



Atlantic States Marine Fisheries Commission

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Northern Shrimp Section and Advisory Panel Meeting Summary

Westin Portland Harborview, Portland, ME
June 12, 2015

Section Members:

ME — Steven Train, Terry Stockwell
NH — Ritchie White, Dennis Abbott, Doug Grout
MA — Mike Armstrong (Chair), Bill Adler

Technical Committee Members:

Maggie Hunter, ME DMR
Kelly Whitmore, MA DMF

Advisory Panel Members:

Gary Libby (Chair), Spencer Fuller (Vice Chair), Mark Bennett, Marshall Alexander, Arnie Gamage, John Seiders, Andrew Lang

ASMFC Staff:

Toni Kerns, ISFMP Director
Max Appelman, FMP Coordinator

Public: For public in attendance, please see the enclosed sign in sheets.

Purpose: Review public comment for the Public Information Document (PID) to Draft Amendment III to the Interstate Fishery Management Plan (FMP), and provide direction to the Plan Development Team (PDT) in drafting Draft Amendment III to the Northern Shrimp FMP for public comment.

Advisