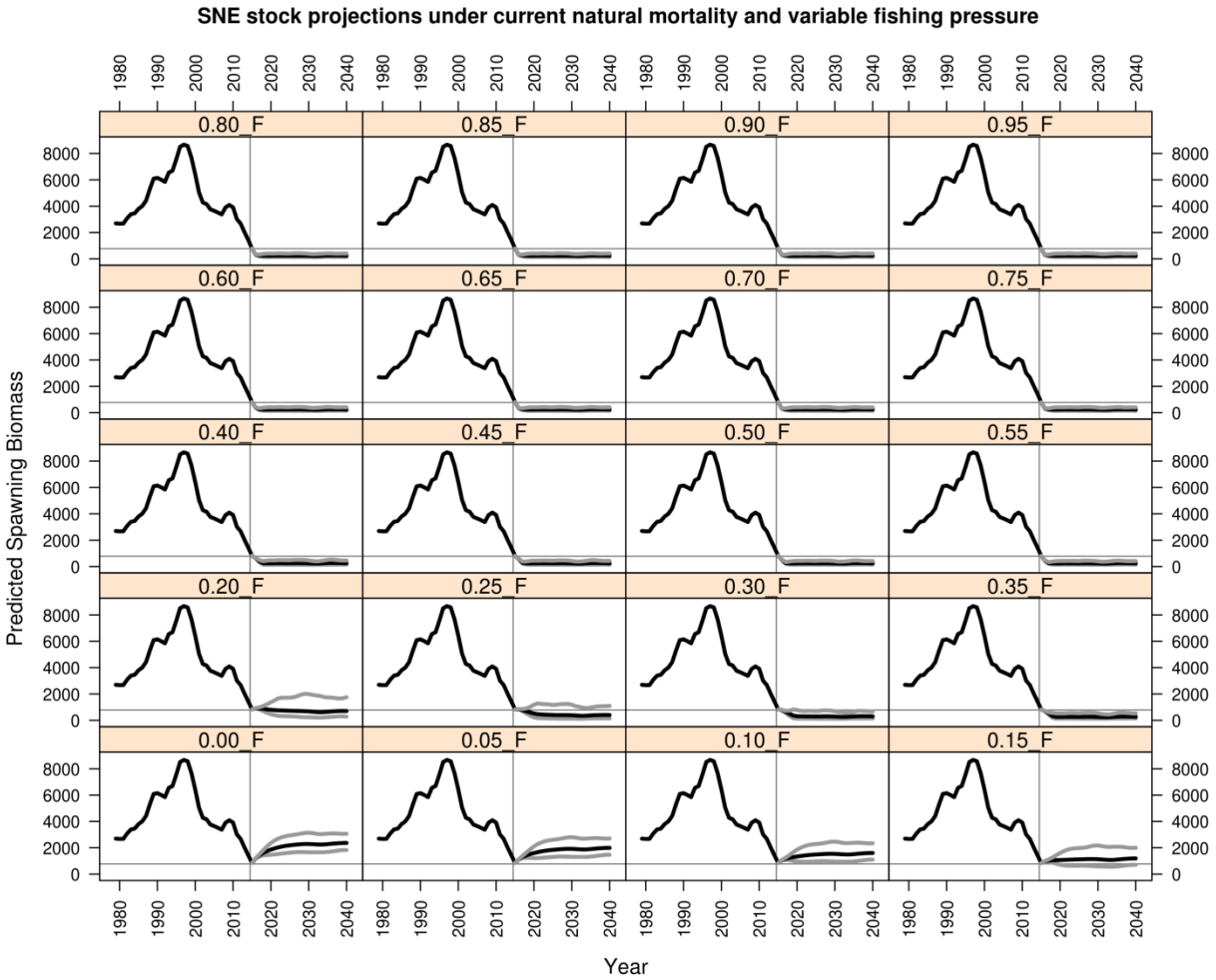


Figure 10: SNE stock projections assuming constant recruitment (similar to levels seen from 2011 to 2014) with an expanded time series from 1980 to 2040. Various levels of F are shown under fixed M=0.285. The units are SSB.

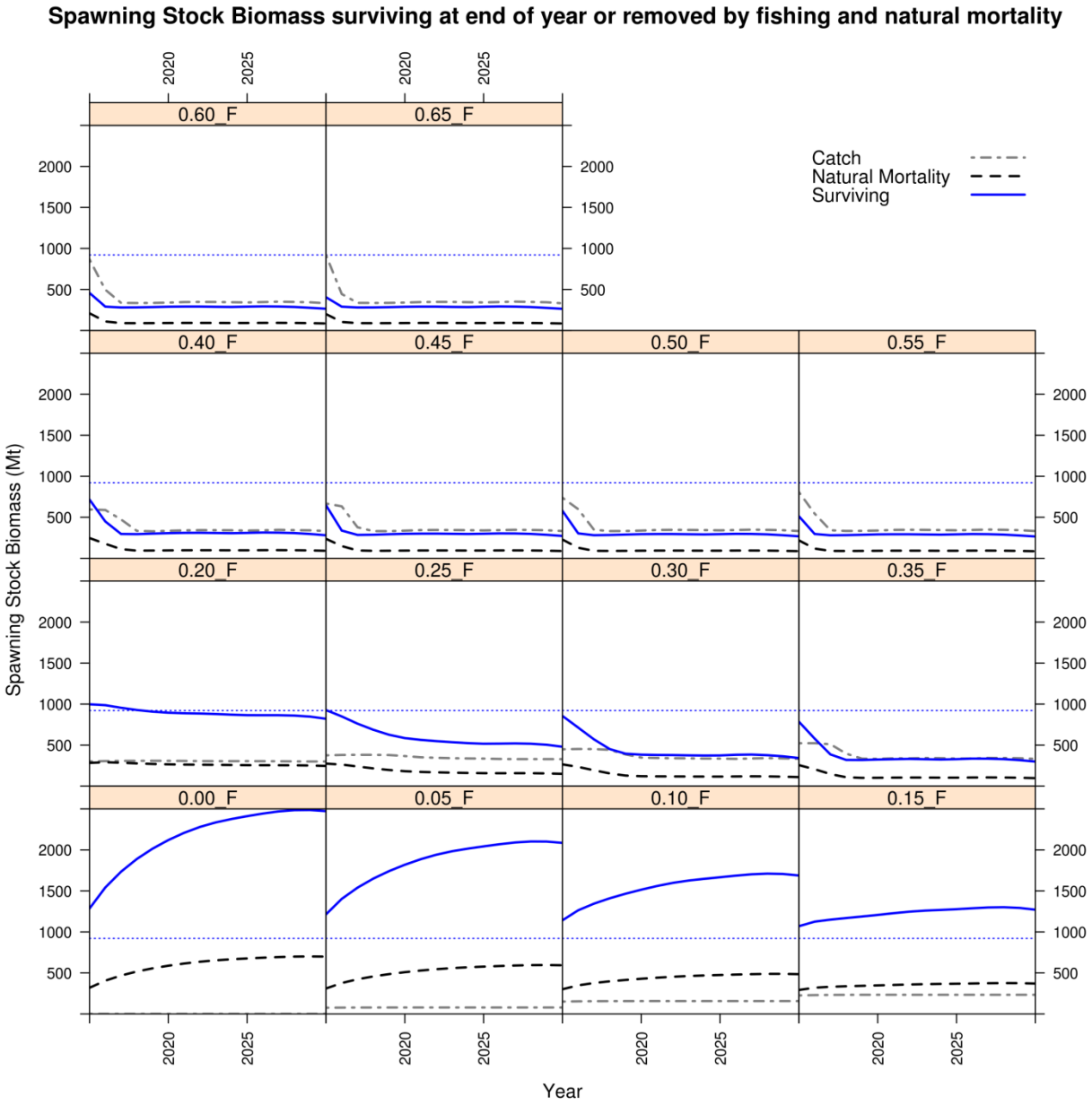


Figure 11. Mean spawning stock surviving to the end of year and removals by fishing and natural mortality, under different levels of fishing extraction. M is fixed at 0.285. At F>0.20, more spawning stock is being removed by harvesting than natural mortality while natural mortality is the larger source of biomass removal for F<0.20. For F>0.5 more biomass is removed by the fishery in the early years of the projections than survive to the end of the year. The blue dotted line is current SSB.

3. Stock Projections with Beverton-Holt Stock Recruit Relationship

Figures 12 – 20 show the projection results from the second scenario which assumes a Beverton-Holt stock recruit relationship. The TC feels that these are the most optimistic, albeit unrealistic, projections for rebuilding, given the current status of the SNE stock, but more realistic for projecting further declines in the stock.

Figures 12 and 13 show SNE stock projections under the assumption of no F and variable M. The units are in reference abundance. These figures show that the reference abundance could remain stable or recover at natural mortality levels up to 0.4 but an M>0.4 could cause the stock abundance to decline in the absence of fishing.

Figures 14 and 15 show the same projections as Figures 12 and 13 (Beverton-Holt recruitment, variable M, no F) but the units are SSB. Similar to reference abundance, SSB has the potential to remain stable or recover at natural mortality levels up to 0.4 but an M>0.4 could cause SSB to decline further in the absence of fishing. The steepness of the predicted recovery in SSB hints at the unrealistic nature of this projection run.

Figures 16 and 17 show the projection results if M is held constant at 0.285 and F is allowed to vary between 0 and 95% of current fishing pressure. The units are in reference abundance. Under the assumption of Beverton-Holt recruitment, the projections suggest that a 75% reduction in fishing mortality (F=0.25) would be needed to stabilize the stock at current levels. Reductions in fishing mortality greater than this could result in increasing stock abundance while reductions in F of less than 75% could result in further stock declines. However, with recruitment tied to spawning stock, the stock has the potential to decline to much lower levels than in the previous projections where recruitment was held constant.

Figures 18 and 19 show the same projections as Figures 16 and 17 (Beverton-Holt recruitment, variable F, M=0.285) but the units are SSB. These model runs also show that a 75% reduction in fishing mortality (F=0.25) would be needed to stabilize the stock at current levels.

Figure 20 shows the weight of spawning stock in the population at the end of each projection year and the weight removed by harvesting or natural mortality, assuming M=0.285. Again, more spawning stock is currently being removed by harvesting than is estimated to remain at the end of a calendar year. At F>0.20, more spawning stock is being removed by harvesting than natural mortality while natural mortality is the larger source of biomass removal for F<0.20.

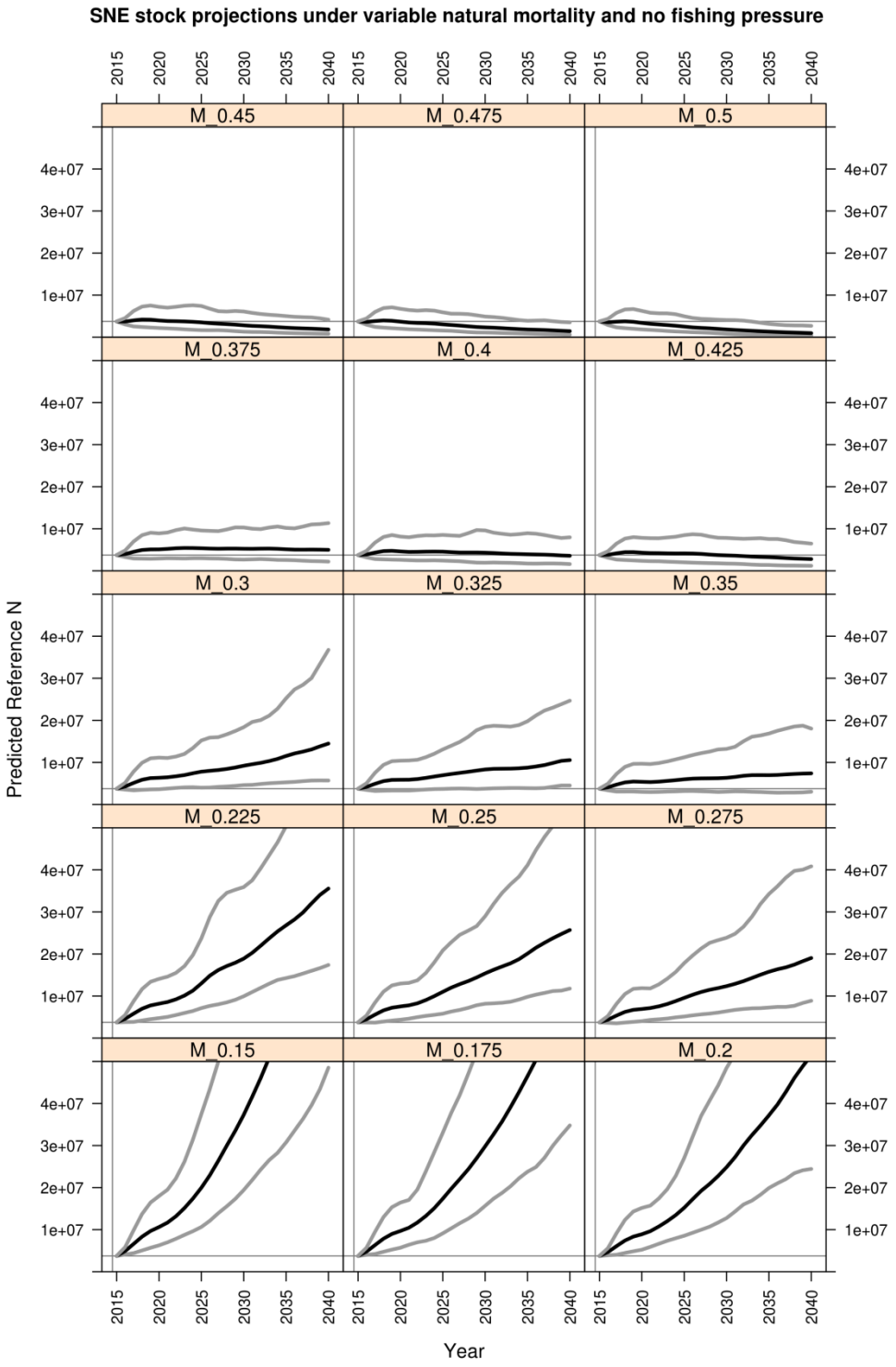


Figure 12: SNE stock projections assuming a Beverton-Holt stock recruit relationship under various levels of M. F is fixed at zero. The units are reference abundance.

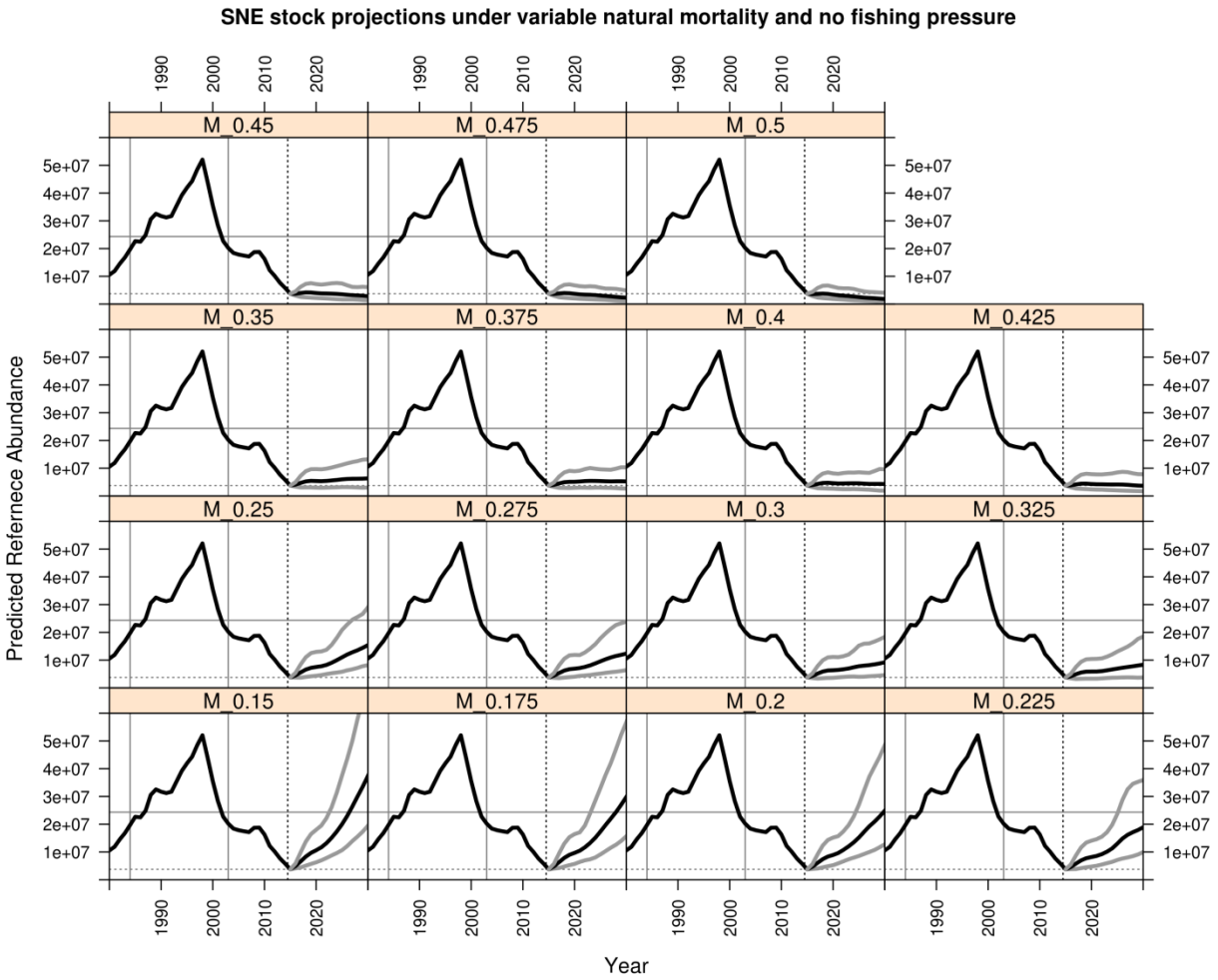


Figure 13: SNE stock projections assuming a Beverton-Holt stock recruit relationship with an expanded time series from 1980 to 2040. Various levels of M are shown under fixed F=0. The units are reference abundance. The reference period and trend-based reference point are shown in solid gray lines.

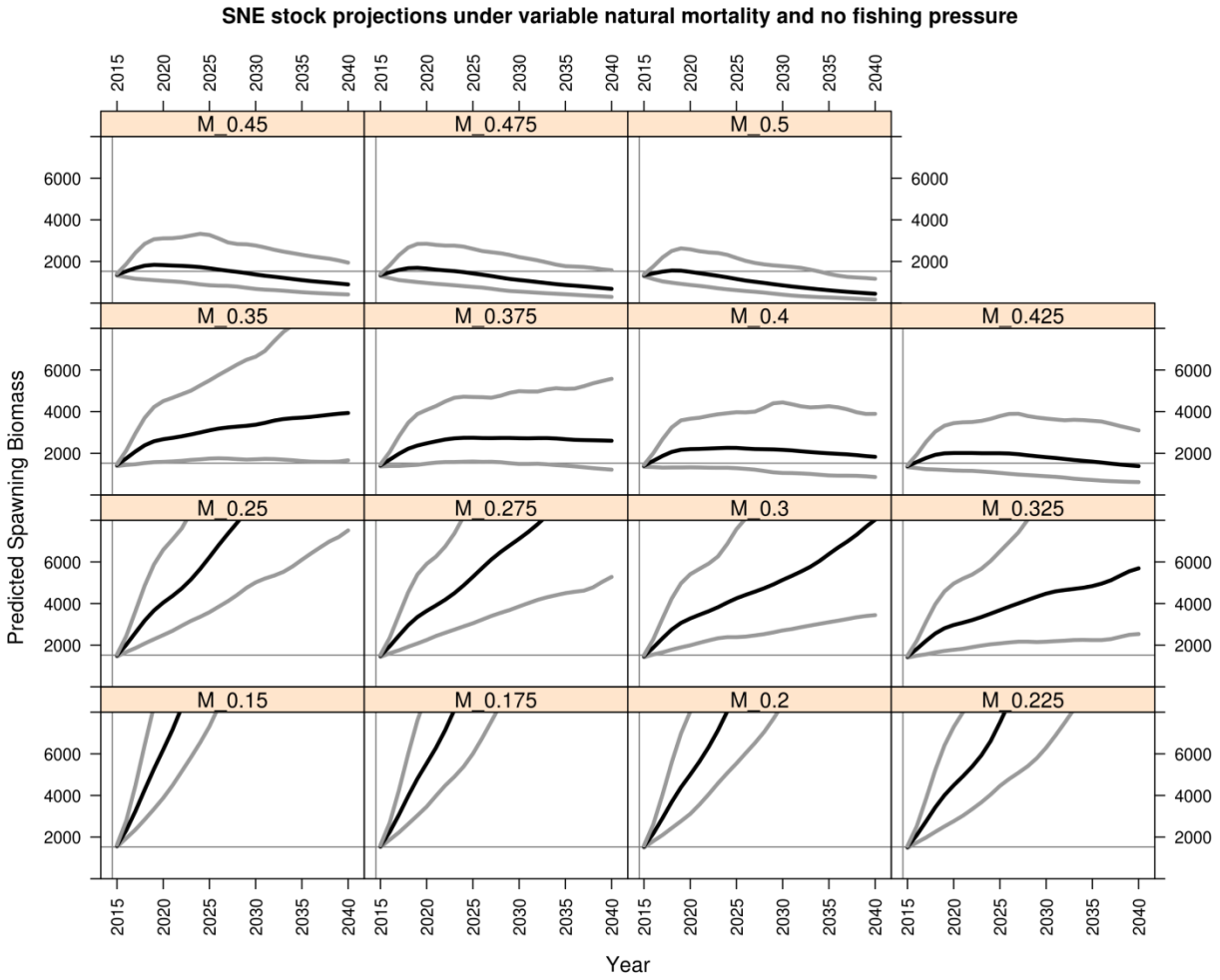


Figure 14: SNE stock projections assuming Beverton-Holt recruitment under various levels of M. F is fixed at zero. The units are SSB

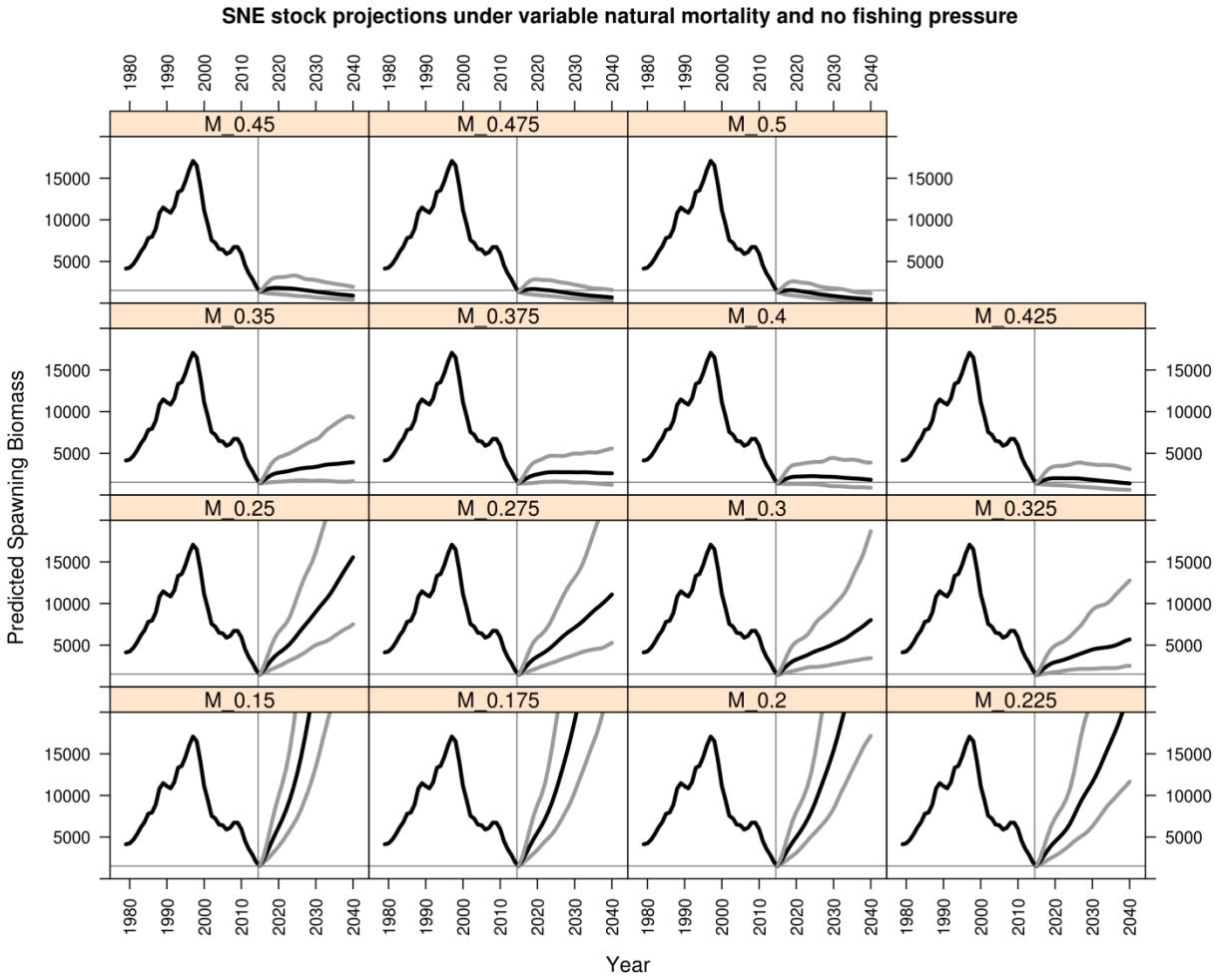


Figure 15: SNE stock projections assuming Beverton-Holt recruitment with an expanded time series from 1980 to 2040. Various levels of M are shown under fixed F=0. The units are SSB.

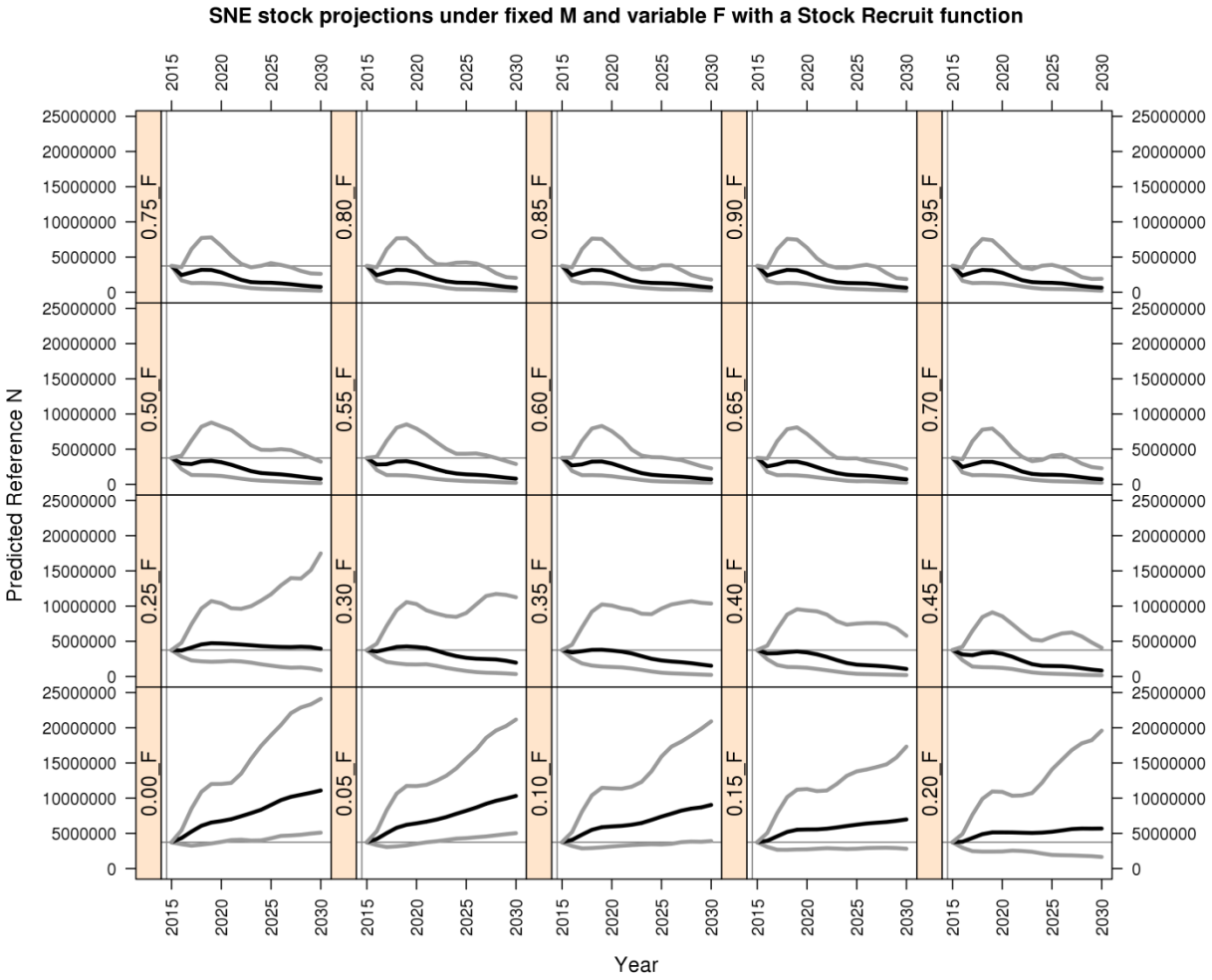


Figure 16: SNE stock projections assuming Beverton-Holt recruitment under various levels of F. M is fixed at 0.285. The units are reference abundance.

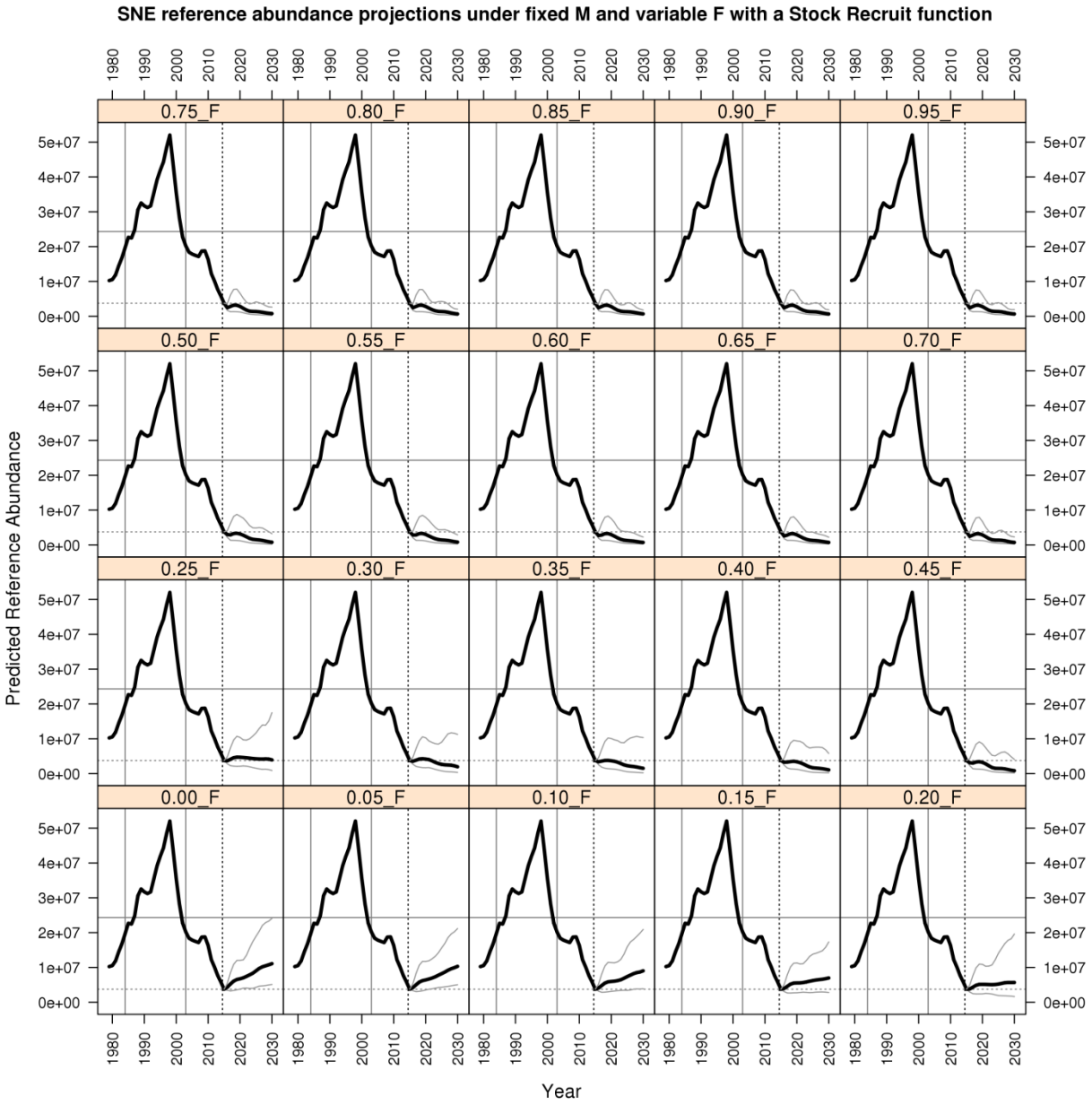


Figure 17: SNE stock projections assuming Beverton-Holt recruitment with an expanded time series from 1980 to 2040. Various levels of F are shown under fixed M=0.285. The units are reference abundance. The reference period and trend-based reference point are shown in solid gray lines.

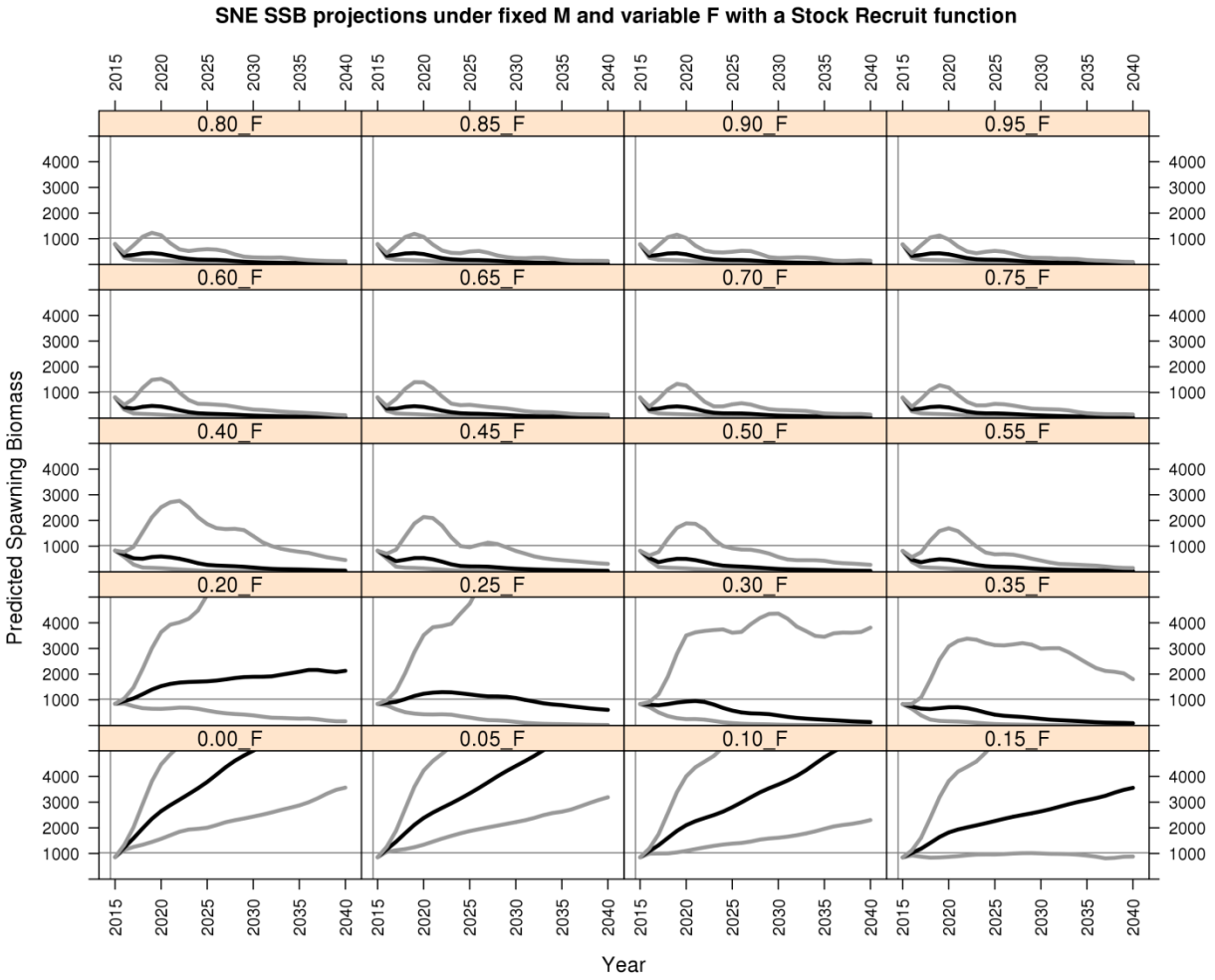


Figure 18: SNE stock projections assuming Beverton-Holt recruitment under various levels of F. M is fixed at 0.285. The units are SSB.

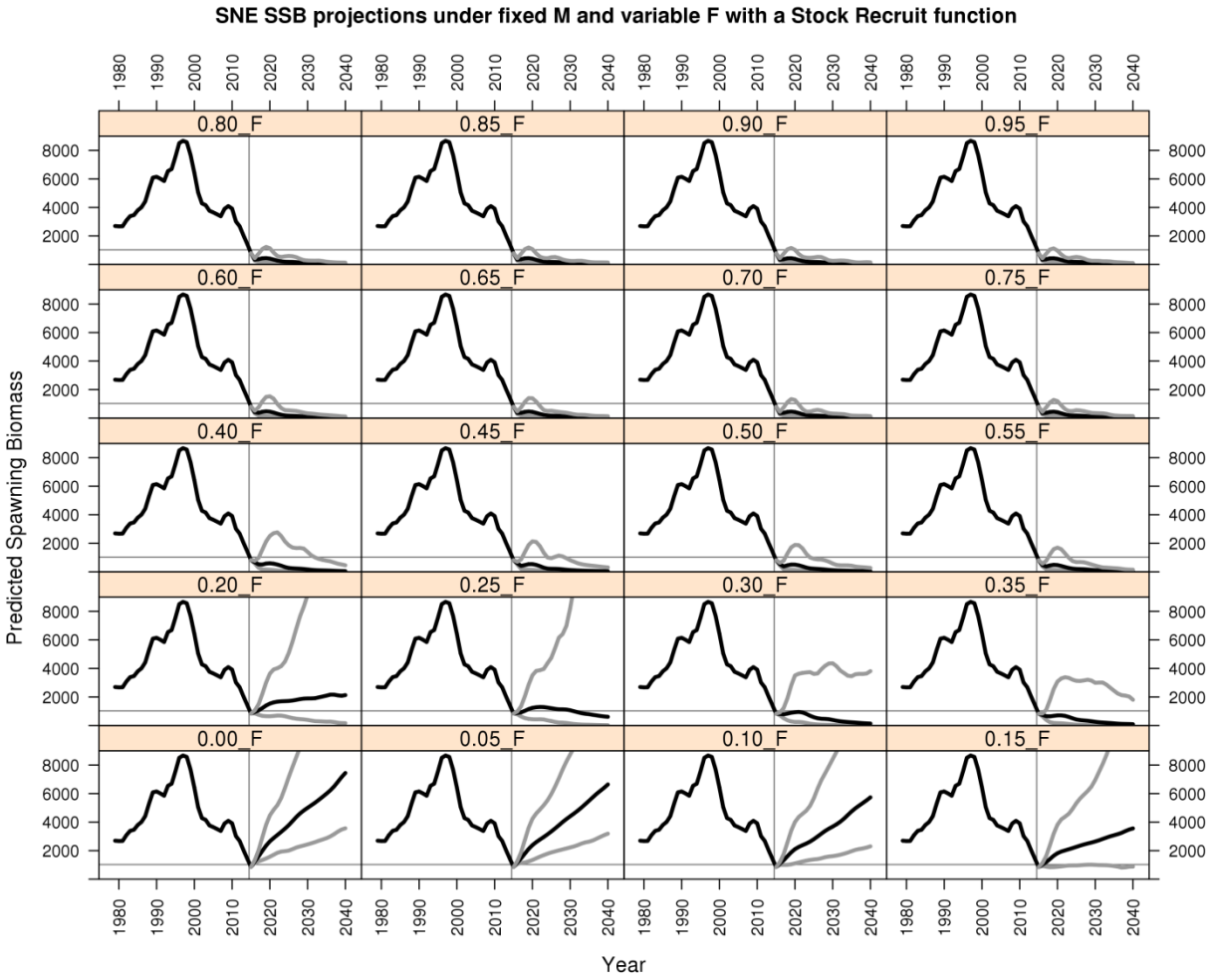


Figure 19: SNE stock projections assuming Beverton-Holt recruitment with an expanded time series from 1980 to 2040. Various levels of F are shown under fixed M=0.285. The units are SSB.

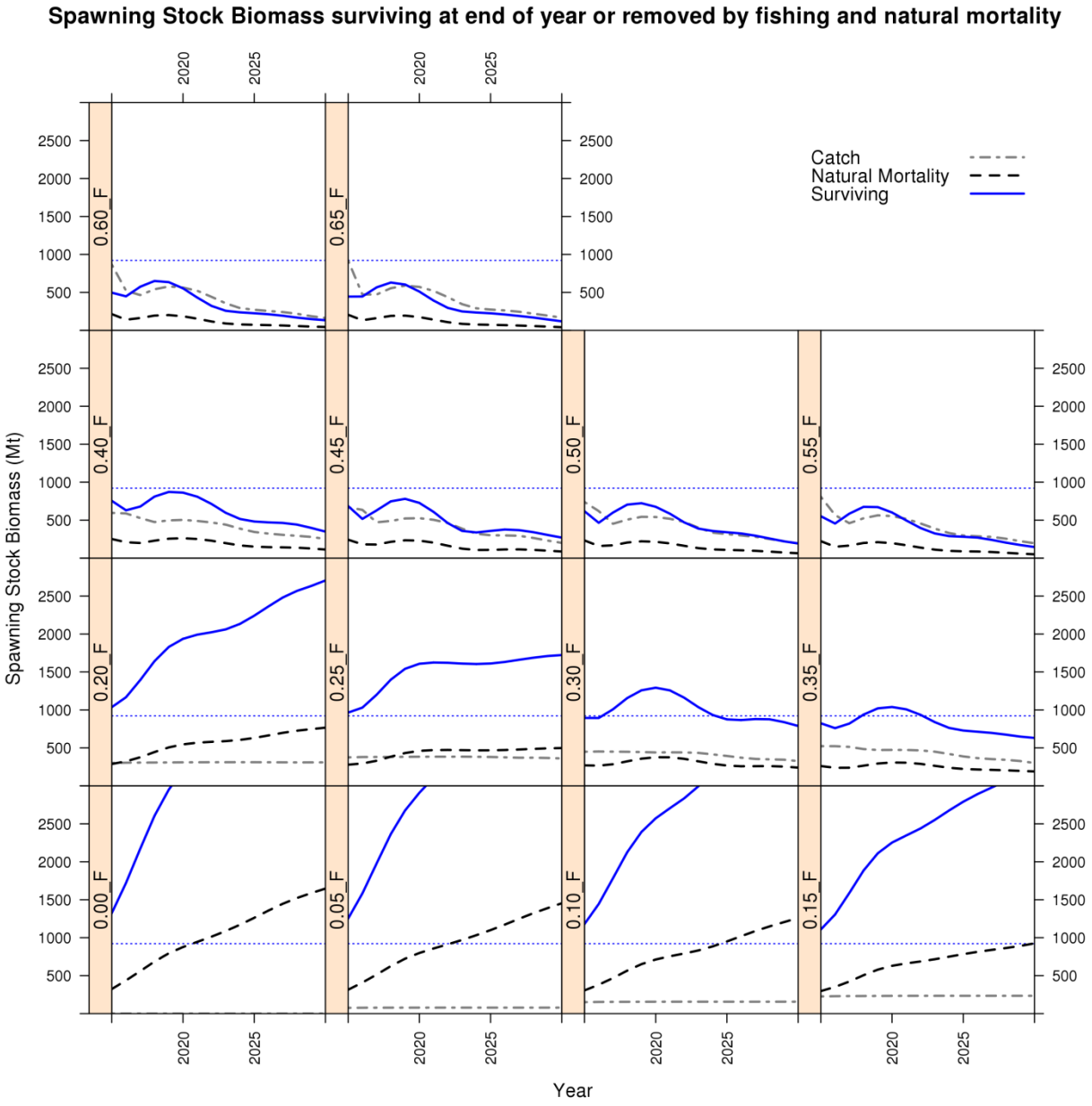


Figure 20. Mean spawning stock surviving to the end of year and removals by fishing and natural mortality, under different levels of fishing extraction. At F>0.20, more spawning stock is being removed by harvesting than natural mortality while natural mortality is the larger source of biomass removal for F<0.20. For F>0.5 more biomass is removed by the fishery in the early years of the projections than survive to the end of the year. The blue dotted line is current SSB.

Reference Table for All Projection Figures

Figure #	Recruitment	M	F	Units	Years	Stabilize Stock At
3	Constant	Variable	0	Ref N	2015-2040	M=0.3
4	Constant	Variable	0	Ref N	1980-2040	M=0.3
5	Constant	Variable	0	SSB	2015-2040	M=0.35
6	Constant	Variable	0	SSB	1980-2040	M=0.35
7	Constant	0.285	Variable	Ref N	2015-2040	90% reduction in F
8	Constant	0.285	Variable	Ref N	1980-2040	90% reduction in F
9	Constant	0.285	Variable	SSB	2015-2040	80% reduction in F
10	Constant	0.285	Variable	SSB	1980-2040	80% reduction in F
11	Constant	0.285	Variable	SSB	2015-2040	NA (spawning stock removals)
12	Beverton-Holt	Variable	0	Ref N	2015-2040	M=0.4
13	Beverton-Holt	Variable	0	Ref N	1980-2040	M=0.4
14	Beverton-Holt	Variable	0	SSB	2015-2040	M=0.4
15	Beverton-Holt	Variable	0	SSB	1980-2040	M=0.4
16	Beverton-Holt	0.285	Variable	Ref N	2015-2040	75% reduction in F
17	Beverton-Holt	0.285	Variable	Ref N	1980-2040	75% reduction in F
18	Beverton-Holt	0.285	Variable	SSB	2015-2040	75% reduction in F
19	Beverton-Holt	0.285	Variable	SSB	1980-2040	75% reduction in F
20	Beverton-Holt	0.285	Variable	SSB	2015-2040	NA (spawning stock removals)

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: American Lobster Technical Committee

DATE: January 19, 2016

SUBJECT: Report on TC Tasks from the Nov. 2015 Board Meeting

The American Lobster Technical Committee (TC) met via conference call on November 17, 2015, December 1, 2015, and January 19, 2016 and in person on December 8th to complete the tasks assigned by the American Lobster Management Board (Board) at their November 2nd meeting. The following report is a compellation of work completed by the TC. Each task is addressed individually and in the order in which it was assigned to the TC. A review of the Southern New England (SNE) projections can be found in the memo entitled "Projections for the SNE Lobster Stock" which is also included in the meeting materials for the February 2016 Lobster Board meeting.

1. ***Investigate Methods to Increase Egg Production & Examine the Biological Cost/Benefit of Existing Regulations***

The current minimum size (86 mm) coupled with the small size at maturity in SNE (98% of females are sexually mature at legal minimum size) ensure that a substantial portion of the total egg production of the stock occurs prior to lobsters recruiting to the fishery. Additional increases in minimum size would increase the egg production per recruit; however, this would not likely be an effective management measure in SNE because of the extremely high total mortality rate (natural mortality + fishing mortality) and continued declines in abundance the stock is experiencing. The primary issue effecting egg production in SNE is that the SSB is severely depleted. The TC recommends that the most effective way to enhance egg production in SNE is to lower the total mortality rate on the stock to preserve as much SSB as possible.

The TC is currently working on projections which look at the impacts of increasing the minimum gauge size on SSB. Due to the large size of the lobsters included in these projections, there is a significant amount of uncertainty in the model runs, especially in regards to the underlying growth assumptions and the effect of low stock size and shell disease on their reproductive success. There is little data available on large lobsters since we see so few of them. The TC is working to quantify this uncertainty and will provide the analysis to the Board when work is complete.

2. *Recalculate Reference Points*

The Southern New England (SNE) lobster stock has declined to record low abundance levels. There is concern that the stock may be experiencing a regime shift and that the current abundance reference point may not be appropriate. The Lobster Board requested that the Technical Committee explore an alternative abundance reference point by removing the peak abundance years of 1989 through 1999, abundance levels which may be unattainable in the current environment. The current abundance reference point for the SNE stock is the 25th percentile of reference abundance from 1984 through 2003, which is 24.3 million lobsters. The revised reference point, after removing the reference abundance values from 1989 through 1999, is 22.5 million lobsters. This is still well above the current status estimate of 10 million lobsters (mean reference abundance from 2011 through 2013). Further exploration revealed that the minimum reference abundance value during the 1984 through 2003 reference period was 19.7 million lobsters, which is almost twice the current estimate of abundance.

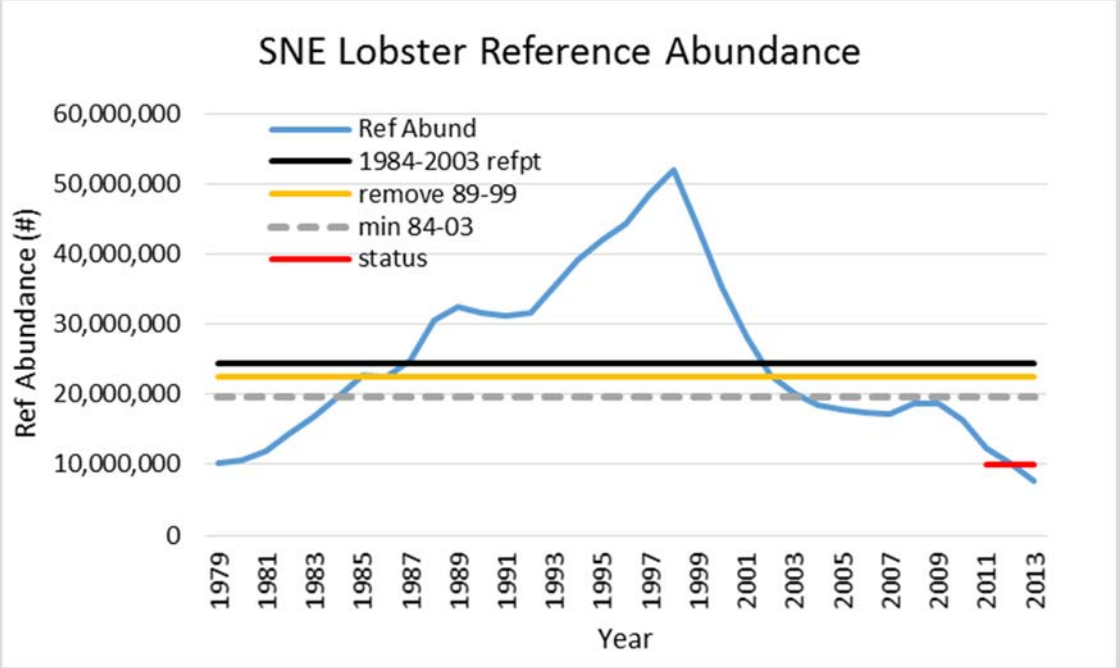


Figure 1: Recalculated reference abundance for the SNE lobster stock. Reference abundance is defined as the number of lobsters 78+ mm CL on January 1 plus the number that will molt and recruit into the 78+ mm CL group during the year.

3. *Examine the Relationship between the Inshore and Offshore Stocks*

There is a clear link between the inshore and offshore portions of the SNE lobster stock. Under "normal" environmental conditions the life history model for lobsters is as follows:

- Egg-bearing female lobsters migrate from offshore areas into shallow coastal areas in May/June to hatch their eggs.

- Larval lobsters develop through 4 stages over a period of 2 to 4 weeks in the mid to late summer. The well mixed warm coastal water promotes rapid development of larvae and set up perfect conditions for post-larvae to settle on prime nursery habitat. Prime nursery habitat consists of shallow water environments (<10 m) with complex substrate (cobble and eel grass where burrows can be made). The warmer, highly productive, complex shallow water environments allow early benthic phase (5 to 40 mm CL) lobsters to grow quickly and minimize exposure to predators during this most vulnerable life history phase.
- During their first several years of life lobsters are largely shelter restricted and have fairly small home ranges.
- As lobsters get larger and start to reach sexual maturity the extent of their home range increases and they begin to make seasonal migrations in the late fall to deeper waters.
- Adult lobsters make directed seasonal migrations offshore in the fall and return inshore in the spring. These migrations allow the lobster to maintain optimal temperatures for growth and egg development throughout the year. It is likely that lobsters only migrate as far as they need to find optimal temperatures (12 – 18° C).

Adult Connectivity

Seasonal migrations of adult lobsters have been documented from the coastal inshore areas of Buzzards Bay (MADMF unpublished data, Pugh et al. 2011), Rhode Island Sound (Fogarty et al., 1980), Eastern Long Island Sound (Lund 1973, Dominion Nuclear Connecticut 2015, CTDEP 2008), and inshore coastal New Jersey/ New York Bight (Andrews 1980) to the mid-shelf and the canyons along the continental shelf. Conversely, movements of adult lobsters from the offshore canyons to the inshore portions of SNE have also been documented (Cooper and Uzmann 1971, Andrews 1980). These inshore/offshore movements of adult lobsters clearly demonstrate connectivity between the inshore and offshore portions of the SNE stock.

Larval Connectivity

Lobster larvae are passive drifters while in their first 3 stages of development and as a result their delivery to settlement habitat is primarily dependent on large scale hydrographic processes. The southern New England shelf is dominated by a strong coastal current that flows from the north east to the south west. This current is the primary factor determining lobster larval delivery along the SNE shelf and dictates that the larval source of a given area originates from eggs hatched upstream. Water transport suggests that small-scale self-seeding is improbable in offshore habitats. As a result recruitment in offshore habitat is dependent upon emigration of juvenile lobsters from inshore habitats or from settlement from upstream larval sources. The coastal embayments of SNE, namely Buzzards Bay, Narragansett Bay, and Long Island Sound, have little influence from the coastal current and are primarily influenced by localized tidal and wind driven currents. These areas tend to be retention areas for larvae and larval delivery is primarily dependent on eggs hatched within these systems.

Larval delivery is highly sensitive to the location of egg hatch. Slight changes in the location of where egg hatch occurs have tremendous influence on lobster settlement dynamics in SNE. Historically egg-bearing females make seasonal migrations to coastal embayments to hatch their eggs in the late spring. Since the late 1990's there has been a shift in the distribution of egg-bearing females in the spring at the time of hatch. Very few egg-bearing females are now found within the embayments in the spring. This is due to both the severe depletion of lobster SSB, and warming inshore waters; female lobsters are no longer migrating as far inshore and are now hatching their eggs in deeper waters along the open coast.

Viability of Offshore Habitat for Settlement

The warmer water, good light penetration, higher primary productivity and better food availability make shallow (< 10 m) coastal waters with complex substrate the most productive lobster nursery habitat.

An examination of water temperature profiles of shelf waters indicate that thermal habitat in offshore waters is appropriate (>12° C) for settlement by the fall season. However, it is questionable if the timing of the seasonal warming of shelf waters is out of synch with the timing of post-larval delivery. Egg hatching has been occurring earlier than normal, and the rate of larval development has been accelerated by warming waters, which suggest that larval settlement is more likely to occur by mid-summer, before bottom temperatures reach appropriate levels offshore.

Nonetheless, some pre-recruit sized lobsters are observed in traps and trawl survey nets in deep offshore areas indicating some degree of settlement. The relative influence on recruitment from local offshore settlement versus migration from inshore areas is hard to quantify. There are no larval surveys, settlement surveys, or ventless traps surveys occurring offshore or at depths >200'. There is also no existing information on survival or growth rates of EBP lobsters in deep, offshore, low-relief habitats. These factors make the contribution from offshore areas to the total recruitment in SNE highly uncertain.

Regardless of the viability of lobster settlement in offshore areas, it should be noted that a large portion of the highest quality nursery habitat in shallow coastal waters is no longer productive in many years because of environmentally-mediated decreases in larval supply and reduced larval survivorship. This has led to recruitment failure in the SNE stock and has greatly diminished the total productivity of the SNE stock.

Genetic Evidence for Connectivity

The most recent genetics study did not collect samples from offshore Southern New England, so it does not provide updated data to address this question (Benestan et al. 2015). Existing work by Crivello et al. (2005b) indicates that egg-bearing females sampled from several Long Island Sound locations were genetically similar to those sampled from the Hudson Canyon region. Similarly, larvae sampled from within Long Island Sound originated from Hudson Canyon females (Crivello et al. 2005a). Thus female lobsters are moving between the inshore and offshore environments, and larvae produced by both inshore and offshore females can be found within Long Island Sound.

Western Long Island Sound lobsters appear to be the exception, and were determined to differ genetically from females sampled in central and eastern LIS and Hudson Canyon (Crivello et al. 2005b).

4. Review Statement of Problem in Addendum XVII

Section 2.1.3 of Addendum XVII outlined management challenges in the lobster fishery resulting from limitations in the quality and quantity of biological and fisheries data. The TC was asked to review this information and provide an update on current data deficits in the lobster fishery. The update is split into three parts: 1) Landings and Effort Data; 2) Biological Data; and 3) Management Limitations Related to Data.

A. Landings and Effort Data

In general, the catch disposition of the state waters portion of the SNE lobster fishery is fairly well characterized. Fishery-dependent monitoring programs currently in place are sufficient to detect and assess the effectiveness of input controls, such as changes in the minimum and maximum legal size and v-notch programs in the state waters portion of SNE.

In contrast, the catch disposition for a substantial portion of the SNE lobster fishery which occurs in federal waters is poorly characterized. NOAA fisheries does not require vessels which only have a federal lobster permit to submit Vessel Trip Reports (VTR's) or otherwise report their landings. Vessels with federal lobster permits who hail out of Massachusetts, Rhode Island, Connecticut, or New York are required to submit harvest reports to their respective state programs; however, the states of New Jersey, Delaware, Virginia, and Maryland do not have such requirements. As a result it is difficult to detect and assess the effectiveness of commonly used input controls in the federal waters portion of SNE.

Another issue with harvest reporting is the level of compliance amongst the states. The compliance rate with trip level reporting in New York is poor, and could be related to the fact that New York has not fully implemented a compliance program for non-reporting. New Jersey does not administer a harvester reporting system; instead they require fishermen to submit landings and effort information data through the federal VTR system. A lack of enforcement in New Jersey to fill out the federal VTR is an issue with harvester reporting. In addition, effort data at the trap haul level is not collected consistently by all states. Total traps is not an adequate measure of fishery effort.

B. Biological Data

The biological data collection programs currently administered in SNE are sufficient to characterize the disposition of the catch in the state waters portion of SNE. The states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Maryland all administer commercial sea-sampling programs. Furthermore, Massachusetts, Rhode Island, Connecticut, New Jersey, and NOAA Fisheries all administer bottom trawl surveys which have sufficient resolution to provide estimates of relative abundance for lobster in the SNE stock. In state waters, these data are complimented by the Regional

Ventless Lobster Trap Surveys in Massachusetts and Rhode Island. These programs make it possible to detect and monitor the effects of input control based management, such as changes in the minimum and maximum legal size, v-notching programs, and closed seasons.

The resolution of these programs is lacking in federal waters where a substantial portion (> 50%) of the SNE fishery currently occurs. NOAA Fisheries has an extensive fishery dependent observer program; however, historically, lobster has not been a sampling priority for this program. As such there are very limited commercial sea-sampling data for lobster in federal waters.

C. Management Limitations Related to Data

As stated in Addendum XVII, the current system of landings reporting used for the SNE lobster fishery is not adequate for monitoring a quota based management program. To allow for adequate accounting of a quota it would be necessary to implement the following changes to the landings reporting system:

- Implement 100% trip level reporting for ALL state and federally licensed vessels.
- Substantially shorten the time lag between harvest and harvester reporting to allow for timely accounting of a quota. Massachusetts, Connecticut, and New York require fishermen to submit their logs monthly, Rhode Island requires them to submit reports quarterly. The minimum time lag between harvest and accounting for the catch is roughly 40 days. However, the average time lag between harvest and accounting for the catch in most cases is substantially greater than that because of poor compliance with reporting deadlines, minimal deterrents for not reporting in a timely fashion, and seasonal staff limitations.
- Collect spatial information (statistical area and LCMA) for the landings data reported to SAFIS.
- Assign a unique id to all licensed vessels that would be used in both the harvester and dealer reporting systems to allow for 100% reconciliation of the two data types.
- Address dockside sales and capture the reporting of dockside sales in a timely manner. Currently, SAFIS does not account for dockside cash sales to the public or for personal consumption.

5. Characterize the 2014 Existing Effort by LCMA

A. Landings

Landings have continued to decline in most of the inshore/nearshore regions, reaching all-time lows in 2013-2014 in LMAs 2, 4, and 6 (Figure 2). Only LMA 5 had recent landings close to the time series average, although these are down from a period of higher landings that occurred from around 2004-2009 (Figure 2).

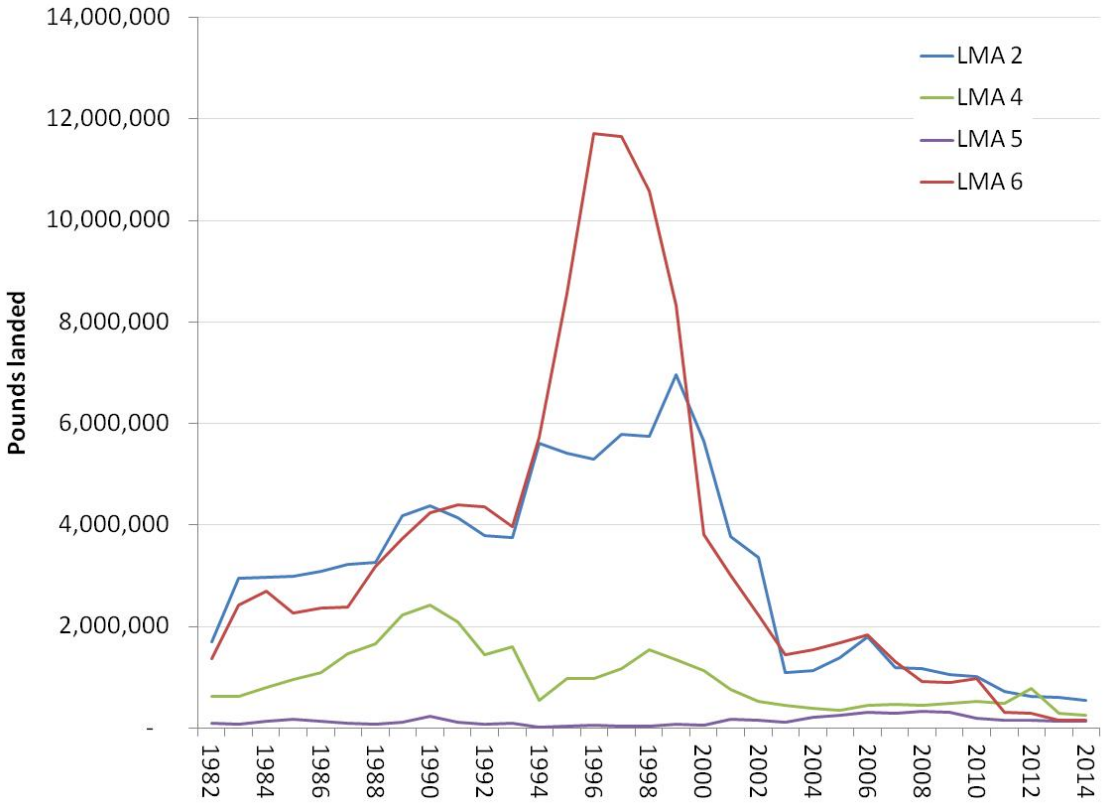


Figure 2. Pounds of lobsters landed in inshore/nearshore LMAs 2, 4, 5, and 6 from 1982 – 2014.

In the offshore regions, landings trends appear to be more stable. However landings in the last 5 years (2010 – 2014) have been generally low relative to the time series, remaining at or below the 25th percentile in LMA 3 and LMA 3/5, and having increased slightly to vary around the 25th percentile in LMA 2/3 (Figure 3).

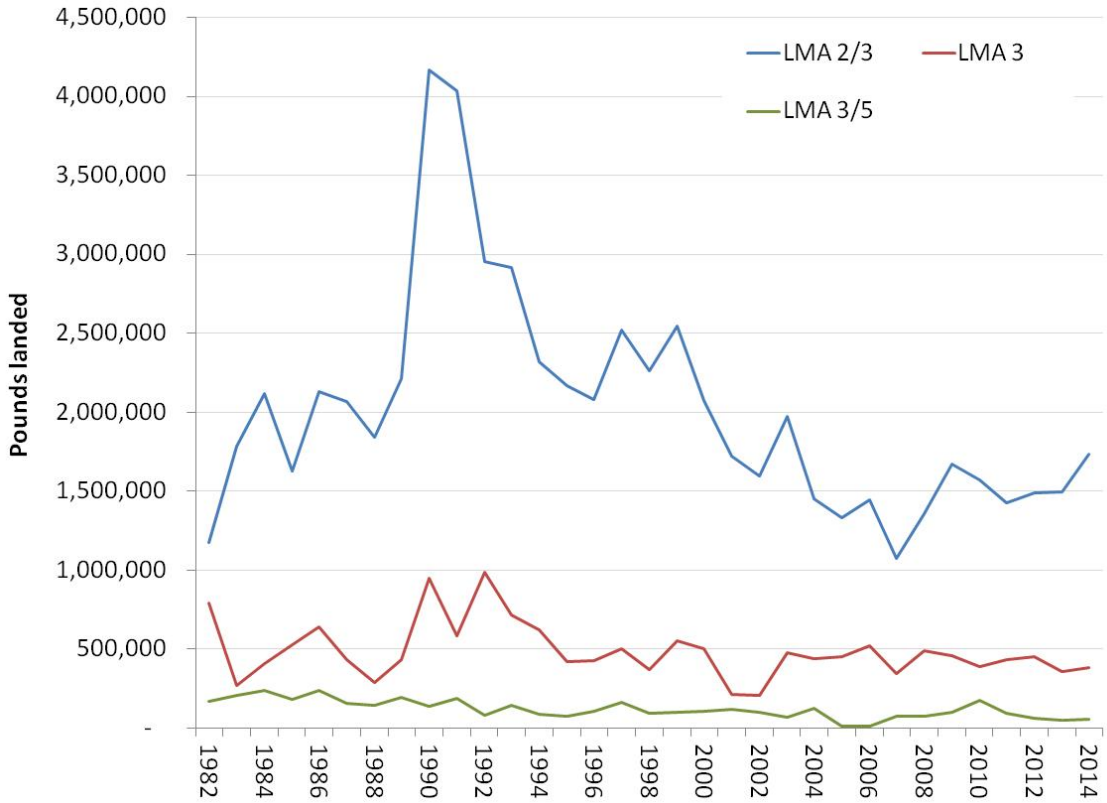


Figure 3. Pounds of lobsters landed in offshore LMAs 2/3 (NMFS Area 537), LMA 3/5 (NMFS Areas 622, 626, 632, 635), and LMA 5 from 1982 – 2014.

The number of active permits (actively reporting landings) in MA, RI, and CT has declined dramatically over time, and in the last year were well below their respective time series averages (Figure 4). Active permits have remained relatively steady in NJ in the last several years with available data, but have been below the average (Figure 4). For NY, only total number of permits issued is available, and this value has also declined dramatically over time (Figure 4).

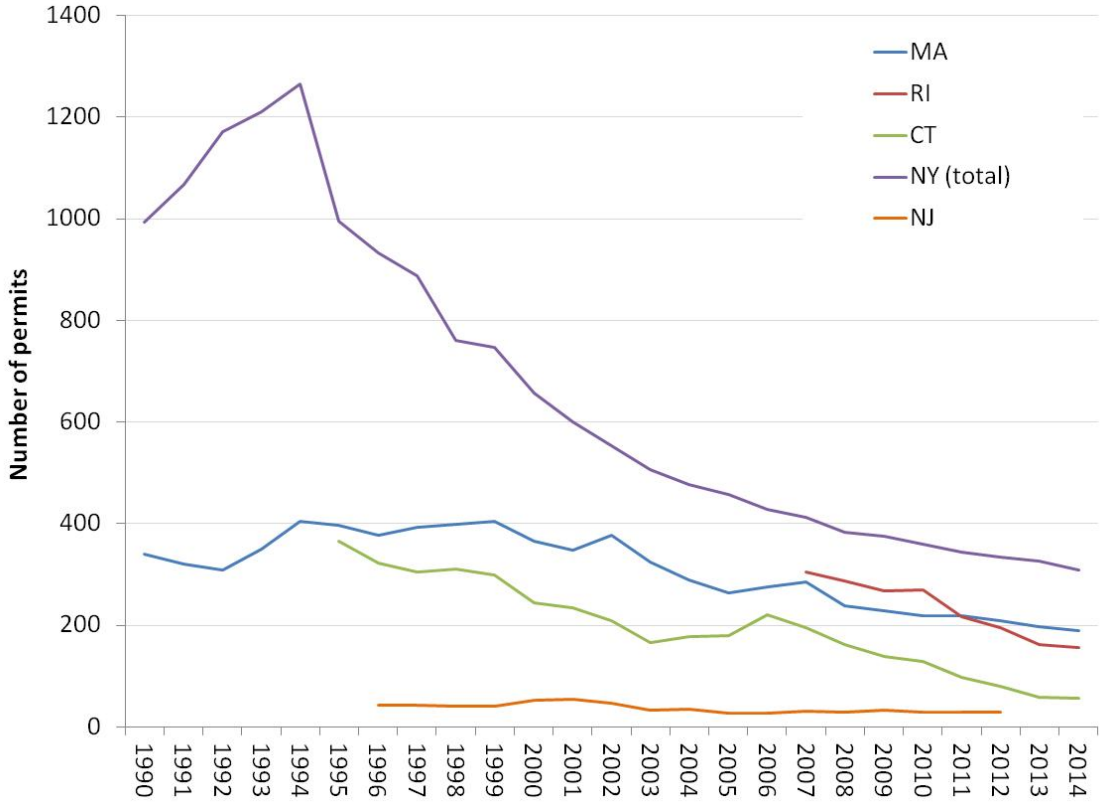


Figure 4. The number of active permits (MA, RI, CT, NJ) or total permits (NY) in the SNE stock.

B. Traps (total traps)

Annual traps fished has declined since peaking in the late 1990s, and were at all-time lows in CT and NY for the last two years (2013-2014) (Figure 5). The total number of traps fished appear to have stabilized in MA since the mid 2000's, while in RI traps fished declined from 2007 through 2011, but have since stabilized (Figure 5). Effort remains higher in MA and RI than in CT and NY, likely since MA and RI have relatively large offshore components to their fisheries unlike CT and NY. Effort in NJ increased from the early to mid-2000's and has only slightly declined since.

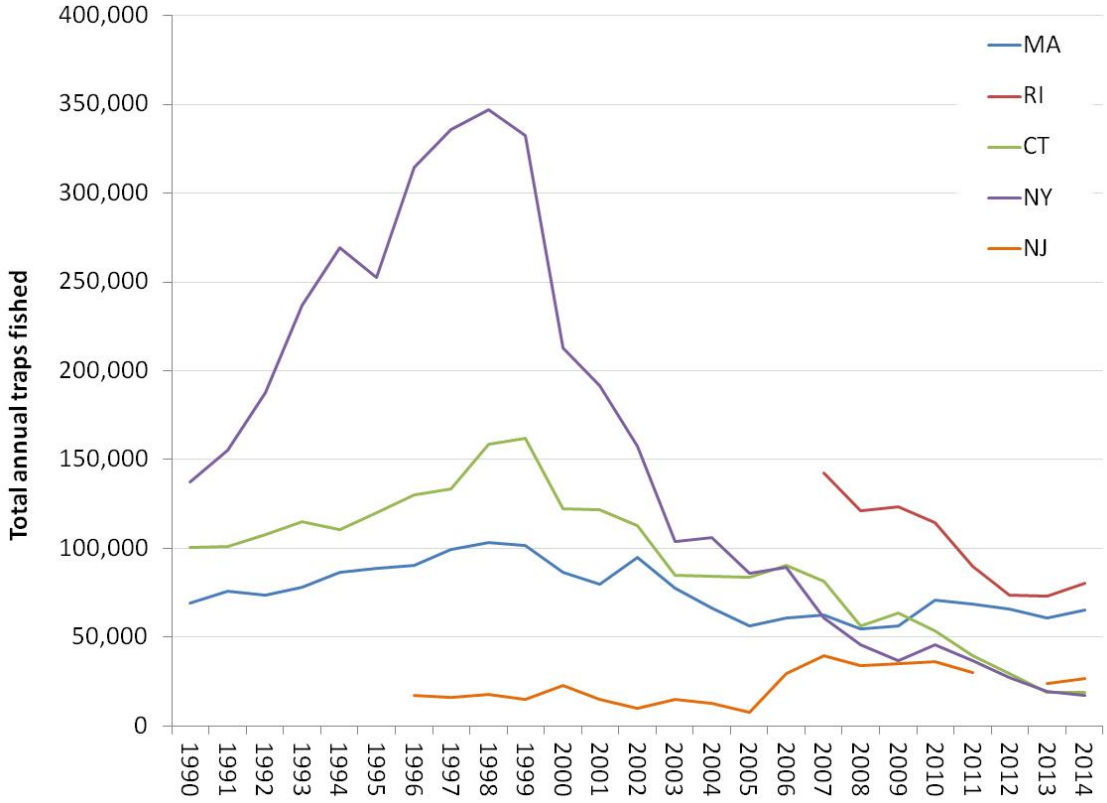


Figure 5. Total annual traps reported fished by state.

6. Update Trends from Fishery Independent Surveys

The TC updated the abundance indicators presented in the 2015 Benchmark Stock Assessment to include data from 2014 and 2015, where available. Below is a description of the changes to the indicators for all lobster stocks. Associated tables can be found on pages 12-22.

A. GOM Indicators

The additional three years of data (where available) for the GOM abundance indicators follow the same pattern as presented in the 2015 assessment. The 2011 – 2015 mean spawning stock abundance, full recruit abundance, and recruit abundance all remain positive, above the 75% percentile of the reference time period for all surveys. The 2011 – 2015 mean survey lobster encounter rate improved, with five of the six surveys now above the 75% percentile. However, the YOY indices now show a downwards trend in all areas, particularly in the southern portion of GOM (Area 514 and western Area 513) where annual values from 2012 onwards are below the 25th percentile. In 2015, four of the five indices were below the 25th percentile (note: 2015 ME data are preliminary). The 2011 – 2015 mean values for the

more north-eastern areas remain positive, eastern Area 513 is neutral, and the two southern regions are negative.

B. GB Indicators

Three of the four updated abundance indicators (2011 – 2015 mean) for the GB stock were positive, while the recruits indicator was negative for both spring and fall surveys. These results are the same as those presented in the 2015 assessment.

C. GOM/GB Combined Indicators

The 2011 – 2015 mean abundance indicators for spawning stock abundance, full recruit abundance, and recruit abundance all remain positive for the combined GOM/GB stock (note fall 2015 data from ME and NEFSC surveys were not yet available). The 2011 – 2015 mean survey lobster encounter rate was positive for five of the six surveys, with only the MA spring survey qualified as neutral. However, the YOY indices now show a downward trend in all areas, particularly in the southern portion of GOM (Area 514 and western Area 513) where annual values from 2012 onwards are below the 25th percentile. In 2015, four of the five indices were below the 25th percentile (note: 2015 ME data are preliminary). The 2011 – 2015 mean values for the more north-eastern areas remain positive, eastern Area 513 is neutral, and the two southern regions are negative.

D. SNE Indicators

The 2011 – 2015 mean abundance indicators remain at or below the time series median values. Spawning stock abundance was negative in five of the eight surveys (5 of 6 inshore surveys) with the remaining surveys classified as neutral. Recruit abundance was negative in six of the eight surveys. The 2011 – 2015 mean full recruit abundance was negative in half of the surveys, neutral in three, and positive in one survey (spring NEFSC survey, due to an anomalously high value observed in 2014). The 2011 – 2015 mean survey lobster encounter rate was negative in six of the eight surveys, and below the median value in all surveys. Three of the four YOY indices were negative (note that the CT/NY summer larval survey ceased operating after 2012). In most instances, particularly inshore, the updated indicator data were either similar to or have declined since the 2015 assessment.

Gulf of Maine Abundance Indicators

SPAWNING STOCK ABUNDANCE Mean weight (g) per tow of mature females						
Survey	NESFC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	127.57	303.66			342.80	251.36
1982	20.19	78.56			404.26	90.43
1983	118.43	176.40			537.29	32.40
1984	159.77	347.71			336.33	78.90
1985	311.91	2189.79			563.45	32.32
1986	155.64	375.38			135.10	50.24
1987	29.47	356.77			146.15	82.80
1988	106.70	173.52			94.55	42.74
1989	205.15	169.48			123.19	114.57
1990	116.49	368.43			538.08	100.27
1991	131.02	301.70			142.51	101.77
1992	115.27	304.54			262.54	110.74
1993	167.68	337.77			53.48	117.58
1994	233.02	521.60			376.55	132.17
1995	284.29	252.38			222.57	91.04
1996	422.24	601.51			262.89	72.61
1997	354.21	757.88			87.30	49.64
1998	216.98	832.32			113.80	81.44
1999	931.76	572.69			178.35	194.17
2000	318.65	875.14	3425.58		287.35	133.73
2001	312.96	1058.84	1858.63	462.60	105.26	151.41
2002	1247.40	1450.71	3707.47	967.67	163.87	105.74
2003	675.87	1688.03	3988.26	847.68	101.81	45.15
2004	411.40	1988.81	3497.55	682.69	86.24	189.23
2005	288.34	1163.74	4062.27	1505.13	167.88	358.32
2006	457.21	1298.00	2909.52	885.80	118.39	290.44
2007	291.48	1094.86	3010.80	735.09	138.01	91.86
2008	497.90	1357.83	3423.42	712.51	354.40	222.36
2009	1111.88	1332.23	5525.54	1138.18	396.60	135.71
2010	1796.57	1720.01	3879.74	1322.90	1176.34	157.93
2011	1334.21	1387.80	4446.97	868.71	782.58	151.85
2012	1964.23	2372.91	2964.59	1190.50	524.55	68.82
2013	2010.87	1672.97	4144.70	671.93	761.16	187.97
2014	2997.61	2037.40	3985.00	1326.88	569.74	300.09
2015	NA	2313.49	NA	881.35	1443.63	269.89
2011 - 2015 ave.	**2076.73**	**1956.91**	**3885.32**	**987.87**	**816.33**	**195.72**
25th	121.58	302.41	3033.84	655.14	116.15	55.84
median	211.06	371.91	3566.52	847.68	171.11	90.73
75th	317.23	813.71	3777.66	907.67	324.09	113.62

FULL RECRUIT ABUNDANCE (SURVEY) Abundance of lobsters > 82 mm CL (sexes combined)						
Survey	NEFSC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	0.24	0.36			1.91	1.83
1982	0.05	0.21			2.80	0.57
1983	0.21	0.20			3.08	0.51
1984	0.29	0.34			4.09	0.49
1985	0.55	1.81			3.94	0.50
1986	0.45	0.55			1.71	0.54
1987	0.15	0.44			0.53	0.56
1988	0.14	0.27			1.51	0.56
1989	0.38	0.28			2.27	0.79
1990	0.25	0.44			4.92	0.97
1991	0.35	0.46			3.18	0.69
1992	0.22	0.36			2.35	0.87
1993	0.40	0.47			0.63	1.00
1994	0.50	0.70			3.15	0.76
1995	0.98	0.47			2.50	0.58
1996	0.89	0.99			2.50	0.33
1997	0.70	1.02			1.69	0.62
1998	0.45	0.96			0.88	0.49
1999	1.55	0.51			1.93	0.72
2000	0.61	1.35	14.22		2.20	0.97
2001	0.62	1.50	9.83	2.25	0.72	0.53
2002	1.89	1.81	12.57	3.40	1.02	0.43
2003	1.14	2.38	16.65	3.08	0.42	0.22
2004	1.18	2.55	16.18	3.14	0.33	0.78
2005	0.62	1.64	21.09	6.53	0.56	0.95
2006	0.83	1.67	14.85	5.33	1.03	0.68
2007	0.51	1.50	14.13	4.19	0.48	0.32
2008	0.90	1.94	20.72	3.06	1.55	0.67
2009	1.82	1.66	30.48	6.32	1.70	0.54
2010	3.06	2.61	21.42	6.29	2.30	0.40
2011	3.15	2.14	23.83	5.14	3.80	0.55
2012	3.35	3.38	16.51	5.94	3.18	0.31
2013	3.29	2.43	21.45	4.50	3.74	0.87
2014	5.77	2.74	26.38	9.33	2.91	0.77
2015	NA	3.98	NA	6.48	5.69	1.26
2011 - 2015 ave.	**3.89**	**2.93**	**22.04**	**6.28**	**3.86**	**0.75**
25th	0.26	0.38	11.88	2.67	1.14	0.50
median	0.45	0.49	13.39	3.08	2.24	0.56
75th	0.68	1.01	14.83	3.24	3.01	0.75

Gulf of Maine Abundance Indicators Con't

RECRUIT ABUNDANCE (SURVEY)						
Abundance of lobsters 71 - 80 mm CL (sexes combined)						
Survey	NEFSC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	0.03	0.06			4.84	6.38
1982	0.17	0.13			3.85	2.74
1983	0.42	0.14			9.76	1.76
1984	0.13	0.10			6.13	2.15
1985	0.65	0.10			9.60	4.48
1986	0.53	0.11			3.80	3.01
1987	0.28	0.23			1.16	2.47
1988	0.51	0.25			4.12	2.52
1989	0.62	0.00			7.51	4.48
1990	0.90	0.21			15.40	6.11
1991	0.74	0.28			7.55	2.73
1992	0.57	0.25			8.95	4.31
1993	0.49	0.11			3.19	5.12
1994	1.15	0.09			13.80	7.59
1995	0.77	0.77			12.10	4.54
1996	2.05	0.33			12.10	3.09
1997	0.86	0.95			6.41	4.57
1998	1.00	0.76			7.47	4.50
1999	1.34	0.60			8.73	4.26
2000	1.26	1.73	23.82		8.86	4.24
2001	0.66	0.58	17.53	9.16	1.58	4.30
2002	0.75	0.74	22.12	22.63	5.00	3.43
2003	0.20	0.60	23.78	13.71	0.66	1.96
2004	1.06	0.39	15.96	9.69	1.30	2.46
2005	0.39	0.30	30.88	23.85	2.11	4.35
2006	0.58	1.14	23.27	23.15	5.30	6.09
2007	0.39	0.71	21.62	20.24	1.61	0.75
2008	1.05	0.49	40.45	22.90	6.12	2.54
2009	1.17	0.97	41.84	31.77	8.88	3.18
2010	1.51	0.71	46.24	22.40	9.39	2.22
2011	2.70	1.96	58.53	47.39	15.00	5.24
2012	1.61	2.32	47.28	44.81	11.30	3.03
2013	3.21	1.97	48.24	39.71	12.20	4.83
2014	4.19	1.88	53.06	78.58	7.06	3.35
2015	NA	2.82	NA	45.20	17.91	7.05
2011 - 2015 ave.	**2.93**	**2.19**	**51.78**	**51.14**	**12.69**	**4.70**
25th	0.50	0.12	20.97	11.43	3.92	2.73
median	0.66	0.25	22.95	13.71	7.49	4.25
75th	0.89	0.60	23.79	18.17	9.44	4.50

YOUNG-OF-YEAR INDICES					
	YOY	YOY	YOY	YOY	YOY
Survey	ME 511	ME 512	ME 513 East	ME 513 West	MA 514
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989			1.64		
1990			0.77		
1991			1.54		
1992			1.30		
1993			0.45		
1994			1.61		
1995		0.02	0.66		0.56
1996		0.05	0.47		0.00
1997		0.05	0.46		0.17
1998		0.00	0.14		0.02
1999		0.04	0.65		0.36
2000		0.10	0.13	0.17	0.19
2001		0.43	2.08	1.17	0.38
2002	0.13	0.29	1.38	0.85	0.89
2003	0.22	0.27	1.75	1.22	0.68
2004	0.18	0.36	1.75	0.67	1.20
2005	1.59	1.36	1.77	0.82	0.82
2006	0.58	1.13	0.84	0.82	0.32
2007	0.84	1.34	2.01	1.27	1.22
2008	0.42	0.83	1.08	0.97	0.24
2009	0.69	0.48	1.25	0.45	0.13
2010	0.28	0.72	0.80	0.47	0.45
2011	0.41	1.10	2.33	0.67	0.63
2012	0.53	0.73	1.06	0.22	0.21
2013	0.10	0.20	0.48	0.12	0.09
2014	0.16	0.43	0.83	0.33	0.09
2015*	0.11	0.22	0.43	0.05	0.00
2011 - 2015 ave.	**0.26**	**0.54**	**1.03**	**0.28**	**0.20**
25th	0.15	0.04	0.47	0.68	0.17
median	0.17	0.05	0.77	1.01	0.36
75th	0.19	0.27	1.57	1.18	0.56

* 2015 Maine data are preliminary

Gulf of Maine Abundance Indicators Con't

SURVEY LOBSTER ENCOUNTER RATE Proportion of postive tows						
Survey	NEFSC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981					0.73	0.86
1982	0.18	0.36			0.70	0.50
1983	0.33	0.26			0.76	0.76
1984	0.36	0.28			0.76	0.76
1985	0.49	0.38			0.67	0.71
1986	0.47	0.33			0.83	0.68
1987	0.24	0.43			0.54	0.85
1988	0.30	0.31			0.58	0.76
1989	0.36	0.19			0.95	0.78
1990	0.32	0.42			0.95	0.86
1991	0.32	0.42			0.94	0.87
1992	0.25	0.40			0.77	0.93
1993	0.39	0.41			0.82	0.97
1994	0.40	0.45			0.93	1.00
1995	0.36	0.41			0.93	0.93
1996	0.54	0.54			0.95	0.91
1997	0.35	0.64			0.86	0.93
1998	0.40	0.52			0.69	0.76
1999	0.43	0.51			0.91	0.73
2000	0.42	0.61	0.94		0.98	0.93
2001	0.40	0.57	0.86	0.88	0.72	0.93
2002	0.53	0.75	0.95	0.94	0.73	0.91
2003	0.44	0.69	0.97	0.98	0.55	0.82
2004	0.31	0.87	0.94	0.93	0.56	0.84
2005	0.36	0.77	0.97	0.98	0.67	0.95
2006	0.60	0.72	0.97	0.97	0.88	0.91
2007	0.43	0.72	1.00	0.97	0.54	0.51
2008	0.49	0.84	1.00	1.00	0.75	0.83
2009	0.63	0.82	0.98	0.99	0.87	0.89
2010	0.75	0.85	1.00	0.99	0.98	0.87
2011	0.74	0.83	0.98	1.00	0.85	0.89
2012	0.78	0.86	0.99	0.97	0.95	0.91
2013	0.73	0.87	1.00	1.00	0.95	0.96
2014	0.71	0.90	1.00	1.00	0.96	0.79
2015	NA	0.93	NA	1.00	0.95	0.98
2011 - 2015 ave.	**0.74**	**0.88**	**0.99**	**0.99**	**0.93**	**0.90**
25th	0.32	0.37	0.92	0.91	0.70	0.76
median	0.37	0.42	0.95	0.94	0.79	0.85
75th	0.42	0.53	0.96	0.96	0.93	0.93

Georges Bank Abundance Indicators

SPAWNING STOCK ABUNDANCE		
Mean weight (g) per tow of mature females		
Survey	NESFC	
	fall	spring
1981	491.28	35.84
1982	438.48	69.86
1983	419.35	71.77
1984	221.61	19.94
1985	345.21	22.28
1986	260.02	191.52
1987	345.02	70.47
1988	451.51	195.65
1989	624.96	89.30
1990	480.53	59.08
1991	542.93	96.84
1992	489.66	90.59
1993	397.36	50.43
1994	500.49	15.84
1995	634.74	21.41
1996	700.78	315.81
1997	446.10	28.19
1998	678.70	31.56
1999	927.74	238.22
2000	610.24	60.00
2001	1162.15	151.11
2002	1463.52	190.11
2003	728.49	540.30
2004	1047.89	191.92
2005	925.37	325.08
2006	1534.94	280.99
2007	1260.32	490.01
2008	2113.99	1271.28
2009	2595.35	925.63
2010	1514.98	723.68
2011	3182.30	676.37
2012	1849.56	954.20
2013	1676.45	929.70
2014	2117.89	1158.19
2015	NA	988.19
2011 - 2015 ave.	2206.55	941.33
25th	424.14	36.28
median	495.08	71.12
75th	667.71	180.36

FULL RECRUIT ABUNDANCE (SURVEY)		
Abundance of lobsters ≥ 90 mm CL (sexes combined)		
Survey	NESFC	
	fall	spring
1981	0.62	0.09
1982	0.61	0.20
1983	0.57	0.17
1984	0.49	0.05
1985	0.50	0.12
1986	0.59	0.28
1987	0.38	0.11
1988	0.68	0.40
1989	0.86	0.22
1990	0.58	0.08
1991	0.75	0.16
1992	0.58	0.27
1993	0.53	0.21
1994	0.64	0.06
1995	0.57	0.07
1996	0.70	0.40
1997	0.77	0.06
1998	0.62	0.06
1999	0.97	0.45
2000	0.75	0.19
2001	1.21	0.32
2002	1.55	0.40
2003	0.68	0.65
2004	1.16	0.24
2005	0.92	0.39
2006	1.16	0.40
2007	1.21	0.53
2008	1.91	1.12
2009	1.97	0.84
2010	1.15	0.91
2011	2.67	0.77
2012	1.57	1.12
2013	1.68	0.72
2014	1.73	1.34
2015	NA	1.00
2011 - 2015 ave.	1.91	0.99
25th	0.57	0.09
median	0.63	0.20
75th	0.75	0.31

RECRUIT ABUNDANCE (SURVEY)		
Abundance of lobsters 71 - 80 mm CL (sexes combined)		
Survey	NESFC	
	fall	spring
1981	0.20	0.03
1982	0.22	0.13
1983	0.15	0.06
1984	0.24	0.08
1985	0.08	0.11
1986	0.29	0.17
1987	0.23	0.09
1988	0.17	0.49
1989	0.05	0.13
1990	0.14	0.14
1991	0.14	0.07
1992	0.29	0.06
1993	0.16	0.31
1994	0.08	0.04
1995	0.13	0.01
1996	0.17	0.03
1997	0.26	0.00
1998	0.16	0.01
1999	0.09	0.12
2000	0.22	0.17
2001	0.29	0.31
2002	0.24	0.03
2003	0.26	0.11
2004	0.08	0.07
2005	0.10	0.03
2006	0.05	0.09
2007	0.16	0.03
2008	0.06	0.06
2009	0.15	0.07
2010	0.04	0.06
2011	0.15	0.01
2012	0.06	0.03
2013	0.06	0.04
2014	0.08	0.03
2015	NA	0.02
2011 - 2015 ave.	0.09	0.03
25th	0.14	0.05
median	0.17	0.10
75th	0.24	0.14

SURVEY LOBSTER ENCOUNTER RATE		
Proportion of postive tows		
Survey	NESFC	
	fall	spring
1981		
1982	0.44	0.24
1983	0.44	0.18
1984	0.41	0.10
1985	0.37	0.20
1986	0.37	0.24
1987	0.33	0.18
1988	0.40	0.34
1989	0.42	0.17
1990	0.44	0.19
1991	0.49	0.18
1992	0.48	0.24
1993	0.38	0.25
1994	0.42	0.11
1995	0.42	0.12
1996	0.36	0.17
1997	0.48	0.11
1998	0.43	0.12
1999	0.53	0.21
2000	0.42	0.21
2001	0.47	0.25
2002	0.57	0.27
2003	0.44	0.26
2004	0.51	0.18
2005	0.54	0.16
2006	0.53	0.25
2007	0.46	0.23
2008	0.52	0.27
2009	0.55	0.33
2010	0.63	0.38
2011	0.70	0.30
2012	0.58	0.33
2013	0.66	0.31
2014	0.61	0.34
2015	NA	0.25
2011 - 2015 ave.	0.64	0.31
25th	0.40	0.17
median	0.43	0.20
75th	0.46	0.24

Gulf of Maine/Georges Bank Combined Abundance Indicators

SPAWNING STOCK ABUNDANCE Mean weight (g) per tow of mature females						
Survey	NESFC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	304.27	173.96			342.80	251.36
1982	223.09	74.35			404.26	90.43
1983	264.22	125.99			537.29	32.40
1984	189.82	188.73			336.33	78.90
1985	328.01	1138.49			563.45	32.32
1986	206.27	286.30			135.10	50.24
1987	179.30	219.81			146.15	82.80
1988	271.72	184.18			94.55	42.74
1989	407.16	130.78			123.19	114.57
1990	289.98	220.91			538.08	100.27
1991	326.86	204.07			142.51	101.77
1992	293.28	202.01			262.54	110.74
1993	277.73	200.30			53.48	117.58
1994	360.16	280.51			376.55	132.17
1995	452.00	141.92			222.57	91.04
1996	555.40	465.08			262.89	72.61
1997	398.24	410.45			87.30	49.64
1998	438.12	449.94			113.80	81.44
1999	929.85	411.02			178.35	194.17
2000	457.89	484.73	3425.58		287.35	133.73
2001	718.46	625.39	1858.63	462.60	105.26	151.41
2002	1350.72	849.37	3707.47	967.67	163.87	105.74
2003	701.10	1139.33	3988.26	847.68	101.81	45.15
2004	716.95	1141.16	3497.55	682.69	86.24	189.23
2005	593.44	762.80	4062.27	1505.13	167.88	358.32
2006	968.92	811.80	2909.52	885.80	118.39	290.44
2007	752.12	805.69	3010.80	735.09	138.01	91.86
2008	1270.51	1316.45	3423.42	712.51	354.40	222.36
2009	1811.80	1140.39	5525.54	1138.18	396.60	135.71
2010	1662.97	1249.92	3879.74	1322.90	1176.34	157.93
2011	2206.17	1053.94	4446.97	868.71	782.58	151.85
2012	1910.13	1703.54	2964.59	1190.50	524.55	68.82
2013	1853.09	1322.28	4144.70	671.93	761.16	187.97
2014	2582.54	1622.58	3985.005	1326.879	569.74	300.09
2015	NA	1688.19	NA	881.3482	1443.63	269.89
2011 - 2015 ave.	**2137.98**	**1478.11**	**3885.32**	**987.87**	**816.33**	**195.72**
25th	273.23	191.62	3033.84	655.14	116.15	55.84
median	344.08	250.71	3566.52	847.68	171.11	90.73
75th	456.42	461.30	3777.66	907.67	324.09	113.62

FULL RECRUIT ABUNDANCE (SURVEY) Abundance of lobsters > 82 mm CL (sexes combined)						
Survey	NEFSC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	0.42	0.23			1.91	1.83
1982	0.32	0.21			2.80	0.57
1983	0.38	0.18			3.08	0.51
1984	0.39	0.20			4.09	0.49
1985	0.52	0.99			3.94	0.50
1986	0.52	0.42			1.71	0.54
1987	0.26	0.28			0.53	0.56
1988	0.40	0.33			1.51	0.56
1989	0.61	0.25			2.27	0.79
1990	0.41	0.27			4.92	0.97
1991	0.54	0.32			3.18	0.69
1992	0.39	0.32			2.35	0.87
1993	0.46	0.35			0.63	1.00
1994	0.57	0.39			3.15	0.76
1995	0.78	0.28			2.50	0.58
1996	0.80	0.71			2.50	0.33
1997	0.74	0.56			1.69	0.62
1998	0.53	0.53			0.88	0.49
1999	1.27	0.48			1.93	0.72
2000	0.68	0.79	14.22		2.20	0.97
2001	0.90	0.94	9.83	2.25	0.72	0.53
2002	1.73	1.14	12.57	3.40	1.02	0.43
2003	0.92	1.55	16.65	3.08	0.42	0.22
2004	1.17	1.46	16.18	3.14	0.33	0.78
2005	0.77	1.04	21.09	6.53	0.56	0.95
2006	0.99	1.06	14.85	5.33	1.03	0.68
2007	0.84	1.04	14.13	4.19	0.48	0.32
2008	1.38	1.55	20.72	3.06	1.55	0.67
2009	1.89	1.27	30.48	6.32	1.70	0.54
2010	2.15	1.81	21.42	6.29	2.30	0.40
2011	2.93	1.50	23.83	5.14	3.80	0.55
2012	2.51	2.32	16.51	5.94	3.18	0.31
2013	2.53	1.62	21.45	4.50	3.74	0.87
2014	3.87	2.08	26.38	9.33	2.91	0.77
2015	NA	2.57	NA	6.48	5.69	1.26
2011 - 2015 ave.	**2.96**	**2.02**	**22.04**	**6.28**	**3.86**	**0.75**
25th	0.40	0.28	11.88	2.67	1.14	0.50
median	0.53	0.37	13.39	3.08	2.24	0.56
75th	0.77	0.67	14.83	3.24	3.01	0.75

Gulf of Maine/Georges Bank Combined Abundance Indicators Con't

RECRUIT ABUNDANCE (SURVEY)						
Abundance of lobsters 71 - 80 mm CL (sexes combined)						
Survey	NEFSC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	0.11	0.05			4.84	6.38
1982	0.20	0.13			3.85	2.74
1983	0.31	0.10			9.76	1.76
1984	0.19	0.09			6.13	2.15
1985	0.40	0.10			9.60	4.48
1986	0.42	0.14			3.80	3.01
1987	0.26	0.17			1.16	2.47
1988	0.36	0.38			4.12	2.52
1989	0.37	0.07			7.51	4.48
1990	0.55	0.18			15.40	6.11
1991	0.46	0.19			7.55	2.73
1992	0.45	0.16			8.95	4.31
1993	0.35	0.22			3.19	5.12
1994	0.64	0.07			13.80	7.59
1995	0.46	0.41			12.10	4.54
1996	1.16	0.19			12.10	3.09
1997	0.58	0.50			6.41	4.57
1998	0.61	0.40			7.47	4.50
1999	0.76	0.37			8.73	4.26
2000	0.78	0.99	23.82		8.86	4.24
2001	0.50	0.45	17.53	9.16	1.58	4.30
2002	0.51	0.41	22.12	22.63	5.00	3.43
2003	0.25	0.37	23.78	13.71	0.66	1.96
2004	0.61	0.24	15.96	9.69	1.30	2.46
2005	0.25	0.17	30.88	23.85	2.11	4.35
2006	0.33	0.64	23.27	23.15	5.30	6.09
2007	0.29	0.39	21.62	20.24	1.61	0.75
2008	0.58	0.29	40.45	22.90	6.12	2.54
2009	0.70	0.55	41.84	31.77	8.88	3.18
2010	0.82	0.41	46.24	22.40	9.39	2.22
2011	1.50	1.05	58.53	47.39	15.00	5.24
2012	0.89	1.24	47.28	44.81	11.30	3.03
2013	1.74	1.06	48.24	39.71	12.20	4.83
2014	2.25	1.01	53.06	78.58	7.06	3.35
2015	NA	1.50	NA	45.20	17.91	7.05
2011 - 2015 ave.	1.60	1.17	51.78	51.14	12.69	4.70
25th	0.35	0.13	20.97	11.43	3.92	2.73
median	0.45	0.19	22.95	13.71	7.49	4.25
75th	0.57	0.40	23.79	18.17	9.44	4.50

YOUNG-OF-YEAR INDICES					
	YOY	YOY	YOY	YOY	YOY
Survey	ME 511	ME 512	ME 513 East	ME 513 West	MA 514
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989			1.64		
1990			0.77		
1991			1.54		
1992			1.30		
1993			0.45		
1994			1.61		
1995		0.02	0.66		0.56
1996		0.05	0.47		0.00
1997		0.05	0.46		0.17
1998		0.00	0.14		0.02
1999		0.04	0.65		0.36
2000		0.10	0.13	0.17	0.19
2001		0.43	2.08	1.17	0.38
2002	0.13	0.29	1.38	0.85	0.89
2003	0.22	0.27	1.75	1.22	0.68
2004	0.18	0.36	1.75	0.67	1.20
2005	1.59	1.36	1.77	0.82	0.82
2006	0.58	1.13	0.84	0.82	0.32
2007	0.84	1.34	2.01	1.27	1.22
2008	0.42	0.83	1.08	0.97	0.24
2009	0.69	0.48	1.25	0.45	0.13
2010	0.28	0.72	0.80	0.47	0.45
2011	0.41	1.10	2.33	0.67	0.63
2012	0.53	0.73	1.06	0.22	0.21
2013	0.10	0.20	0.48	0.12	0.09
2014	0.16	0.43	0.83	0.33	0.09
2015*	0.11	0.22	0.43	0.05	0.00
2011 - 2015 ave.	0.26	0.54	1.03	0.28	0.20
25th	0.15	0.04	0.47	0.68	0.17
median	0.17	0.05	0.77	1.01	0.36
75th	0.19	0.27	1.57	1.18	0.56

* 2015 Maine data are preliminary

Gulf of Maine/Georges Bank Combined Abundance Indicators Con't

SURVEY LOBSTER ENCOUNTER RATE Proportion of postive tows						
Survey	NEFSC		ME/NH		MA 514	
	fall	spring	fall	spring	fall	spring
1981	0.40	0.34			0.73	0.86
1982	0.33	0.29			0.70	0.50
1983	0.40	0.22			0.76	0.76
1984	0.39	0.18			0.76	0.76
1985	0.43	0.28			0.67	0.71
1986	0.42	0.28			0.83	0.68
1987	0.29	0.28			0.54	0.85
1988	0.35	0.32			0.58	0.76
1989	0.39	0.18			0.95	0.78
1990	0.39	0.30			0.95	0.86
1991	0.41	0.28			0.94	0.87
1992	0.37	0.31			0.77	0.93
1993	0.38	0.32			0.82	0.97
1994	0.41	0.27			0.93	1.00
1995	0.39	0.26			0.93	0.93
1996	0.45	0.34			0.95	0.91
1997	0.42	0.36			0.86	0.93
1998	0.42	0.33			0.69	0.76
1999	0.47	0.34			0.91	0.73
2000	0.42	0.39	0.94		0.98	0.93
2001	0.44	0.39	0.86	0.88	0.72	0.93
2002	0.55	0.50	0.95	0.94	0.73	0.91
2003	0.44	0.46	0.85	0.92	0.55	0.82
2004	0.42	0.49	0.86	0.89	0.56	0.84
2005	0.46	0.44	0.91	0.95	0.67	0.95
2006	0.56	0.48	0.93	0.93	0.88	0.91
2007	0.45	0.44	0.85	0.97	0.54	0.51
2008	0.51	0.52	0.86	0.92	0.75	0.83
2009	0.58	0.57	0.92	0.98	0.87	0.89
2010	0.68	0.61	0.93	0.98	0.98	0.87
2011	0.72	0.54	0.96	0.99	0.85	0.89
2012	0.67	0.61	0.98	0.98	0.95	0.91
2013	0.70	0.58	0.93	1.00	0.95	0.96
2014	0.66	0.63	1.00	1.00	0.96	0.79
2015	NA	0.59	NA	1.00	0.95	0.98
2011 - 2015 ave.	**0.69**	**0.59**	**0.97**	**0.99**	**0.93**	**0.90**
25th	0.39	0.28	0.86	0.90	0.70	0.76
median	0.41	0.31	0.90	0.92	0.79	0.85
75th	0.42	0.34	0.94	0.93	0.93	0.93

Southern New England Abundance Indicators

SPAWNING STOCK ABUNDANCE								
Mean weight (g) per tow of mature females								
Survey	NESFC		MA		RI		CT	
	Fall	spring	fall	spring	Fall	spring	Fall	spring
1981	198.93	15.71	9.21	99.78	161.55	111.57		
1982	156.07	118.29	50.04	26.42	53.52	43.52		
1983	120.20	35.51	0.72	59.62	87.86	141.69		
1984	192.38	44.50	4.04	51.67	203.58	259.91	2331.33	
1985	132.96	138.13	1.88	36.90	125.09	60.22	1040.42	1155.01
1986	59.83	61.35	87.60	19.06	128.49	136.78	1548.94	751.75
1987	143.76	67.33	44.51	35.12	475.51	86.13	1869.91	932.49
1988	122.36	121.34	13.16	46.33	662.07	100.75	1081.60	639.82
1989	124.57	44.65	233.88	70.68	363.92	151.06	853.74	1193.87
1990	175.83	75.87	59.02	150.21	230.17	258.72	1818.59	2369.93
1991	160.99	53.14	125.79	236.11	367.25	698.35	2185.29	2692.42
1992	178.88	61.38	179.80	47.84	321.95	117.18	1905.99	3598.02
1993	139.25	71.48	99.33	25.59	1286.74	1595.77	3335.55	2320.25
1994	54.70	36.40	126.00	82.42	359.96	164.37	3402.43	1170.49
1995	145.39	10.18	10.89	92.76	410.53	153.14	2253.58	3302.56
1996	227.08	32.01	59.61	54.16	861.32	353.55	3018.00	3882.27
1997	121.74	137.20	29.11	225.15	654.91	439.93	7173.56	5994.27
1998	161.20	44.97	52.73	138.81	251.53	286.59	2573.44	7738.30
1999	69.56	122.59	24.53	81.12	171.54	324.62	2546.24	8261.90
2000	95.66	60.02	20.08	142.78	268.99	303.32	1744.69	4430.68
2001	95.78	36.43	21.28	16.61	267.62	535.45	1513.56	3363.78
2002	85.56	146.86	0.00	44.75	35.68	572.35	365.12	2044.42
2003	52.83	31.71	0.00	5.97	205.85	110.43	1187.14	698.04
2004	47.10	47.01	37.18	3.58	288.49	591.60	626.96	522.99
2005	110.36	42.31	101.87	23.02	353.53	243.36	473.26	479.71
2006	65.03	90.62	0.00	60.77	465.26	788.63	219.99	465.37
2007	44.60	34.20	41.79	10.32	350.43	206.96	188.98	595.89
2008	25.90	58.14	0.00	19.67	401.73	194.57	248.63	760.88
2009	36.92	24.49	3.95	31.29	184.35	250.00	305.31	371.95
2010	101.74	46.39	130.73	32.09	166.07	177.64	na	361.72
2011	89.95	22.79	36.96	8.55	148.47	152.43	30.24	64.00
2012	205.12	39.64	14.13	9.93	31.16	118.13	6.28	88.85
2013	52.95	42.05	23.96	35.49	2.02	67.76	24.56	39.81
2014	50.93	198.30	0.10	20.95	190.12	24.98	23.00	34.02
2015	na	44.83	54.57	1.72	62.34	15.60	na	23.02
2011 - 2015 ave.	99.74	69.52	25.95	15.33	86.82	75.78	21.02	49.94
25th	93.14	42.48	12.59	36.45	205.28	131.88	1431.95	1162.75
median	128.76	60.69	36.81	52.92	295.47	259.32	1887.95	2369.93
75th	161.04	87.24	90.53	104.27	426.78	375.15	2553.04	3740.14

Southern New England Abundance Indicators Con't

FULL RECRUIT ABUNDANCE (SURVEY)								
Abundance of lobsters > 85 mm CL (sexes combined)								
Survey	*NEFSC*		*MA*		*RI*		*CT*	
	Fall	*spring*	*fall*	*spring*	*Fall*	*spring*	*Fall*	*spring*
1981	0.24	0.03	0.00	0.02	0.01	0.03		
1982	0.17	0.13	0.07	0.02	0.04	0.03		
1983	0.13	0.03	0.00	0.07	0.13	0.08		
1984	0.24	0.04	0.07	0.03	0.16	0.31	2.67	
1985	0.12	0.07	0.00	0.00	0.10	0.07	0.81	1.06
1986	0.06	0.12	0.05	0.00	0.08	0.11	2.73	0.63
1987	0.19	0.05	0.05	0.05	0.31	0.04	1.62	0.99
1988	0.15	0.04	0.00	0.03	0.83	0.09	1.26	0.82
1989	0.20	0.07	0.20	0.07	0.24	0.05	1.00	1.41
1990	0.19	0.05	0.05	0.05	0.38	0.10	2.39	1.35
1991	0.20	0.04	0.23	0.19	0.44	0.37	1.34	3.26
1992	0.20	0.07	0.22	0.05	0.34	0.10	2.37	1.44
1993	0.14	0.10	0.12	0.02	1.12	1.42	1.55	0.68
1994	0.08	0.03	0.00	0.00	0.55	0.10	3.75	0.50
1995	0.15	0.01	0.01	0.05	0.33	0.07	2.20	1.85
1996	0.22	0.02	0.06	0.08	0.82	0.19	1.97	1.96
1997	0.11	0.19	0.02	0.10	0.98	0.08	4.00	4.44
1998	0.25	0.00	0.04	0.00	0.17	0.17	1.48	4.10
1999	0.08	0.07	0.00	0.16	0.27	0.26	1.70	3.27
2000	0.08	0.08	0.08	0.08	0.30	0.32	0.95	2.44
2001	0.10	0.07	0.02	0.03	0.10	0.32	0.35	2.47
2002	0.08	0.08	0.00	0.08	0.00	0.20	0.03	1.35
2003	0.08	0.05	0.00	0.06	0.29	0.07	0.62	0.35
2004	0.07	0.04	0.04	0.00	0.26	0.41	0.27	0.30
2005	0.12	0.07	0.06	0.00	0.30	0.33	0.21	0.25
2006	0.11	0.06	0.00	0.14	0.24	0.65	0.03	0.20
2007	0.07	0.03	0.05	0.01	0.32	0.15	0.03	0.24
2008	0.07	0.06	0.00	0.02	0.74	0.12	0.19	0.66
2009	0.07	0.03	0.00	0.01	0.17	0.19	0.24	0.32
2010	0.11	0.05	0.15	0.07	0.07	0.12	na	0.26
2011	0.10	0.04	0.07	0.00	0.14	0.16	0.01	0.07
2012	0.19	0.05	0.03	0.02	0.02	0.09	0.03	0.06
2013	0.08	0.09	0.03	0.07	0.00	0.02	0.03	0.07
2014	0.07	0.18	0.00	0.02	0.00	0.00	0.01	0.04
2015	na	0.06	0.05	0.02	na	0.00	na	0.02
2011 - 2015 ave.	**0.11**	**0.08**	**0.03**	**0.03**	**0.04**	**0.06**	**0.02**	**0.05**
25th	0.08	0.04	0.00	0.03	0.17	0.07	0.99	0.91
median	0.14	0.06	0.04	0.05	0.31	0.10	1.59	1.41
75th	0.20	0.08	0.07	0.08	0.46	0.28	2.38	2.46

Southern New England Abundance Indicators Con't

RECRUIT ABUNDANCE (SURVEY)								
Abundance of lobsters 71 - 80 mm CL (sexes combined)								
Survey	*NEFSC*		*MA*		*RI*		*CT*	
	Fall	*spring*	*fall*	*spring*	*Fall*	*spring*	*Fall*	*spring*
1981	0.40	0.05	0.07	0.65	1.31	0.89		
1982	0.29	0.24	0.04	0.10	0.62	0.26		
1983	0.28	0.14	0.04	0.09	0.43	0.94		
1984	0.19	0.04	0.01	0.42	1.21	1.03	8.62	
1985	0.34	0.78	0.09	0.34	0.97	0.26	5.03	4.73
1986	0.14	0.09	0.20	0.17	1.30	0.75	8.22	3.45
1987	0.20	0.33	0.17	0.27	2.53	0.79	9.46	3.90
1988	0.26	0.09	0.16	0.24	4.14	0.42	4.82	2.16
1989	0.52	0.04	0.43	0.14	3.26	0.93	6.32	5.51
1990	0.36	0.29	0.31	2.29	1.38	2.17	10.31	9.53
1991	0.24	0.18	0.87	1.18	3.05	4.77	14.23	15.39
1992	0.38	0.06	0.57	0.10	1.97	0.67	12.25	16.55
1993	0.17	0.29	0.52	0.25	8.29	7.81	21.46	10.69
1994	0.12	0.10	0.42	0.95	3.64	1.00	18.87	5.90
1995	0.28	0.00	0.03	1.14	4.48	1.36	15.30	16.31
1996	0.77	0.14	0.32	0.40	6.42	1.60	14.91	16.30
1997	0.56	0.62	0.12	1.45	6.10	2.58	40.43	25.49
1998	0.46	0.37	0.11	1.09	3.38	1.63	18.61	37.56
1999	0.20	0.92	0.19	0.75	2.10	1.64	20.22	40.84
2000	0.40	0.30	0.13	0.54	1.83	1.54	12.71	20.72
2001	0.17	0.14	0.03	0.18	2.21	3.03	11.94	19.12
2002	0.17	0.62	0.00	0.34	0.75	2.73	3.52	11.44
2003	0.12	0.21	0.00	0.07	1.00	0.29	5.56	4.58
2004	0.12	0.11	0.00	0.05	1.48	1.86	4.52	2.92
2005	0.08	0.06	0.00	0.08	2.48	1.02	2.14	2.67
2006	0.12	0.14	0.03	0.08	2.26	3.63	1.38	2.12
2007	0.11	0.12	0.00	0.08	2.76	0.73	1.35	2.86
2008	0.12	0.14	0.01	0.16	2.98	0.64	1.43	3.10
2009	0.05	0.05	0.05	0.16	1.36	1.14	1.72	1.55
2010	0.14	0.05	0.18	0.06	1.21	0.44	na	1.41
2011	0.12	0.03	0.00	0.18	1.02	0.42	0.19	0.42
2012	0.16	0.04	0.21	0.07	0.27	0.61	0.14	0.50
2013	0.10	0.02	0.04	0.11	0.02	0.18	0.06	0.23
2014	0.14	0.52	0.00	0.04	0.14	0.02	0.05	0.15
2015	NA	0.01	0.30	0.07	na	0.05	na	0.15
2011 - 2015 ave.	**0.13**	**0.12**	**0.11**	**0.09**	**0.36**	**0.26**	**0.11**	**0.29**
25th	0.17	0.09	0.08	0.23	1.36	0.78	7.74	5.12
median	0.25	0.20	0.17	0.37	2.37	1.45	12.09	11.44
75th	0.38	0.34	0.35	0.99	3.77	2.27	16.13	17.84

Southern New England Abundance Indicators Con't

YOUNG-OF-YEAR INDICES				
	YOY	YOY	Larvae	Postlarvae
Survey	MA	RI	CT / ELIS Summer	CT_NY / WLIS Summer
1981				
1982				
1983				14.48
1984			0.43	6.89
1985			0.53	66.75
1986			0.90	4.58
1987			0.78	18.98
1988			0.74	49.27
1989			0.74	5.88
1990		1.31	0.81	19.66
1991		1.49	0.55	9.97
1992		0.63	1.44	14.12
1993		0.51	1.19	26.23
1994		1.23	0.98	96.52
1995	0.17	0.33	1.46	18.20
1996	0.00	0.15	0.31	12.07
1997	0.08	0.99	0.21	13.69
1998	0.20	0.57	0.55	4.85
1999	0.03	0.92	2.83	39.70
2000	0.33	0.34	0.78	14.28
2001	0.10	0.75	0.32	9.46
2002	0.10	0.25	0.64	1.99
2003	0.03	0.79	0.25	2.60
2004	0.03	0.42	0.45	6.10
2005	0.13	0.53	0.49	6.90
2006	0.17	0.44	0.71	1.70
2007	0.10	0.36	0.37	18.10
2008	0.00	0.14	0.37	8.10
2009	0.03	0.08	0.19	7.62
2010	0.00	0.11	0.35	9.91
2011	0.03	0.00	0.26	5.90
2012	0.00	0.09	0.12	2.77
2013	0.13	0.22	0.16	no data
2014	0.07	0.22	0.06	no data
2015	0.00	0.14	na	no data
2011 - 2015 ave.	0.05	0.13	0.15	4.34
25th	0.03	0.39	0.50	6.64
median	0.10	0.69	0.74	13.91
75th	0.17	0.97	0.92	21.30

SURVEY LOBSTER ENCOUNTER RATE									
Proportion of postive tows									
Survey	NEFSC		MA		RI		CT		
	Fall	spring	fall	spring	Fall	spring	Fall	spring	
1981			0.15	0.38	0.54	0.49			
1982	0.34	0.24	0.21	0.28	0.59	0.30			
1983	0.22	0.14	0.16	0.21	0.36	0.45			
1984	0.27	0.09	0.18	0.40	0.45	0.59	0.76	0.72	
1985	0.30	0.20	0.22	0.51	0.50	0.31	0.69	0.57	
1986	0.25	0.19	0.38	0.39	0.43	0.64	0.61	0.67	
1987	0.23	0.13	0.18	0.28	0.47	0.33	0.76	0.63	
1988	0.27	0.08	0.21	0.39	0.59	0.49	0.66	0.65	
1989	0.37	0.11	0.33	0.50	0.55	0.52	0.63	0.75	
1990	0.43	0.14	0.44	0.66	0.54	0.66	0.76	0.73	
1991	0.29	0.13	0.39	0.41	0.69	0.77	0.78	0.81	
1992	0.31	0.23	0.23	0.51	0.57	0.41	0.69	0.78	
1993	0.26	0.09	0.26	0.54	0.73	0.50	0.77	0.74	
1994	0.23	0.09	0.20	0.51	0.57	0.56	0.74	0.73	
1995	0.33	0.06	0.13	0.44	0.67	0.55	0.68	0.77	
1996	0.41	0.08	0.16	0.30	0.76	0.79	0.78	0.68	
1997	0.28	0.24	0.21	0.45	0.71	0.75	0.81	0.71	
1998	0.30	0.11	0.13	0.54	0.55	0.59	0.71	0.83	
1999	0.29	0.18	0.21	0.41	0.59	0.76	0.79	0.78	
2000	0.30	0.13	0.15	0.45	0.63	0.68	0.73	0.82	
2001	0.24	0.18	0.18	0.28	0.61	0.64	0.58	0.77	
2002	0.21	0.19	0.03	0.28	0.45	0.63	0.59	0.73	
2003	0.25	0.11	0.03	0.14	0.40	0.53	0.63	0.71	
2004	0.20	0.10	0.03	0.28	0.50	0.54	0.66	0.61	
2005	0.20	0.08	0.15	0.34	0.45	0.50	0.55	0.63	
2006	0.23	0.13	0.03	0.43	0.61	0.81	0.53	0.61	
2007	0.19	0.15	0.10	0.34	0.54	0.43	0.53	0.70	
2008	0.24	0.11	0.10	0.33	0.52	0.55	0.65	0.63	
2009	0.28	0.16	0.05	0.50	0.40	0.57	0.55	0.49	
2010	0.30	0.09	0.24	0.23	0.45	0.47	na	0.54	
2011	0.32	0.11	0.05	0.18	0.23	0.29	0.28	0.46	
2012	0.32	0.12	0.15	0.18	0.16	0.29	0.20	0.44	
2013	0.24	0.09	0.08	0.18	0.09	0.20	0.15	0.28	
2014	0.24	0.23	0.08	0.13	0.23	0.07	0.10	0.26	
2015	na	0.054	0.05	0.10	na	0.12	0.10	0.27	
2011 - 2015 ave.	0.28	0.12	0.08	0.15	0.18	0.19	0.17	0.34	
25th	0.25	0.09	0.16	0.37	0.49	0.52	0.65	0.70	
median	0.29	0.13	0.20	0.42	0.57	0.59	0.72	0.73	
75th	0.31	0.18	0.24	0.51	0.64	0.66	0.76	0.77	

Draft Document for Board Review. Not for Public Comment.

Atlantic States Marine Fisheries Commission

DRAFT ADDENDUM I TO THE JONAH CRAB FISHERY MANAGEMENT PLAN FOR PUBLIC COMMENT

Incidental Bycatch Limit for Non-Trap Gears

Vision: Sustainably Managing Atlantic Coastal Fisheries

This draft document was developed for Management Board review and discussion at the February 2016 meeting week. This document is not intended to solicit public comment as part of the Commission/State formal public input process. However, comments on this draft document may be given at the appropriate time on the agenda during the scheduled meeting. Also, if approved, a public comment period will be established to solicit input on the issues contained in the document.

December 2015

Draft Document for Board Review. Not for Public Comment.

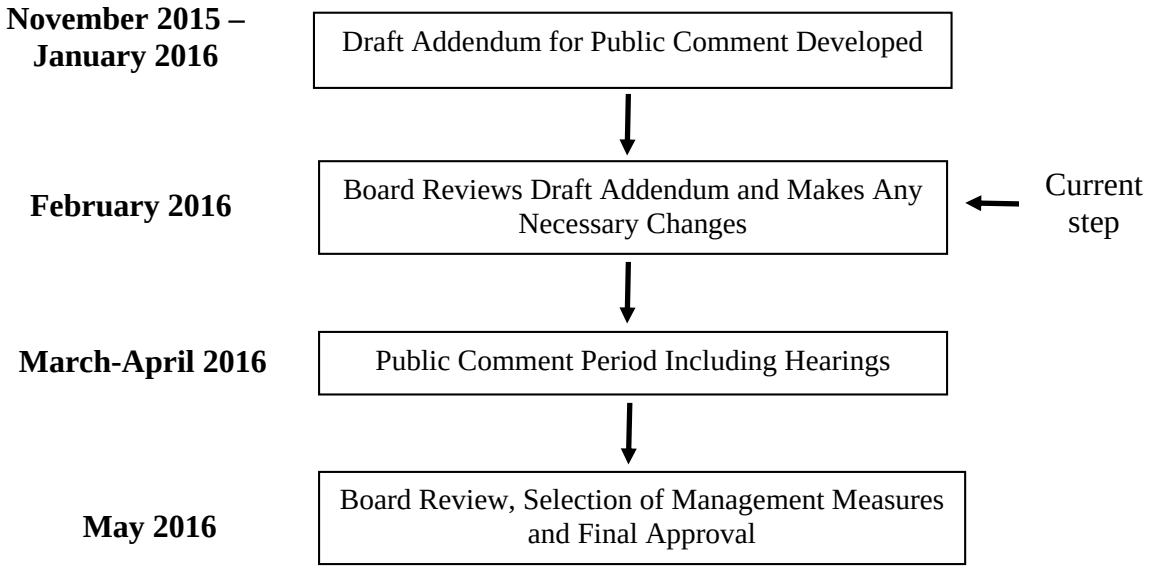
Public Comment Process and Proposed Timeline

At its November 2015 meeting, the American Lobster Management Board (Board) discussed concerns over the appropriateness of the incidental bycatch limit for non-trap gear in the Jonah Crab Fishery Management Plan (FMP). The Board initiated Draft Addendum I to consider increasing or removing the bycatch limit to address the potential inadequacy of the trip limit provision.

The public is encouraged to submit comments regarding the proposed management options in this document at any time during the addendum process. The final date comments will be accepted is **XXX at 5:00 p.m**. **EST.** Comments may be submitted by mail, email, or fax. If you have any questions or would like to submit comment, please use the contact information below.

Mail: Megan Ware
Atlantic States Marine Fisheries Commission
1050 N. Highland St. Suite 200A-N
Arlington, VA 22201
Fax: (703) 842-0740

Email: mware@asmfc.org
(Subject line: Jonah Crab Draft Addendum I)



1.0 Introduction

The Atlantic States Marine Fisheries Commission (ASMFC) coordinates the interstate management of Jonah crab (*Cancer borealis*) in state waters (from 0-3 miles offshore). ASMFC manages Jonah crab through an Interstate Fishery Management Plan (FMP), which was approved in August 2015 under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (1993). Management authority in the exclusive economic zone (EEZ), which extends from 3-200 miles offshore, lies with NOAA Fisheries. The management unit for Jonah crab includes the Atlantic states from Maine through Virginia. The biological range of the species is primarily from Newfoundland, Canada to Florida.

The Board initiated Addendum I to the FMP after concern that the incidental bycatch limit of Jonah crab for non-trap gear was not appropriate. Specifically, there was concern that the original 200 crabs per calendar day, up to 500 crabs per trip limit did not encompass all fishermen who currently land Jonah crabs as bycatch. Since a goal of the Jonah Crab FMP is to prevent expansion of the fishery while including all current participants, the Board directed the Plan Development Team (PDT) to draft an addendum to change the incidental bycatch limit for non-trap gear, either by increasing or removing the trip limit.

2.0 Overview

2.1 Statement of the Problem

The Jonah Crab FMP established a 200 crabs per calendar day or 500 crabs per trip incidental bycatch limit for non-trap gear. However, an investigation of data found that, while the majority of trips from 2010 through 2014 were within the current limit, there were a number of trips above the bycatch limit. Since the Board wanted to ensure that current participants, including those who land Jonah crab as bycatch, are not excluded from the fishery, the Board initiated an addendum with options to increase or remove the incidental bycatch limit for non-trap gear.

2.2 Background

Jonah crab has long been considered a bycatch of the lobster industry; however, in recent years there has been an increase in targeted fishing pressure and demand for Jonah crab. Since the early 2000s, landings of Jonah crab have increased 650% creating a mixed crustacean fishery that can target lobster or crab at different times of the year based on slight, legal gear modifications and small shifts in the areas in which traps are fished. This rapid and recent increase in demand can be attributed to an increase in the price of other crabs (such as Dungeness), creating a substitute market for Jonah crabs, as well as a decrease in the abundance of lobsters in Southern New England, causing fishermen to supplement their income with Jonah crabs. As a result of this growing demand, ASMFC approved a FMP for Jonah crab to support the implementation of a unified coastal management program which promotes the conservation and full utilization of the Jonah crab resource.

While the majority of Jonah crabs are harvested by lobster fishermen using lobster traps, roughly 0.1% of Jonah crabs are caught as bycatch in non-trap gear such as bottom otter

trawls and gillnets (Table 1). The FMP address the bycatch fishery through the establishment of a 200 crabs per calendar day, up to 500 crabs per trip incidental bycatch limit for those non-trap gears. However, the Board expressed concerned that the bycatch limit is not high enough to include all current participants in the fishery.

Table 1: Number of permits and trips landing Jonah crab with non-trap gear as well as estimated total landings (2010-2014). Provided by the New England Fishery Management Council (NEFMC).

Year	Number of Permits Landing Jonah Crab w/ Non-Trap Gear	Number of Trips Landing Jonah Crab w/ Non-Trap Gear	Total Non-Trap Jonah Crab Landings (lbs)	% of Year's Total Jonah Crab Landings
2010	20	109	10,815	0.099%
2011	23	72	2,986	0.032%
2012	14	53	4,099	0.035%
2013	22	109	6,081	0.038%
2014	17	114	13,306	0.078%

An investigation of trip-level data across the entire management unit found that while 97-99% of trips from 2010 through 2014 were within the current FMP limit, a number of trips were above the trip limit (Table 2). Specifically, 23 trips were above the limit between 2010 and 2014 and 3 trips landed over 900 crabs between May 2013 and August 2015. [1] To address the small amount of harvest in excess of the trip limit, the Board initiated an addendum to increase the incidental bycatch limit for non-trap gear. The option to remove the bycatch limit was added to solicit input from the public on the need for an incidental bycatch limit in the Jonah crab fishery.

Table 2: Percentage of trips affected by the current ASMFC crab bycatch limit for non-trap gear (2010-2014). This spreadsheet was submitted by NEFMC and is based on data provided by NOAA Greater Atlantic Regional Fisheries Office (GARFO) using the Data Matching Imputation System. It assumes that 1 crab=1 pound.

Year	Average Number of Days Fished	Percentage of Trips Constrained by Crab Limit
2010	1.17	2.33%
2011	1.72	0.61%
2012	1.26	3.03%
2013	1.18	2.38%
2014	1.23	2.86%

[1] Data provided by NOAA GARFO from the Vessel Trip Report database. Assumes that 1 crab=1 pound.

3.0 Proposed Management Options

This section proposes to replace the "Incidental Bycatch limit for non-trap gear" in *Section 5.1* of the Jonah Crab FMP.

Option A: Status Quo
Under this option, the incidental bycatch limit for non-trap gear would remain at 200 crabs per calendar day, up to 500 crabs per trip.

Option B: Incidental Bycatch Limit of 1000 crabs per trip.
This option would replace status quo with a 1,000 crab trip limit for a trip of any length.

Option C: Remove the Incidental Bycatch Limit for Non-Trap Gear
Under this option, there would be no bycatch limit for non-trap gear in the Jonah crab fishery.

4.0 Compliance

If approved, states must implement the management measures in Addendum I by **Month, 201X.**

5.0 Recommendation for Federal Waters

The management of Jonah crab in the EEZ is the responsibility of the Secretary of Commerce through the National Marine Fisheries Service (NMFS). The Atlantic States Marine Fisheries Commission recommends that the federal government promulgate all necessary regulations to implement complementary measures to those approved in this addendum.

6.0 Literature Cited

ASMFC, 2015. Interstate Fishery Management Plan for Jonah Crab.

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: Jonah Crab Plan Development Team

DATE: January 15, 2016

SUBJECT: Addressing Catch by Non-Lobster Trap Gear in Draft Addendum I

The Jonah Crab Plan Development Team (PDT) met via conference call on December 17, 2015 and January 15, 2016 to review draft Addendum I to the Jonah Crab FMP. While reviewing bycatch data for the Jonah crab fishery, it became apparent that there is Jonah crab bycatch from non-lobster trap gear such as fish pots, crab traps, and whelk pots. As draft Addendum I currently reads, incidental landings from these non-lobster trap gears are not addressed; the bycatch provision only applies to non-trap gear, such as otter trawls and gill nets.

Data provided by NOAA GARFO which was queried from the Vessel Trip Report (VTR) database showed that between May 1, 2013 and August 31, 2015 there were 194 trips which landed Jonah crabs from whelk pots, crab pots, and fish pots. Of this, 80 trips landed 100 crabs or fewer and 115 trips landed 200 crabs or fewer. Approximately 45 trips landed between 200 and 500 crabs and 40 trips landed more than 450 crabs. Trips with the highest landings came from whelk pots.

Landing reports from Maryland show that between 2012 and 2015, 33 trips landed Jonah crabs with fish pots. All of these trips were under 200 lbs. Reports also indicated that from 2014-2015, 36 trips landed Jonah crabs with whelk pots. Average landings per trip with whelk pots were under 500 lbs. The PDT notes that channeled whelks and Jonah crabs are not typically caught in the same area, so there is concern that landings from whelk pots may in fact be rock crabs.

As a result of these findings, the PDT recommends that a second issue be added to draft Addendum I prior to public comment. This addition would not remove the three current options that address non-trap incidental bycatch; rather, it would add a second issue with options that provide language to address bycatch from non-lobster trap gear. This issue would read:

> ***Issue 2: Incidental Bycatch Limit for Non-Lobster Trap Gear***
> *The following options would apply to all traps which do not have a valid lobster tag. These include fish pots, whelk pots, and crab pots.*
>
> *Option A: Status Quo*
> *Under this option, there would be no incidental bycatch limit for non-lobster trap gear. Those wishing to harvest Jonah crabs with traps that do not have a valid lobster tag would be required to obtain an incidental permit as stipulated in Section 5.1 of the Jonah Crab FMP. There would be no limit on the number of crabs caught by these fishermen.*
>
> *Option B: Incidental Bycatch Limit of 200 Crabs per Day, 500 Crabs per Trip*
> *This option would establish an incidental bycatch limit for all traps that do not have a valid lobster tag of 200 crabs per day, up to 500 crabs per trip, for trips three days or longer. For the purpose of this addendum, a day means a 24-hour period.*
>
> *1 day fishing trip means a trip 24 hours or less*
> *2 day fishing trip means a trip greater than 24 hours up to 48 hours*
> *3+ day fishing trip means a trip greater than 48 hours*

The addition of a bycatch limit for non-lobster trap gear would cap incidental landings while ensuring the inclusion of current participants in the Jonah crab fishery. Furthermore, a trip limit on non-lobster trap gear would prevent the proliferation of traps by fisheries that are not regulated in federal waters.

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

January 15, 2016

To: American Lobster Management Board

From: Law Enforcement Committee

RE: Jonah Crab bycatch limits

The Law Enforcement Committee (LEC) of the Atlantic States Marine Fisheries Commission (ASMFC) met via conference call on January 7, 2016 to review and provide comments on proposed bycatch limits for Jonah crab harvest. The following members were in attendance:
LEC: Capt. Steve Anthony (NC); Deputy Chief Kurt Blanchard (RI); Deputy Chief Jon Cornish (ME); Deputy Director Chisolm Frampton (SC); Asst. Director Larry Furlong (PA); Special Agent-in- Charge Honora Gordon (USFWS); Capt. Jamie Green (VA); Asst. Chief Wayne Hettenbach (USDOJ); Capt. Rob Kersey (MD); Capt. Bob Lynn (GA); Capt. Doug Messeck (DE); Maj. Pat Moran (MA); Director Kyle Overturf (CT); Lt. Colby Schlaht (USCG); Lt. Jason Snellbaker (NJ); Capt. Rama Shuster (FL)
LEC ALTERNATES: Jeff Ray (NOAA OLE); Tom Gadomski (NY)
OTHER ATTENDEES: Col. Jim Kelley (NC); Maj. Dean Nelson (NC); Chief Dean Hoxsie (RI); Todd Mathes (NCDEQ); Jason Rock (NCDEQ)
STAFF: Mark Robson; Mike Waine; Megan Ware

ASMFC is considering changes to the incidental bycatch limit for Jonah crabs in Draft Addendum I of the Jonah Crab Interstate Fishery Management Plan. Given that one of the options considers a higher bycatch limit (1000 crabs), the LEC was asked to review whether a count limit is still the most appropriate metric in terms of enforcement. The LEC considered the following 3 methods for setting a bycatch limit:

A count limit (1,000 crabs).
A poundage limit (1,000 pounds).
A volumetric limit based on the number of crates.

The consensus of the LEC is that a bycatch limit based on the number of crabs (count) is preferable in this fishery. As there will be a minimum size-limit and a prohibition on the possession of egg-bearing females, officers will likely need to examine individual crabs when inspecting catches. Since handling crabs would be required anyway, checking bycatch limits based on the number of crabs would be more feasible and practical. Other comments suggested that bycatch limits based on volume, such as a set number of crates or bushels, would also be workable from an enforcement perspective. Regardless of the type of limit, as bycatch limits increase the time and effort required to check catches also increases significantly.

Based on experience with the fishery to date and its limited landings from non-trap gear, LEC members expressed concern that large bycatch allowances, particularly in non-trap gear, could result in directed efforts that may increase gear conflicts in the future.

The LEC appreciates the opportunity to review and comment on these bycatch limit options.

Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

TO: American Lobster Management Board

FROM: Jonah Crab Plan Review Team

DATE: January 15, 2016

SUBJECT: Claw Data from the Jonah Crab Fishery

Following the November Lobster Board meeting, states were asked to submit data on the size of their respective Jonah crab claw fisheries. Information of specific interest included: the number of Jonah crab claw fishermen, whether fishermen are landing whole crabs and selling claws or landing claws, the pounds of claws landed, whether fishing occurs in state or federal waters, and any common practices of Jonah crab claw fishermen.

The Jonah Crab Plan Review Team (PRT) met via conference call on January 7, 2016 to review data submitted by the states. The following information is being forwarded to the Board for their consideration. Information was also provided by Derek Perry (Massachusetts DMF) on the relationship between Jonah crab carapace width, claw height, and claw length, and by Craig Weedon (Maryland DNR) on the relationship between carapace width and claw length for both male and female Jonah crabs. These reports can be found on pages 5 and 7, respectively.

Maine
An investigation of Maine's landings program revealed the landing of Jonah crab claws by lobster fishermen. Since Maine only requires 10% harvester reporting, it is possible for harvesters to fish for Jonah crabs and not report. Furthermore, it is believed that fishermen harvest Jonah crab claws for personal use and, as a result, these landings are not recorded in dealer reports. Therefore, the Jonah crab claw landings shown in Table 1 likely underestimate the true size of the claw fishery. Landings from 2010-2012 as well as the number of fishermen landing Jonah crab claws are confidential and not presented below.

Table 1: Jonah crab claw landings, in pounds, and the associated total value from Maine.

Year	Total Pounds	Total Value
2013	5,048	$2981.85
2014	7,965	$5934

New York
The majority of fishermen in New York land whole crabs; however, some land whole crabs and then sell claws when they are unable to find buyers for the whole crabs. The values in Table 2 are total landings, in pounds, reported on VTRs for all NY fishermen who sold claws to dealers. This is an overestimate since 100% of the landings were not claws; however these values provide an upper bound for Jonah crab claw harvest. Landings are from both state and federal waters and there is a mix of fishermen harvesting one or two claws per crab. Fishermen did not indicate a size preference when harvesting claws, stating that Jonah crab claws go to processors.

Table 2: New York's Jonah crab harvest from fishermen who were reported to have sold claws. This data provides an upper bound for yearly Jonah crab claw harvest since landings are a mix of whole crabs and claws.

Year	# Selling Claws	Max Landings (lbs)
2008	11	144,980
2009	6	150,843
2010	9	213,876
2011	15	227,709
2012	12	244,134
2013	19	293,376
2014	10	130,851

New Jersey

Based on Jonah crab landings, most (if not all) of the vessels holding lobster permits and actively landing American lobster are also landing Jonah crab. As shown in Table 3, this may be up to 18 permitted vessels. The exact number of Jonah crab fishermen is not known because it is possible for a harvester to fish for Jonah crabs and not report if the vessel does not have a federal permit and fishes in state waters. New Jersey obtains its data on Jonah crab landings from dealer reports uploaded to the ACCSP Data Warehouse. The dealer reports do not breakdown the poundage of Jonah crabs landed between claws and whole crabs. Therefore, it is not clear which Jonah crab fishermen are landing claws and what portion of their landings is parts. Furthermore, the dealer reports do not specify where the fishing activity took place; they just list the county in which the catch was landed. Therefore, it is not possible to know from dealer reports if fishing is occurring in state or federal waters. Data from at-sea lobster observers suggests that there are claw fishermen in federal waters who are taking both claws from Jonah crabs.

Table 3: Number of New Jersey vessels that landed Jonah Crab 2012-2015. Since dealer reports do not differentiate between whole crabs and claws, it is not possible to know how many of these fishermen are landing parts. Total number of vessels in 2015 landing Jonah crabs was not available.

	2012		2013		2014		2015	
Gear Type	# of Vessels	# w/ Lobster Permit	# of Vessels	# w/ Lobster Permit	# of Vessels	# w/ Lobster Permit	# of Vessels	# w/ Lobster Permit
Gill Nets	3	0	2	0	5	0		0
Otters Trawls	7	3	2	0	2	2		4
Pots and Traps	16	16	14	14	18	18		16

Delaware

A review of harvest records shows that there were 2 Jonah crab claw fishermen in 2014. These fishermen landed whole crabs and claws, depending on the market, and fished in federal waters. Their landings are confidential. In general, these fishermen harvested both claws and had a preference for crabs larger than 4".

Maryland

Trip level harvester records show that there have been 18 Jonah crab claw fishermen between 2000 and 2015. More recently, the number of Jonah crab claw fishermen has been 7 (2014) and 8 (2015). Catch is typically landed as claws since not all boats have a seawater storage tank. In the last 10 years, total landings from Maryland have ranged from 1,684 lbs in 2005 to 30,665 lbs in 2014 (Table 4). Much of the individual trip level data is confidential; however, all trips landed less than 4,500 lbs. Between 2000 and 2015, roughly 50% of fishermen averaged less than 50 lbs per trip each year and roughly 80% of fishermen averaged less than 200 lbs per trip each year. 60% of fishermen landed less than 500 lbs yearly. Claw landings occur in both state and federal waters and typically both claws are harvested. At-sea observers reported that crabs under 6.5" are throw back.

Table 4: Trip level data on the Jonah crab claw fishery in Maryland. The table shows the number of fishermen landing claws, the total number of trips from these fishermen, total pounds landed, and the average poundage per trip for that year. Data is from all gear types.

Year	# of Fishermen	Trips	Pounds Landed	Pounds/Trip
2005	5	34	1,684	50
2006	4	54	2,336	43
2007	5	74	4,480	61
2008	5	79	7,878	100
2009	7	52	7,942	153
2010	4	43	5,545	129
2011	3	19	4,175	220
2012	9	53	7,507	142
2013	Confidential			
2014	7	54	30,665	568
2015	8	70	21,232	303

Fishermen in Maryland land Jonah crab claws using a variety of gears in addition to lobster traps. These include fish pots, gillnets, whelk pots, and otter trawls. Table 5 summarizes the total landings from these gear types between 2000 and 2015.

Table 5: Jonah crab claw landings in Maryland, broken down by gear type (2000-2015).

	Lobster Trap	Fish Pot	Gillnet	Whelk Pot	Otter trawl
Total Pounds (2000-2015)	110,894	6,212	35,554	15,410	650

Given the large size of Jonah crabs retained (6.5"), the prevalence of fishing in state waters, and the fact that channeled whelks and Jonah crabs are not typically found together, the Jonah Crab Plan Review Team expressed concern that some Maryland trip reports may be misidentifying rock crabs as Jonah crabs.

Jonah Crab Reporting Requirements
States were also asked to provide information their respective reporting requirements for Jonah crab. Table 7 summarizes the information submitted.

Table 7: Jonah crab reporting requirements by jurisdiction.

	NMFS	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA
Trip level harvester data collected includes gear used and effort (e.g. traps hauled and traps in water)	Yes for most federal permit holders. No for federal lobster-only permit holders and Jonah crab-only harvesters with no other federal permits	Yes (10%)	No	Yes	Yes	Yes	Yes	Yes, through VTR's and as long as the vessel has a federal permit.	No		Yes
Is it lawful for any harvesters to fish and land Jonah crabs and NOT report?	No for most federal permit holders. Yes for federal lobster-only permit holders and Jonah crab-only harvesters with no other federal permits	Yes	No	No	No	No	No	Yes, only if the vessel does not have a federal permit and is fishing state waters.	No		No
Trip-level harvester data delineates whole crab vs. claw only	No	No	No	No	No	No	No	No	No		Yes (though not always done in the past)
Trip-level dealer data is collected that would capture Jonah crab transactions	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes, through SAFIS for vessels with federal permit.	No		Only for federal water harvest that is sold to a federal dealer and can be tied back to a VTR
Requires trip-level dealer data that would delineate transactions of whole crab vs. claws	No	Yes	No	Yes	Yes	Yes	Yes	No	No		No

The following data was provided by Derek Perry, Massachusetts DMF, for Board consideration in regards to the Jonah crab claw provision.

As part of a Saltonstall-Kennedy Grant awarded in 2015 to collect biological data on the Jonah crab fishery, the carapace width, claw height, and claw length of several hundred Jonah crabs were measured. From this data, the relationships between carapace width and claw height as well as carapace width and claw length were examined. Figure 1 shows the relationship between carapace width and claw height for the Gulf of Maine/Georges Bank (GOM/GB) and Southern New England (SNE). Measurements from regenerated claws were removed using a least square method and only data from male Jonah crabs is included. In GOM/GB, the regression analysis suggests that a crab meeting the minimum size of 4.75" (120.65 mm) would have an expected claw height of 1.31" (33.4 mm). In SNE, a crab meeting minimal legal size would be expected to have a slightly larger claw height of 1.39" (35.2 mm). The resulting R^2 values for GOM/GB and SNE were both fairly high at R^2=0.9457 and R^2=0.8792, respectively.

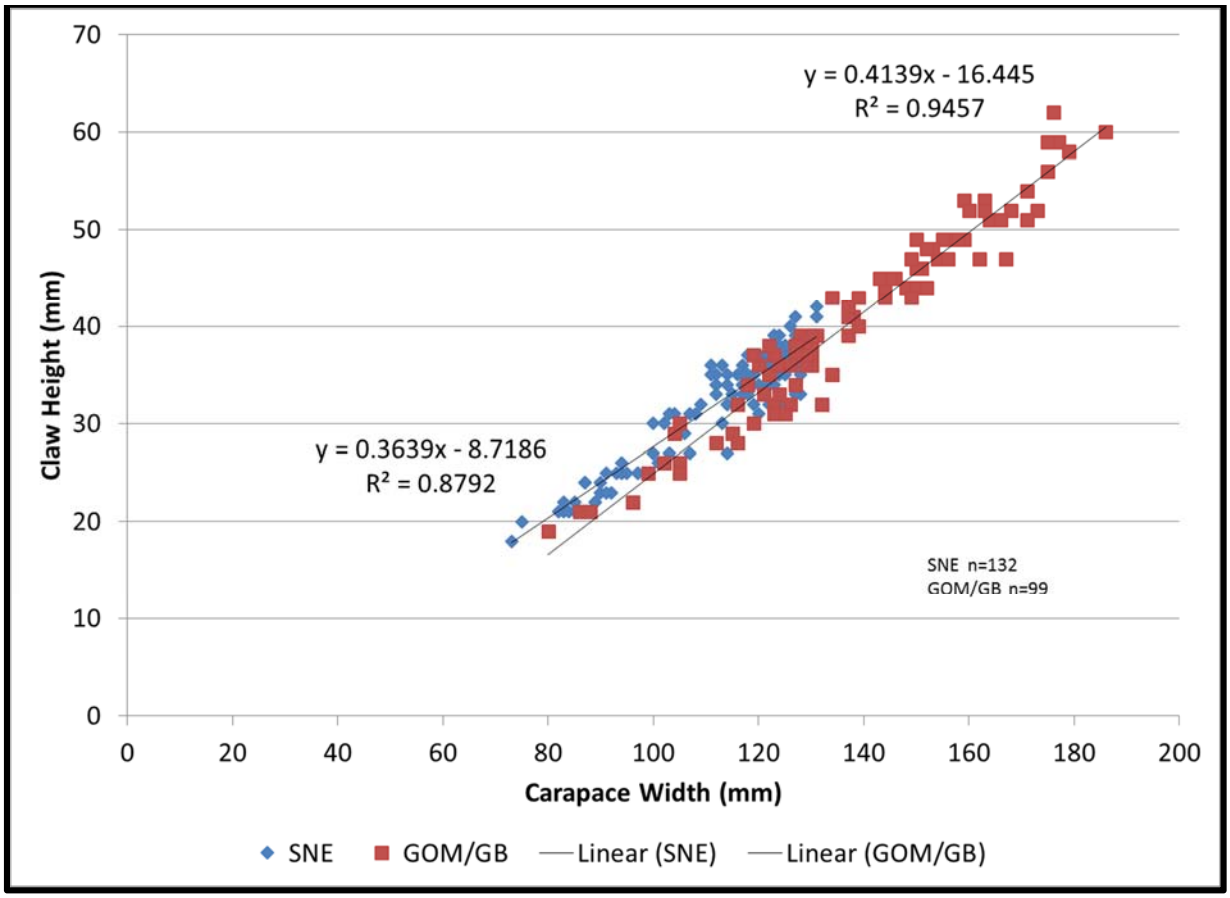


Figure 1: Linear regression between the carapace width and claw height of Jonah crabs (n=99 for GOM/GB and n=132 for SNE). For a male crab with a 4.75" (120.65 mm) carapace width, the linear regression expects a claw height of 1.31" (33.4 mm) for crabs in GOM/GB and 1.39" (35.2 mm) for crabs in SNE.

Figure 2 shows the relationship between carapace width and claw length for GOM/GB and SNE. Again, only data from male Jonah crabs is included and regenerated claws were removed using a least square method. The data suggests that, for a male crab whose carapace width meets the minimum size of 4.75" (120.65 mm), an expected claw length in GOM/GB would be 2.42" (61.5 mm) while an expected claw length in SNE would be 2.46" (62.5 mm). The resulting R^2 values for GOM/GB and SNE were both fairly high at R^2=0.9648 and R^2=0.9084, respectively.

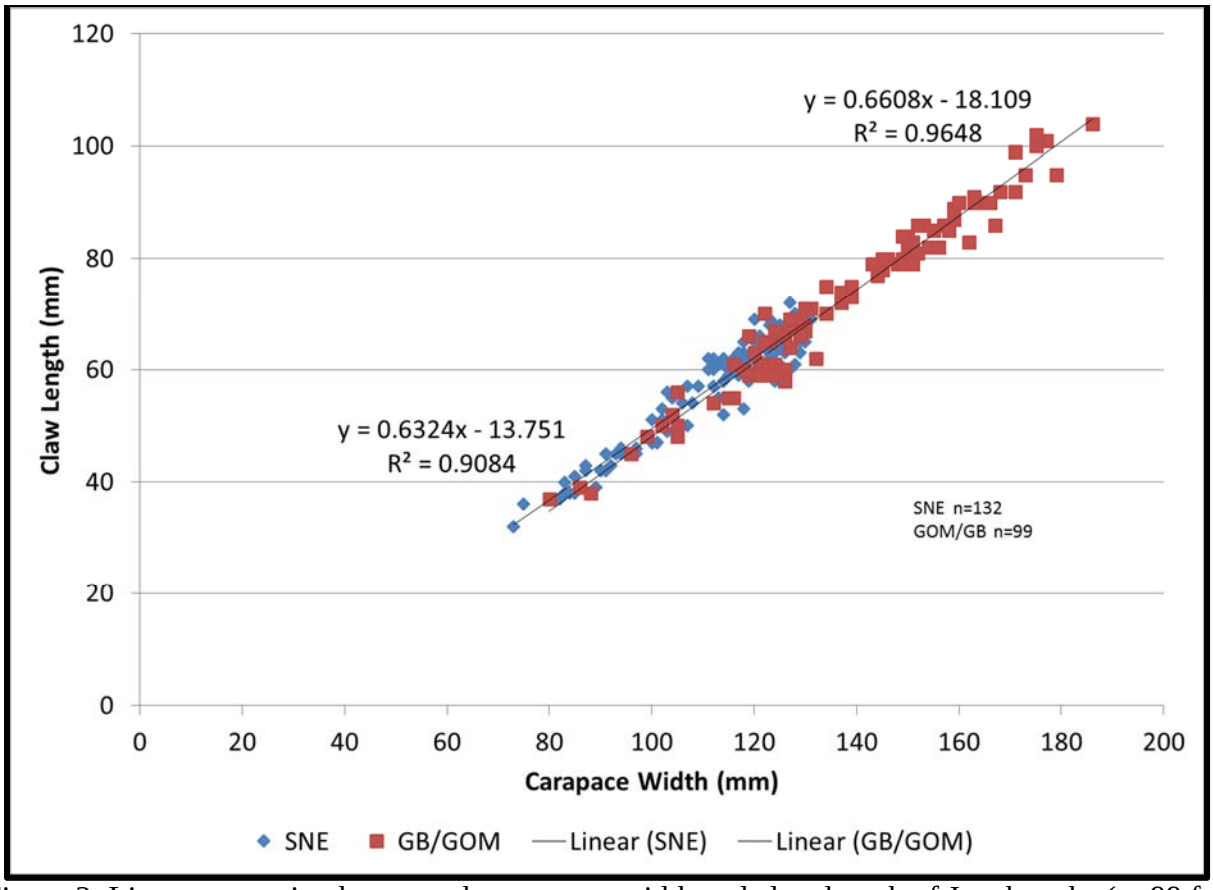


Figure 2: Linear regression between the carapace width and claw length of Jonah crabs (n=99 for GOM/GB and n=132 for SNE). For a male crab with a 4.75" (120.65 mm) carapace width, the linear regression expects a claw length of 2.42" (61.5 mm) in GOM/GB and 2.46" in SNE (62.5 mm).

The following data was provided by Craig Weedon, Maryland DNR, for Board consideration in regards to the Jonah crab claw provision.

As part of Maryland's sea sampling program, the carapace width and claw length of 40 Jonah crabs were measured. Of the 40 crabs, 20 were female and 20 were male. Claw lengths were measured from the tip of the bottom of the claw to the elbow. Figure 3 shows the relationship between carapace width and claw length for the Jonah crabs measured. The claws of female Jonah crabs are noticeably smaller than those from male crabs. The data suggests that a claw length of 2.75" would protect both males and female crabs at the minimum legal size of 4.75".

Figure 3: Relationship between Jonah crab carapace with and claw length from Maryland sea sampling (n=40). The red dotted line is the minimum size for harvest (4.75").

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
E.F. "Terry" Stockwell III, *Chairman* | Thomas A. Nies, *Executive Director*

December 18, 2015

Mr. Robert E. Beal
Executive Director
Atlantic States Marine Fisheries Commission
1050 N. Highland Street, Suite 200 A-N
Arlington, VA 22201

Dear Bob:

Our Council is currently working on an omnibus amendment to protect deep-sea coral habitats in the New England region from the impacts of fishing. During a December 15, 2015 meeting of the Habitat Plan Development Team, it came to our attention that Vessel Trip Report (VTR)-based maps of the distribution of effort in the lobster fishery may be missing some important grounds.

The enclosed figure shows the distribution of revenues in the lobster fishery between 2007 and 2012. More recent data from 2013 and 2014 (not shown) indicate similar patterns of effort. As you can see, there is no reported effort in the vicinity of Lydonia and Oceanographer Canyons. Industry members in the audience said that lobster effort is distributed along the entire shelf edge between Heezen and Alvin canyons, but that vessels fishing in some locations may not be represented in the vessel trip report data. We do not know if this is because they do not hold other federal permits that trigger the VTR requirement, or because VTRs record only one location for each sub-trip (gear/statistical area).

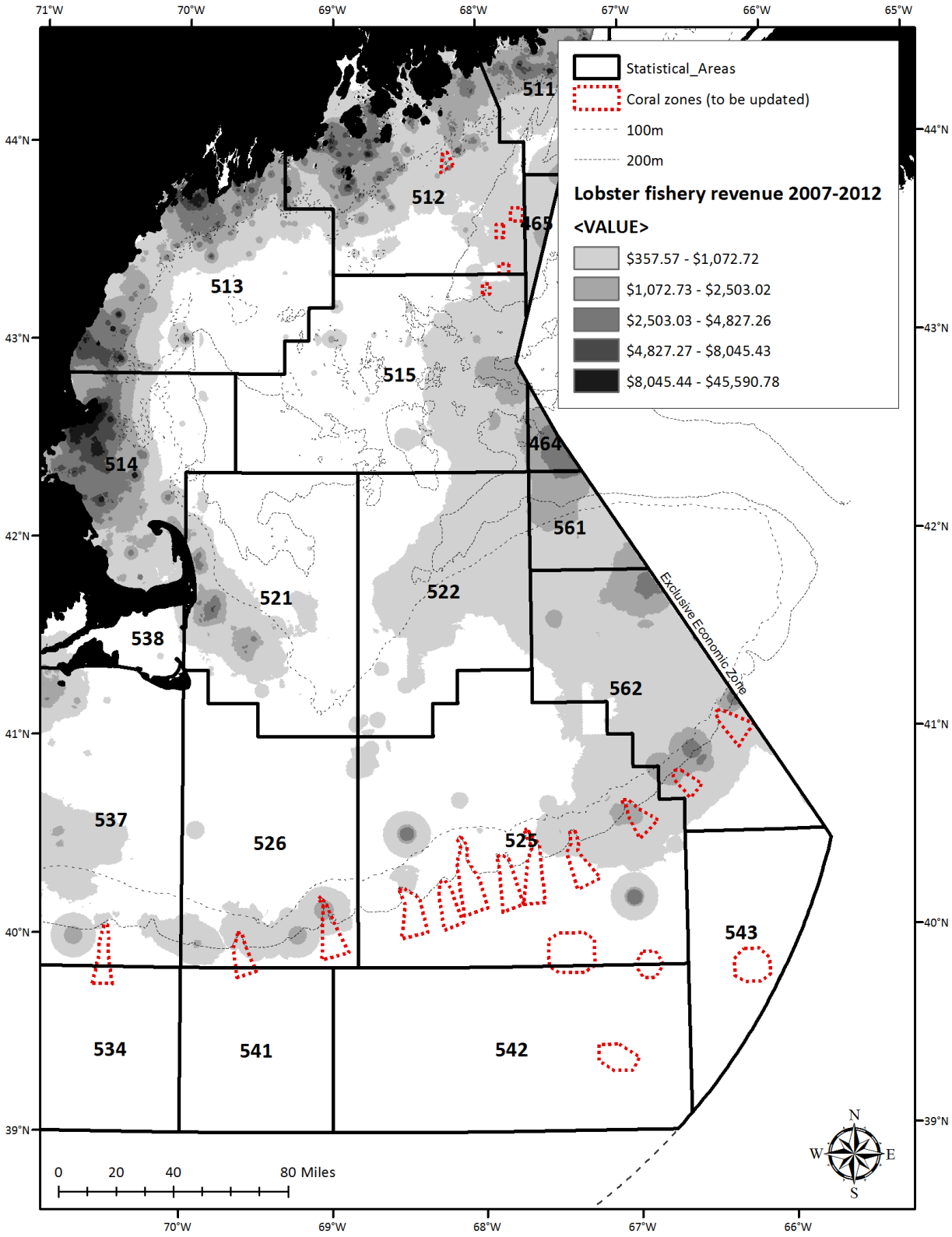
We are reaching out to you and your staff to see if you have data that can help us to better understand the distribution of lobster fishing activity in and around the canyons off Georges Bank and Southern New England. To be clear, the Council has not yet indicated that they intend to restrict the use of lobster traps within coral zones, but we want to be prepared to analyze effects on all fisheries operating within the region.

Michelle Bachman is the plan coordinator for this amendment and can answer any questions you may have.

Sincerely,

Thomas A. Nies

Thomas A. Nies
Executive Director


Statistical_Areas
Coral zones (to be updated)
100m
200m
Lobster fishery revenue 2007-2012
<VALUE>
$357.57 - $1,072.72
$1,072.73 - $2,503.02
$2,503.03 - $4,827.26
$4,827.27 - $8,045.43
$8,045.44 - $45,590.78
511
512
465
513
515
464
514
561
521
522
538
562
537
526
525
543
534
541
542
Exclusive Economic Zone
71°W
70°W
69°W
68°W
67°W
66°W
65°W
44°N
43°N
42°N
41°N
40°N
39°N
0
20
40
80 Miles
N
W
E
S

From: VISEL, TIM <TIM.VISEL@new-haven.k12.ct.us>

Sent: Wednesday, January 06, 2016 1:45 PM

To: Megan Ware

Cc: JOHN WHITTAKER; JON CARTER; Robert Baines; DAVID COUSENS; ARTHUR H.SAWYER JR.; Grant Moore; LANNY DELLINGER; DAVID SPENCER

Subject: Historical Lobster Habitat Study

Hello Megan,

I hope that you might be able to direct my email to the proper lobster habitat committee members – and perhaps respond to my proposal below as a follow up to emails several months ago.

My proposal is this – could the ASMFC take two to four years and assemble a climate habitat profile for the period 1880 to 1920 in southern New England for lobsters. I think that much of my disappointment with the stock assessment peer report (August 2015 which represents a huge undertaking I am certain) is that climate factors, the 1898- 1905 die off of Southern New England lobster populations was not included. Part of that climate/habitat discovery process would include the tremendous summer heating and thermal constraints upon cold water species during that time – including the lobster but also impacting Brook Trout, Smelt, Alewife, Bay Scallops and Quahogs as well.

I was anticipating a full habitat review for southern lobster population during this period which lead to the establishment of several New England lobster hatcheries and a surprising surge of Blue Crabs post 1900. Several Southern New England areas began to produce measurable quantities of Blue Crabs immediately following the 1898-1905 lobster die off and we have had the same situation occur again a century later.

All the New England states should help with this effort (my view) scanning and making available for all lobster fishers, the lobster habitat observations mentioned in numerous lobster hatchery records during this period.

I have many such records and would of course make them available to any such effort. A few months ago I mentioned a newsletter effort and attached IMEP #53 which came out shortly before the August assessment.

Please let me know if I can be of any help – I think this topic would be of interest to many lobster fishers.

Tim

The Southern New England Lobster Fisheries Collapse of 1898-1905

IMEP #53 Habitat Information for Fishers and Fishery Area Managers

Understanding Science Through History

(IMEP History Newsletters can be found indexed by date – Title on the BlueCrab.info™ website: Fishing, Eeling and Oystering thread)

The Sound School ISSP – Capstone Series

Do Climate Factors Lead to Habitat Failures?

The Rhode Island Narragansett Bay Lobster Die-Off Case History

Timothy C. Visel, Coordinator

The Sound School Regional Vocational Aquaculture Center

60 South Water Street

New Haven, CT 06519

Revised for Capstone/SAE Proposals, July 2015

ASTE Standards Aquaculture #6 Natural Resources #6, #7, #9

Aquaculture and Restoration: A Partnership
N.A.C.E., M.A.S. and I.C.S.R.
December 12-15, 2012
Groton, CT USA

Preface

Preface – July 2015

Of the southern New England states, Rhode Island, I believe, has the best historical records detailing the collapse (die-off) of the lobster fishery a century ago. When you examine some of the Rhode Island historical records (1890-1910), you get a sense of the frustration and questions from both fishers and fishery managers during this time; cold water fisheries, bay scallops, lobsters and quahogs were disappearing, while soft shell clams, oysters and blue crabs suddenly surged – to levels not previously recorded. Every time Rhode Island officials felt that they had a list of "native" species, the list was changed. When Tarpon were caught in Narragansett Bay that seemed to put fishery managers on edge and lead to the commission of the Narragansett Bay Biological Survey, which was used to find out what was going on; that survey continues today.

Footnote #1 – Fishes Known to Inhabit the Waters of Rhode Island by Henry C. Tracy, Biological Assistant, Wickford Station, 1909; E.L. Freeman, Camping State Rhode Island Printers, 1910, 176 pages

"In the year 1898, the Commission of Inland Fisheries began a 'systematic examination of the physical and biological conditions of Narragansett Bay"

The first List of Fishes of Narragansett Bay developed by Dr. H.C. Bumpus in 1900 (Dr. Bumpus was to lead in the development of lobster aquaculture at Woods Hole) was revised the second time by Dr. Tracy in 1910 was first revised in 1905.

As each list was to be finished, it had to be amended the capture of Tarpons in 1906 (pg. 72) caused a review after Block Island fishers noted strange fish not observed before (pg. 39-40) and from the tropics – "schools of fish not seen before (pg. 42)."

Some of the current biologists, fishery managers and shellfishers then were asking the same questions until the heavy rains of July 1898 hit the Providence, Rhode Island area sending, it is thought, thousands of tons of organic matter: manure, leaf and forest litter and human sewage into the upper Narragansett Bay. Professor A.D. Mead of Brown University wrote an article, "An Investigation of the Plaque Which Destroyed Multitudes of Fish and Crustacean(s) During the Fall of 1898." In this article, which appeared in Science Magazine in 1899 (and was reprinted in part by S. Nixon in 1992), describes the event:

> Upper Narragansett Bay Fish Kill of 1898 – A Classic Tannin/Sapropel Case History
>
> After heavy July 1898 rains – Dr. Mead Reports the following:
>
> "During the last two months the inhabitants of Rhode Island witnessed the following remarkable phenomenon. The water of a considerable portion of the Bay became thick and red, omitting an odor almost intolerable to those living nearby. The situation became alarming when, on the 9th and 10th of September {1898}, thousands of dead fish, crabs and shrimps were found strewn along the shores or even piled up in windrows.
>
> During the last of August, throughout September and a part of October streaks of red or 'chocolate' water were observed from near Quonset Point and Prudence Island, north to Providence, and, on the flood tide, up to Seekonk River, nearly to Pawtucket, a range of about fifteen miles. In other parts of the Bay, as far as could be learned, the phenomenon had not been observed.
>
> On the 8th and 9th of September the water became extremely red and thick in various localities from East Greenwich to Providence, and the peculiar behavior of the marine animals attracted much attention. Myriads of
> shrimps and blue crabs, and vast numbers of eels, menhaden, tautog and
> flatfish came up to the surface and to the edge of the shore as though struggling to get out of the noxious water. Indeed, the shrimp and crabs were observed actually to climb out of the water upon stakes and buoys and even upon the iron cylinders which support one of the bridges and which must have been very hot in the bright sun.

And even though that was written over a century ago, it fits the descriptions found today for similar low oxygen/high sulfide events. The 1898 "Plaque" was the last straw in a habitat battle that vanquished the lobster from upper Narragansett Bay. These shallow water habitats contained the highest heat and organic deposits.

Ammonia generation from them not only caused pH so high (basic), but it most likely killed larval stages and also killed adult fish in low oxygen events, adding to sulfide smells – and sulfide waters were so toxic, they were termed, “black water deaths.”

Rhode Island and other southern New England states soon felt the impact of larval, stage 4 habitat failure. The kelp/cobblestone forests in cooler water and colder areas (like eastern Connecticut) most likely held lobster populations longer, but eventually catches collapsed as recruitment failures were felt in the lobster fishery; with no “year classes “ being recruited into the fishery, catches dropped and then ended. Rhode Island’s response was to close its lobster fishery for a brief time in 1904. By 1905, all New England states (even later, New York) built lobster hatcheries. The heat had taken the lobster fishery to “ruin,” but its ruin can be examined in habitat reports. It got very hot and sulfur-reducing bacteria now likely had “plenty” to eat during this warm water/low oxygen period. A habitat battle between bacteria strains out of sight and leaving few clues happened in the shallows. Organic matter was reduced by types of bacteria that didn’t need oxygen; they used sulfate and likely changed habitat quality for small lobsters into a toxic killing field. At first the lobster fishers were blamed for the “ruin” of the fishery (overfishing), but eventually fishery managers agreed there were just no lobsters of any size; they seemed to have vanished. Even lobster tagging studies were discouraging. In 1904 through 1906, Rhode Island tagged several hundred lobsters in Narragansett Bay. Returns indicated that nearly without exception lobsters were leaving Narragansett Bay for deeper water. This was surprising and raised more questions (its ironic that during this “Great Heat” of the 1890s that those who could rushed to the shore for relief of the summer heat with breezes and cool waters. The concept that fish or lobsters would do the same and seek cooler waters is rarely mentioned in the historical literature. – Tim Visel)

Footnote #2 – State of Rhode Island Annual report of the Commissions of Inland Fisheries, 1905, Providence, Rhode Island, January Session, 1906, E.L. Freeman and Sons, State Printers, 336 pages

Liberation of Tagged Lobsters – page 114 – 115:

“The total number of tagged lobsters liberated in 1905 was 385 (pg. 114) and more went to the south (out of Narragansett Bay) with one lobster liberated at the same time (multiple tag released) traveled 11 miles in five days.” Of the 49 tags returned with the date in tack, 47 had moved south out of the Bay (Narragansett), 2 had moved north; one lobster had traveled 4 miles in one day (toward deeper, cooler water – Tim Visel).”

[Although the tagging program showed lobsters were all moving south, the concept that warming water may have impacted lobster movement was not mentioned – T. Visel]

While most of the research in recent times has targeted aqueous nitrogen compounds for removal, they represent a far less toxic or rapid (ready) nitrogen cycle – quickly used by algae and distributed by tides flushing and subject to dilution. It is the long (composting) nitrogen cycle, one that releases nitrogen compounds in high heat by sulfur-reducing bacteria, that is so damaging to inshore habitats. It is the long cycle by way of Sapropel that sheds ammonia in hot summers and purges sulfides in cold winters that is so toxic to fish and shellfish, especially the larval forms. It is not subject to distribution (except by storm energy or dredging) and kills by direct burial and then the byproducts of bacterial sulfate digestion. In fact, most recent information suggests (strongly) that the ready forms of nitrogen (nitrite and nitrate) buffer the impacts from the long Sapropel cycle fishers called marine

humus or mussel mud. Some of the shallow inshore habitats likely failed a century ago for lobsters. The upper Narragansett Bay was one of the first from available printed historical accounts.

This paper was developed for the N.A.C.E. conference in 2012 and looks at climate issues that precede habitat failures. It is a case history of the southern New England lobster fishery collapse of the 1900s and reviews habitat quality discussions that include temperatures.

A much larger paper, "The Northern Lobster Fishery and Climate Change," is also available from the Sound School Adult Outreach and Education program. A previous post, "Lobster Die off of 1898 and The Great Heat" IMEP #6, describes Rhode Island's response to the lobster die-off with first in the nation lobster larval upwellers. A Complex lobster hatchery and rearing facility was constructed in Wickford, Rhode Island in 1899. In 1905, Rhode Island was clearly leading the nation in aquaculture technology with its lobster larval upwellers.

I respond to all emails at tim.visel@new-haven.k12.ct.us.

Abstract

A little more than a century ago, the southern New England lobster fisheries collapsed. The lobstering industry was blamed for the decreased productivity (canneries, size regulation enforcement) and regulations enacted to prevent additional fishery losses. These regulations were ineffective and later modified. At the same time, New England states (and New York much later) built lobster hatcheries and designed rather sophisticated upwellers and larval grow-out culture bags (1905). Much research time and financial resources were dedicated to raising lobster larvae and later stage four lobsters for release into preselected habitat types. The efficacy of such large hatcheries (Booth Bay Harbor, Maine had the largest) remains in question today but as for the missing critical lobster life history segment, they were absolutely correct – stage four. As winters turned colder and the number of storms that raked the coast increased, habitat conditions improved hatcheries were closed except for Massachusetts.

In southern New England, our lobster fishery depends on a critical kelp/cobblestone habitat type that fluctuates from climate – temperature and energy conditions. In colder energy-filled periods, thousands of acres of glacier cobblestones, the remains of a retreating shoreline, provide the near-shore habitat structure services for kelp forests. These kelp/cobblestone forests contained the essential stage four lobster habitat. In times of high heat and low energy, these kelp cobblestone habitats silt over and fail, precluding a lobster fishery failure. Kelp/cobblestone transitions from smooth bottoms may be critical habitat types for stage four lobsters and other species as well but are largely dependent upon climate and energy cycles. Inshore areas that warm fastest may have become unstable for the larval stages, followed by a lack of substrate in deeper water.

Governments often turn to aquaculture when habitat failures lead to fishery failures as in the late 1890s. Today, a century later, during a period of recognized high heat and few storms, the southern New England lobster fishery has failed again. Interest has been renewed in lobster hatchery work that focuses upon stage four but habitat research should include kelp forests and habitat quality of estuarine soils as well.

Introduction

The Historical Importance of Kelp Forests to Lobster Populations

It is foolish to underestimate the impact we have had on the planet. In time we may know and reflect upon the extent of that impact. Until then, fishery history is one of the few instruments that can provide that reflection, and that history is not only about us but the natural world as well. Although many researchers have looked at the Narragansett Bay fish and shellfish populations ("A Century of Fishing and Fish Fluctuations in Narragansett Bay." (Oviatt et al, 2003) Few have made a direct climate and energy connection. This is surprising as to the huge volumes of historical material pertaining to Narragansett Bay, including the long running biological survey and Rhode Island early lobster culture experiments exist.

In this instance the failure in the lobster fishery is not from "us" or harvesters, but a long climatic cycle. The crisis in the Southern New England lobster fishery is a classic current example. The problem is that our capacity for understanding our long term ecological impacts habitat succession from natural cycles are far too short. For example, a severe storm may uproot large trees sending a cascade of small branches, twigs, and leaves to the forest floor. In several years, this wood becomes tinder dry; perhaps dry wood has accumulated in the area for decades. On a windy day, a poorly built campfire starts a horrific forest fire, the campsite is blamed for the fire, but for the conditions and amount of tinder, i.e. the huge amounts of dry combustible material is likely the result of the previous storm, and there is often no connection to these long ago natural conditions. It is natural to have forest fires; it is unnatural not to have them. We may not like them, or choose to fight them, but they are part of a natural cycle connected to climate and temperature. Forest fire capacity is enhanced in heat and dry periods, in times of above average rainfall and cool periods less forest fire capacity exists. We often forecast when extremely dry conditions are present and "issue red flag warnings" and grow up listening to "Only You Can Prevent Forest Fires". The truth of the matter is heat lightning is responsible for the greatest number of forest fires, not us or "you". It is also natural to have fishery failures following a habitat failure and for the Southern New England Lobster Fishery both have occurred after long periods of extended heat – 1898-1905 and again in 1998-2003.

The Law of Habitat Succession

But what happens after the fire, massive amounts of carbon are released (some would say recycled) land cleared and in time new habitats grass meadows emerge. That is natural; it is natural to have storms and forest fires and habitats experience this terrestrial energy cycle. To "protect us" from this energy cycle takes an enormous effort on our part and as terrestrial beings we constantly crave that habitat stability. We want the same habitat conditions to exist forever but sadly they cannot—that is not natural. A visit to a forest fire several years later with adequate rainfall we will see different yet healthy habitats, perhaps new species that were not there before and perhaps an absence of those who were there before, but again that is natural. As one habitat clock ends another often begins. We call that the natural law of habitat succession. It is easy to see if an historical habitat history is kept and reviewed over decades such as those observations after a forest fire. If the energy pathway is large enough and the habitat clock limited by any number of factors, a habitat extinction event can occur, even extinction as it is most difficult for many to accept, is in fact, natural, and a series of extinction events can lead to a species eventual extinction; it is rarely one extinction event, however, but a series of habitat setbacks over time.

The chief advantage over terrestrial natural succession is that we can observe it on land and the impacts of climate and temperature upon species. It is known that examining the "rings" of cut trees for example, can tell us much

about past climate conditions, a thick wide ring signifies good growing conditions, a series of narrow tightly grouped rings, not so good, perhaps dry or cool periods. We know that conditions change over time and what we see today may not have been so in the past, a past we often had little influence. It's not always about us, although that is often the perception after decades of public environmental policy debate. That is the largest challenge of the environmental community today is to accept the fact that we may impact the ecological balance of our planet but natural conditions must also be acknowledged and the environmental habitat history explained just as often as the negative human impacts, which seems today to be the only environmental message heard. (My view) The case history of the Southern New England lobster failure is a case in point –not many reports reference it even today.

And it is easy policy-wise to accuse resource user groups such as the lobster fisheries of overharvesting as resource use is often the first place historically we seek to explain such resource "failures" as "overfishing." A second area to blame is of course pollution bet even that concept over time does not hold up constantly. While lobsters in upper Narragansett Bay were leaving and dying, blue crab populations exploded. Few, if any reports would link increased pollution to the increase of blue crabs? With the lobster fishery this overfishing response is simply not the case. While it appears that overfishing is the reason for the decline, it is changed habitat conditions that caused the lobster fishery to collapse. In fact, our lobster fishing practices has increased the habitat carrying capacity by removing the largest of lobsters, freeing up habitat space and providing additional food for more yet smaller lobsters, a biological cannibalistic attribute of lobsters.

The Collapse of the Southern New England Lobster Fishery – Again

In the marine environment the environmental message is far more complicated and much more dangerous policy wise. In the case of the lobster fishery it has been highly regulated for over a century accepted and management practices promoted by both the fishers and regulatory community. Management measures include rules such as the female V notch, a large "oversize" spawning population and overall size of capture retention regulations. Many of these measures were supported by fishers and fishery managers however they could not stop habitat succession – that followed high heat, nothing could have prevented that.

In the late 1970s as our climate again entered a second warming period, New England winters warmed, and the number of coastal storms declined, it became hot with a few significant energy events we call hurricanes. Hurricanes acted as forest fires, changing conditions for many species just as marine forest fires on shorelines often destructive for existing habitats but creating conditions for new robust (energized) habitats. Hurricanes in colder weather scoured hundreds of miles of shorelines of silt, clearing near shore cobble stone habitats in which kelp often grew, clinging to cobblestones in five to fifteen feet of water. It is the long frond of ribbon like brown sea weed, a valuable crop for forage and protection that grips this cobblestone, cleaned and tumbled in the surf. Tens of thousands of acres of kelp/cobblestone habitat was created (or many might call "restored") in New England coastal areas in the 1940s and 1950s, and significant kelp forests grew upon these exposed cobbles. A review of the current "recent lobster fishery failure" does provide on insight as to what happened a century ago.

In Southern New England this habitat provided critical habitat for Stage 4 lobsters, as our shores lack the enormous habitat capacity of Maine's rocks and reefs, but for Southern New England Stage 4 lobsters, the kelp forests provided this essential habitat, at a critical life cycle time, both forage and protective cover. I used to set green crab traps in these kelp forests and would catch numerous small lobsters in them. Decades later I would begin to learn how important those kelp forests were but fifty years ago they were although annoying for me when

flounder fishing in the 1960s and 1970s. A flounder hook back then would snag the hold fast of the kelp and instead of a large winter flounder, a cobblestone and entire kelp blade came inboard, and many winter flounder fishermen at that time experienced this, which is why the flounder were also interested in what these kelp forests held – I guess even the small lobsters were food for winter flounder as well.

By the late 1970s the kelp "forests" started to fail in Connecticut, the cobblestones during a warmer period became buried in silt and by the mid 1980s, this habitat failed, and the shallow water kelp forests disappeared and with it, essential critically vital habitat for small lobsters especially that Stage 4 size, a critical size for our future lobster fisheries. The extent of the habitat failure would not be felt in the fishery for almost a decade; it takes about 7-10 years for a lobster to reach a size subject to legal harvesting. If a habitat failure happened it just wouldn't be known or connected to the loss of cobblestone kelp habitat many years before. The lobster industry has suffered habitat extinction events, and then a series of habitat failure episodes as waters continued to warm and near shore waters contained less and less suitable kelp habitat. It was getting too warm for the larger lobsters and they left the near shore shallows for the deeper water (shorts also), making them easier to catch and catches actually increased and then quickly collapsed. Higher temperatures drove very small lobsters from the shallows completely and caused them to suffer new and intense predator/prey relationships. This would extenuate the extent of the recruitment failure and then the eventual fishery collapse. Although some fishery regulators termed it overfishing, but with the regulatory controls on effort, size, escapement panels, and egg bearing females protected, it was a fishery failure that followed a habitat failure.

[In all probability one of the management/regulatory features of this habitat failure that worked against the lobster industry was to return "shorts" (undersized, sublegal) lobsters back to the marine environment during daylight. Here the blackfish (Tautog) and black sea bass which thrive in warmer water consumed most of the returnees which I personally observed in shallow water lobstering off the coast of Madison with my brother Raymond in the 1970s. In shallow water released lobsters were predated upon by blackfish that would dart out behind rocks and attack lobsters from the back, punching them hard and biting their tails, but it was so fast the returned lobster didn't stand a chance, especially if they landed on clear sand between rock ledges in blinding daylight. We felt badly and stopped emptying old lobster bait over them which actually chummed additional Tautog to the site and began throwing shorts up on the rocks that still had kelp so they could hide until dark, but even then a quick seagull could make short work of these shorts. Although we did not observe this activity in deeper water, we suspected it was a factor including predatory loss, we often thought about an evening haul (against conservation laws) so at least small lobsters would have some time to hide in darkness before the light. (It appeared on some occasions in shallow water Tautog appeared to be waiting for us.)

From my modest observations many decades ago, the attack from the blackfish was strategic, a large bite from above to the tail, from behind, and just in back of the solid carapace, in a few seconds the lobsters would quickly bleed to death, and then numerous small blackfish and some cunners (Tautogolabrus adspersus) would emerge and tear and rip the lobster body to shreds. The debate over daylight releases is something that has never been adequately addressed by the research community until present times, but the predation upon sub legal lobsters is real and increases in significance in the absence of kelp forests. It is thought that kelp cobblestone habitats often fringed the lobster rocks and ledges in the eastern part of Connecticut and provided some protection to thrown overboard shorts that today may not be the case. Some discussions have included the creation and study of rubble reefs in deeper waters (artificial reefs) to increase Stage 4 capacity, even in Maine. (See Capstone proposal for reef ball studies). Rhode Island has conducted some very successful experiments in this area.]

From an environmental history viewpoint, this habitat failure is not new, far from it, the lobster fishery; in Southern New England experienced that same type of habitat failure during The Great Heat 1880-1920. In this period (which is very similar to today's warmer winters) lobster recruitment levels sharply fell after decades of hot temperatures and few large storms, and strict regulations were enacted to prevent over fishing (many of the regulations today governing the lobster fishery had their beginnings during The Great Heat) and they include:

- Returning of berried or egg carrying females (Maine also had an oversize limit)
- An accurate way to measure lobsters- the lobster gauge – sublegal lobsters returned – called "shorts" today replaced length of lobsters.
- Seasons-Maine and Rhode Island only – Rhode Island in 1905 prohibited a fall fishery and reversed this decision in 1906. Maine allowed some communities to enact local management laws.
- Possession of lobster "parts"- must be whole and not mutilated.
- Licensing

What wasn't addressed was the climate and energy conditions during this period which were known for brutally hot summers (and extreme high water temperatures in shallow critical lobster Stage 4 habitat areas) and almost a total absence of hurricanes/strong storms. In this 40 year period only four significant storms, one blizzard (1888), the Portland Gale 1898 (category 2 hurricane wind gusting to 90 mph) and two summer gales 1903 and 1904 were known.

Compare this to the New England (North Atlantic) Oscillation a cooler more some filled time of 1951-1965 which saw some 27 named and severe storms. Long Island Sound would frequently freeze over or nearly so. This period would and did have significant lobster habitat impacts. It would destroy most of the deep water eelgrass meadows established during The Great Heat and replace them with kelp/cobblestone forests. The habitats created in the 1940s and 1950s (kelp forests) would sustain the lobster fishery for nearly a half century. Lobster populations in Southern New England – recovered.

The Collapse of The Southern New England Lobster Fishery in 1905

In 1888, the lobster industry in Southern New England centered then in Noank, CT, began to fail and much blame was placed at lobster canneries and poor harvest restrictions at the time. The lobster canneries closed as lobster supplies diminished, but habitats continued to warm and the catch per unit effort measured by the number of lobster traps set rose accordingly. It took more and more lobster traps to catch the same number of lobsters and eventually more traps to catch fewer lobsters – a symptom of overfishing. But what was really happening was habitats favoring lobsters were declining but those favoring the blue crab were increasing. As summers warmed and the kelp forests waned, a new vegetation appeared – eelgrass and with it, the blue crab. As the habitat quality for lobsters declined, the habitat quality for blue crabs increased. Blue crab populations surged at this time in Southern New England, especially in Narragansett Bay.

The increase in the blue crab was noticed in Narragansett Bay shortly after the turn of the century and blue crab population greatly increased in the bay into the teens. At the same time lobster habitat continued to decline setting up a collapse in the Southern New England lobster stocks. Maine lobster production did fall but nearly not as much as

Connecticut and Rhode Island and south of Cape Cod as declines were devastating and would take decades to "recover". (See Appendix 5).

The dramatic collapse of the Southern New England (1896) lobster fishery alarmed federal researchers, fishermen and the United States Fish Commission. By 1910, all of the New England states had built lobster hatcheries, all targeting that critical stage 4 lobsters. Millions of lobsters were released into the environment apparently with some success. Below is a short quote from "Report of Commissioners of Inland Fisheries," State of Rhode Island, (pg 5. 1905)

"The practical result of this planting of young lobsters is unquestioned. Reports from the lobster fishermen show that more small lobsters were present in the localities where the fry were liberated than have been seen before for many years. It will be but a few years before these small lobsters will be of marketable size and then the expense of developing the lobster rearing plant of the Commission will be returned to the inhabitants of the state many times over.

Such results as these are very gratifying, especially when we consider that nowhere else in the world have any such results been obtained. Indeed, nowhere else has it been possible to rear lobster fry at all successfully, and the results of your Commission's work have attracted the attention of those interested in promoting the fishery interests in all parts of the world.

In this country our work has been watched by the United States Bureau of Fisheries and the commissioners of other maritime states, and now that our efforts are crowned with success both the national Bureau and the commissioners of other states are ready to follow our example. Indeed, the neighboring State of Connecticut has already appropriated $10,000 to establish a hatchery, and a committee has visited our laboratory at Wickford to secure the information necessary to begin operations in their own waters."

The book issued by the State of Rhode Island in 1905 details the lobster hatchery upweller operations in a lengthy bulletin titled, "State of Rhode Island and Providence Plantations. Thirty-Sixth Annual Report of the Commissioners of Inland Fisheries" which details in 150 pages, some of the regional lobster replenishment efforts of that period, Rhode Island's work was a huge achievement- they developed the first larval upwellers.

The end of The Great Heat saw eelgrass meadows spread into deeper and deeper waters in warm temperatures and ample nutrients dense monocultures came into being, the meadows became so thick at times to impede navigation. Special propellers were designed for vessels so that they may travel bays and coves now filled with eelgrass. In extremely hot weather and after a stormy night, beachgoers arose to find mountains of loose eelgrass on shorelines. In Massachusetts eelgrass was removed so beach goers could even walk to the water line. In the hot temperatures eelgrass worked against several colder water inshore species, by slowing tidal exchange flows and created habitat conditions (too hot low oxygen) unfavorable for lobsters. In the end, vegetation rotted on the bottom in sluggish poorly flushed coves drawing oxygen from already high temperature oxygen depleted waters. The teens are remembered for some of the most horrific fish kills (winter flounder) on the South Shore of Long island during this time.

In areas such as Southern New England the inshore habitats are limiting and greatly susceptible to fluctuations in the kelp/cobblestone habitat. Created habitats although rarely studied do provide an increase in habitat capacity. Habitat creation for the small lobsters are critical because of life history parameters mentioned above, when small the predator/prey relationship is huge and habitats required for protection when lobsters mature it becomes a food/territory issue, and a struggle for habitat against other lobsters, rather than direct predators. This issue would be changed with the invention of the wire trap, lobster habitat capacity would be enhanced by the structure lobster pots provide even the feeding of sublegal lobsters has been compared to terrestrial bird feeders and resembles extensive "aquaculture" production systems. There is little doubt that lobster fishing practices have helped lobster habitat carrying capacity.

Capstone Proposal

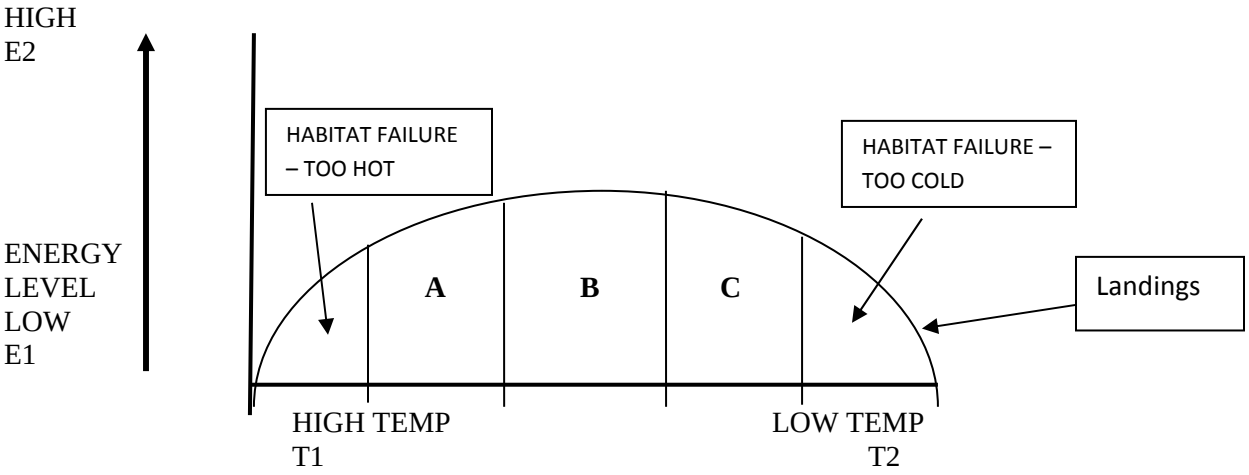
Longer lived species are able to overcome short term habitat disruptions – lobsters and hard shell clams have relatively long life spans, even longer than ours. One of the questions is why and some answers can be found in reproductive capacity, habitat capacity and habitat quality. For example, a long life span has been attributed to hard shell clams because heavy reproductive (recruitment) success is periodic after hurricanes and colder temperatures. The largest hard shell clam sets occur after strong storms and in cooler sea water temperatures, as habitat quality is then enhanced- a more alkaline soil and an absence of larval veliger predators dislodged by the previous storm or storms.

For lobsters in our area, cooler storm filled periods cleaned and sustained kelp/cobblestone habitats critical to the post larval sets, the crucial Stage 4. There can be plenty of eggs/larval presence in the water column available from plankton net tows but imagine if the critical Stage 4 habitat was gone, the predation would be immense, and a recruitment failure would most likely occur. This often happens with hard shell clams, they spawn every year and most years good quantities of clam veligers observed in the water column, but if the habitat conditions are negative (acid soil, high populations of predators) little if any "set" will mature into a clam fishery.

The same is true for the Southern New England Lobster Fishery; lobsters will continue to breed and produce eggs to viable fry but with hot temperatures and limited critical habitat most will perish and populations will decline. That is why lobsters are known as a "cold water species" but that explanation is far too simple, it's more than just warmer temperatures, it's the combination of warmer temperatures and declines in energy dependent habitat quality of a type suitable for lobsters. There is a direct climate and energy habitat link that few researchers today will acknowledge and fewer still understand and our lobster fishery has most likely the ability to make this connection from historical landing statistics more complete.

Figure 1.

INDEX OF LOBSTER HABITAT QUALITY – SOUTHERN NEW ENGLAND



T1- LETHAL LIMIT AT WHICH LOBSTERS SUFFER RESPIRATORY COLLAPSE – TOO HOT
T2- TEMPERATURE AT WHICH LOBSTER EGGS FAIL TO DEVELOP – TOO COLD
E1- ONE STORM/DECADE – INSUFFICIENT ENERY – TOO LITTLE
E2- TEN STORMS OR MORE/DECADE – HABITAT INSTABILITY – TOO MUCH ENERGY
A - BETTER FOR YOUNGER LOBSTERS TO STAGE 4- FASTER GROWTH UP TO A POINT.

B - BETTER OVERALL POPULATION
C - FAVORS FEWER BUT LARGER LOBSTERS – COLD SLOWS GROWTH.

It is the near shore habitats that drive habitat carrying capacity for the Southern New England Lobster Fishery.

It is also strongly suggested a direct movement of larval stages is to the north- due to prevailing summer winds and entrainment of larval stages held along the coast by offshore currents. If that is true an increase in water temperatures and decrease in enemy levels (storms) even wind direction and intensity would impact the southern areas first which it did at the turn of the century when it warmed noticeably from the 1870s. It was the Connecticut and Rhode Island lobster fisheries that noticed the reduction in Stage 4 lobsters: first, long before Maine and northern Massachusetts, but as the warming continued even these areas showed marked declines, lobsters could not live in the shallows as it became extremely hot (see Rhode Island Report of the Wickford Lobster Hatchery in Appendix 6) and lobsters derived of habitat cover protection persisted with new and different predatory/prey relationships often suffering much high mortality rates.

New England Lobster Landing Compared to Habitat Indexes on Figure 1

Table A	**RHODE ISLAND**			Final		Landings to Habitat Index	
YEAR	LANDINGS lbs		HERITAGE VALUE		HABITAT INDEX	low	CATEGORY
1962	575,000		(LOW)		Cold/energy		C
1977	3.4 million		+		Transition	increase	B to C
1986	5.5 million		++		cobblestone/kelp fails	heritage	B to A
1999	8.1 million lbs		++		cobblestone/kelp failure heat	Above heritage high	B to A
2009	2.9 million		.		fishery failure heat/low energy-loss of shallow habitats	declining	A-

	CONNECTICUT						
YEAR	LANDINGS		HERITAGE VALUE		HABITAT INDEX		CATEGORY
1962	lbs 250,000		(LOW)		cold/energy	Low	C
1977	750,000		+		transition	increase	B to C
1986	1.2 million		+		cobblestone kelp fails in warming/low energy conditions	heritage	B to A
1991	2.6 million		++		cobblestone kelp failure high heat continues growth/maturation rate higher	Above heritage	A to B+
1999	3.5 million		+++ high		habitat failure shallow water	Very high	A/B-
2009	400000		.		fishery failure loss of shallow habitats	declining	A-

Table A	MASSACHUSETTS			Final		Landings to Habitat Index	
YEAR	LANDINGS lbs		HERITAGE VALUE		HABITAT INDEX		CATEGORY
1962	3.8 million		(LOW)		cold/storms	Low	C
1977	8.0 million		+		Transition	Heritage	C to B
1986	11.8 million		++		cobblestone /kelp* failure (heat	Above heritage	B to A
1991	11.0 million		+		habitat failure South - habitat faiure North	Above heritage	B to A B

1999	15.8 million		.+++high		Habitat failure South Habitat failure North	Very high	A B to A
2009	10.9 million				fishery failure South habitat failure North	declining	A A
	MAINE						
YEAR	LANDINGS		HERITAGE VALUE		HABITAT INDEX		CATEGORY
1962	lbs 22 million		low		Colds storms	Low	C
1977	20 million		low		cold storms	Stable	C
1986	20 million		low		transition South	Stable low	C to B
1991	27 million		+		South Central North	Heritage	B C C
1999	50 million		.++		South Central North	Above heritage	B B B
2009*	90 million		.+++		South Central North	Very high	B to A B B

* Southern Mass. Fishery - Buzzards Bay /Vineyard Sound * Expect Maine landings to continue unless habitat catches in South regions begin to fail - could signify habitat failure for critical Stage 4 habitats

In times of habitat failure the fishery often improves as what may be ideal recruitment habitat quality may not be the same as mid or end cycle life history. Once lobsters had molted beyond the critical Stage 4 and reached one year old, they were able to compete in deeper water by nocturnal instincts. A period of warmth and few storms would favor the adult stages yet devastate the recruitment (year classes) of the young. Eventually, there would be no smaller lobsters to replace those harvested and catches soon (naturally) would decline. If it became too hot even for the adults which it did in Long Island Sound in the 1990s--even adult lobsters would perish, a habitat extinction episode on top of all larger long term habitat extinction events. That is how lobster production soared from 1.7 million lbs in 1983 to 3.5 million lbs in 1998 but crashed when habitat conditions failed for both small lobsters and adults reducing industry harvests to under 500 thousand pounds in 2004.

Therefore, temperature energy and climate conditions must take into account local water depths. The impacts would be first felt in the shallow coves and bays – those which warmed first, and the spread out eventually to even deeper waters.

Lobsters would naturally seek out colder waters, but those trapped in warm oxygen depleted waters would have only a few minutes at best to seek (some would say run) to deeper cooler waters. That is what happened during The Great Heat and the late 1990s again in response to warmer temperatures. Often lobsters trapped in lobster pots and unable to escape localized lethal oxygen depletion events and would perish in the lobster trap itself. This frequently happened during periods when oxygen depletion is most strong, just before sunrise.

During The Great Heat, 1880-1920, lobster production at first went up, and then dropped like a rock. It would take decades for lobster habitats to recover. That only happened after a period of cold and more "habitat" energy. The same pattern happened again (see chart #1).

As such the beginnings of massive habitat shifts at first are difficult to detect. In fact increases of catches of adults can often occur and those of a regulated size that enter the fishery actually increases as shown in figure one (B & C). Warmer temperatures for lobsters at first helps smaller lobsters survive (usually indicative of less damaging storms also) or are beneficial to habitat cover protection or availability of food (A & B). Colder temperatures most likely restrict larval production and over time, generally favors much fewer but much larger lobsters. This partially explains the first settler reports of giant lobsters in shallow waters – the first Colonists arrived during a harsh mini ice age and most likely approximated the natural carrying capacity of extreme cold or the C area of Figure 1 – extreme cold would restrict larval production but be offset by the extremely long life span of lobsters. In a higher temperature more juveniles could survive but increasing habitat competition if the adult habitats were limiting—less space and limited food availability. Due to the age and size restrictions, a movement to the left – adult numbers would rise and landings also masking for a while, the shift in habitat quality until catches fell off the left edge. In a climate/temperature habitat quality scenario, southern areas would experience a sudden surge in production first, followed by a dramatic collapse which is exactly what happened. It just got too hot and the juveniles' could not adapt and survive such conditions. That would be reflected in recruitment "failures" that preceded fishery failures.

The lobster fisheries of Southern Mass – RI and CT all show historic rapid rises in production, habitat index shifts to the left and then far to the left – to much heat for a fishery collapse. Larger lobsters who survive will seek out colder deeper waters. Many of the female V-notched lobsters in eastern CT according to some lobster fishermen at a Sound School meeting July 2010 were reported to be caught off Block Island Sound. Those Long Island Sound lobsters that remained would tend to move to the deepest, cooler waters as possible.

Secondary Mortality Features

When lobster mortalities hit Connecticut in the late 1890s (1898 being the worst) black tail was described to me by Jeff Wilcox of Stonington CT. Oral history recalls by Mr. Wilcox reports of lobsters dying in heat on the way to Fulton Fish Market then on trains after the Civil War, with lobster showing "black tail" which could be red tail – a bacterial disease that collapses the circulatory system and the tail meat appears dark red. It is known that in waters so warm heat stress can weaken lobsters promoting diseases and related mortalities. Certain disease organisms thrive in warmer waters filled with organic matter and induce oyster and blue crab diseases as well. Waters with contaminants also have a role, any substance that could weaken or harm lobsters (like pesticides) in warm or hot water is far more dangerous. Organisms already stressed by environmental conditions (low oxygen) have reduced disease fighting capacity, may be too stressed to feed or even too weak to avoid predators. Lobstermen in Connecticut refer to lobsters in 1998 as lifeless and lethargic that was why. All of these factors should be taken into consideration.

With the continued warm temperatures and recruitment failures in the Southern New England Lobster fishery – (CT lobster production has fallen to below 300,000 lbs –an historic low).

In 2009 Southern Massachusetts Fishery (Buzzards Bay and Vineyard Sound) landed 177,000 lbs also historic lows for that region.

However, the lobster fishery in Maine continues to improve indicating enhanced growth rates and enhanced habitat reproductive capacity. It is also known that the warmer temperatures in Maine have favored the growth of kelp – thought to be habitat limiting in our region. The 2011 catch in Maine is now over 100 million lbs or four times its estimated heritage or baseline value of 25 million lbs. It is thought that wire lobster traps have enhanced habitat carrying capacity (i.e. feeding stations for sublegal lobsters). Warmer water has enhanced kelp and may have improved juvenile survival. It is also shown that warmer waters lobsters do grow faster and sexually mature quicker. In Long Island Sound's western region in the 1970s and 1980s had 30% of sublegal female lobsters were sexually mature and often egg bearing. All of these factors including low cod predator populations should be considered in Maine's tremendous surge in production.

But what about the other states, Southern Mass, Rhode Island and Connecticut could it be just coincidence that all three states reached record landings in 1999. No, I don't believe so, all indicate massive habitat failures for several cold water species not just lobsters, and they include bay scallops, winter flounder and lobster share most of not all of that critical shallow water habitat during part of a critical life cycle stage; all have had "fishery failures" after "habitat failures". Good fisheries management policies (regulations) could not stop region wide climate/energy shifts or impacts habitat losses continued, just as it could not a century ago during the period 1880-1920 when the New England states all built lobster hatcheries after a similar habitat failure occurred- Boothbay Harbor, Maine being the site of the largest US Lobster hatchery ever built to date.

Capstone Questions

(1) Is it possible to build a habitat history for Connecticut lobsters – most of our fisheries history records still exist in storage at the DEEP Marine headquarters in Old Lyme, CT.

(2) Can we build or demonstrate opportunities for increasing Stage 4 lobster habitats- in deeper cooler waters, such as reef balls or rubble reefs similar to similar reefs built in Rhode Island.

(3) What is the historical importance of kelp forests to lobster populations – current reports or papers on the subject are available.

Thank you for considering the Connecticut lobster fishery as a possible Capstone project. If you have questions about the State of Connecticut high school graduating requirement – "Capstone Project" you should contact your guidance counselor. ASTE students please contact your FFA-SAE advisor.

Appendix 1 Predator/Prey Relationships

There is some evidence that in western Long Island Sound, other habitat types also helped lobsters – oyster beds both cultivated and natural and soft mud bank burrows in rivers and creeks. In cooler temperatures, lobsters frequently dug in soft clay sediments have making extensive lobster burrows. In times of high heat these habitats

would also fail, (sulfide and ammonia purging) and if temperature were high enough would stress and perhaps kill adults who often left small lobsters to the predatory impacts of libina, the spider crab with this long tapered claws could reach in and capture small lobsters. Reports in the 1980s include reports from Connecticut lobstermen that huge populations of the spider crabs "had overrun" rock ledge habitats once known to contain thousands of shorts (lobsters). It was felt that the larger lobsters that defended territories and tended to keep spider crabs from juvenile nursery areas left the shallows leaving small lobsters defenseless against enhanced spider crab populations.

Appendix 2

United States Dept of Interior Statistics Digest 59
Fishery Statistics of the United States 1965
Charles H. Lyles GPO 1967
Washington, DC
History Fishery Statistics for New England Northern Lobster Catch
1879-1965

The Collapse of the New England Lobster Stocks during the Great Heat 1880-1920

All states Maine, Massachusetts, Rhode Island and Connecticut total pounds of lobsters landed – 1924 being the base of the collapse except RI 1889 base year

Maine 1889 – 25 Million lbs *[1]
1924 – 5.5 Million lbs
1965 – 19 Million lbs

Massachusetts 1889 – 3.3 million lbs
1924 – 1.6 Million labs
1965 – 6.5 Million lbs

Rhode Island 1889 – 500,000 lbs *[2]
1924 – 1.5 Million lbs
1965 – 1.8 Million lbs

Connecticut 1889 – 1.6 Million lbs *[3]
1924 - 700,000 thousand lbs
1965 – 743,000 thousand lbs

*[1] Maine's Heritage Production value is suspected being 25 million lbs.
*[2] Rhode Island collapse started in 1886 – closed lobster fishery in 1905 – from the 15 of November to the 15th of April – repealed in 1906.
*[3] Reflects landing from New York and Rhode Island waters also
---

Appendix #3

State of Rhode Island and Providence Plantations

Thirty–Sixth Annual Report

Of the

Commissioners of Inland Fisheries

Made to the

General Assembly

At Its

January Session, 1906

Providence:

E. L Freeman & Sons, State Printers

1906

Report of Commissioners of Inland Fisheries

VIII. The Propagation of Lobsters Fry for the Purpose of Increasing the Supply of Lobsters in the Waters of the State. Methods of Artificial Propagation and Cultivation.

Lobster Culture in 1905

By Earnest W. Barnes,

Assistant Superintendent of the Wickford Experiment Station

The first mature lobster eggs were scraped into a hatching bag about noon on the 21st of May, and by 1pm of the same day nearly all had hatched. These eggs were obtained from one egg lobster, and no more lobsters with mature eggs were found till the 24th. The hatching then proceeded quite rapidly. The last lot of eggs was hatched on the 21st of July. By August 1st al the fry had reached the fourth stage, except a few weak undersized ones. Consequently, after a continuous run of 71 days, the engine was shut down and the season closed. The work usually closes by the middle or last of July, and it is quite remarkable that the season should last till the first of August.

The weather conditions throughout the season were very good. The absence of any bad storms and the many bright warm days made the season one of the best the station has had.

Introduction

The success in lobster culture attained by the Commission of Inland Fisheries, at their Experiment Station at Wickford, is one of those few remarkable successes in artificial marine culture which have been reached through a long course of slow and, at times, disheartening experiments. The ordinary method employed in the artificial propagation of fishes, the mere hatching the eggs, has been of little avail in the case of the lobster. Its failure may be stated, briefly, as due to two causes: The first and most important of these is the slow growth of the lobster,

the length of time required to reach maturity and propagate itself naturally; the second is the prolonged period of larval helplessness.

If we leave out of consideration the helpless larval period we find that the lobster in its natural state is not materially handicapped in its struggle for maintenance, except in the particular fact of its slow growth. With reference to the natural advantages it might be stated that its life on the sea bottom, together with the instinct of hiding in burrows in the mud or under rocks, affords much better protection than fishes seem to posses. Besides, there is perhaps no external part, unless it is the eye, which can be lost in injured without the lobster being able to replace it. The loss of a fin or the upturning of a few scales will often be sufficient cause for the death of a fish. The lobster also has the advantage of having its eggs more surely fertilized and afterwards cared for by the parent until hatched. The eggs of most fishes are thrown into the water, and depend on chance fertilization and favorable circumstances for their fostering. But against the human foe the lobster in powerless, and there has been a rapid decrease in their abundance since there was a demand for them in the market.

Because the lobster possesses, in a high degree, natural advantages for protecting itself, except in its larval helplessness, it seemed necessary to adopt some measure of rearing them through this latter period. For more than a decade experiments were pushed with vigor by the various States, the United States Government, and also by European governments. The many difficulties, however, prevented success till 1900, when the honor of having offered the first and, up to the present time, the only solution of the problem was won by a Rhode Island Commission at Wickford. It has taken, nevertheless, since the discovery of the principle, five years of slow and tedious experiments to develop the scheme to the point where it is practical and economical.

Fifty per cent in round numbers (48.2 per cent actually) have been reared from the first to the fourth stage in lots of 20,000. It is in this stage that the fry commence to burrow and are, therefore, more able to care for themselves. These figures will be appreciated when it is recalled that the best result in Europe was 6.6 per cent from an estimated 3,000 fry in the first stage of Woods Hole.

Appendix 4 REPORT OF COMMISSIONERS OF INLAND FISHERIES

SHORT LOBSTERS.

There was a greater number of small lobsters caught last season tan there has been before for a great many years. It is quite significant that this reported increase in number comes almost entirely from that part of the Bay where the Commission has liberated its fourth stage lobsters. Because of its nearness, the region about Conanicut Island has received the greater part of the output in the past years. Walter H. Munroe, who sets lobster pots along the west shore of Conanicut, reports that during the past year he very seldom pulled in his pots but that four or five small lobsters would slip out between the slats. At Dutch island harbor, somewhat near the central part of the island, the lobsters under nine inches area so numerous that the lobster deputies have had considerable difficulty in preventing their sale. It is the common opinion that, in spite of their vigilance, barrels of “shorts” have found their way into the market from this place. The two deputies are very much handicapped in their efforts by having such an extensive shore to cover, especially considering that their only means of getting to the pots is in what boats they can get on the nearest shore. The great number of small-sized lobsters looks very promising for the future supply of lobsters in Narragansett Bay, and extremely encouraging for the scheme of rearing used at Wickford.

RECORDS.

A careful record of each lot of lobsters, with conditions under which they were reared, was made and filed in a card catalog. From this catalogue the following tables are taken:

REPORT OF COMMISSIONERS OF INLAND FISHERIES.
LIBERATION OF FOURTH STAGE LOBSTERS, 1905.

Date	Locality.	Number	Character of Shore
13-Jun	East Poplar Point	400	Rocky
26-Jun	Little Tree Point	3000	Very rocky, abundance of rockweed
27-Jun	East Poplar Point	9000	Rocky
28-Jun	Wickford Cove	200	Muddy Bottom
6-Jul	Point Judith Pond, Billings' Cove	15000	Stony, light seaweed
11-Jul	Warwick Neck, below Rocky Point	10000	Rocky
13-Jul	Portsmith	10000	Rocky, rockweed
13-Jul	Kickemuit River	15000	Rocky, rockweed
17-Jul	Conanicut Island	12000	Rocky ledge, rockweed below
21-Jul	Dutch Island Harbor	20000	Muddy Bottom
29-Jul	Conanicut Island	6000	Muddy bottom
	Total liberated	100600	
	Used for experimental purposes	2972	

*This number is that of the fourth stage lobsters actually counted. In addition to these there were many first, second and third stage lobsters preserved for study, and some fourth lobsters were liberated in the cove by accident to the bags.

Total Number of Fourth Stage Lobster Reared Each Year Since 1900.

1900	3425
1901	8974
1902	27300
1903	13500
1904	50597
1905	103572
Total	207368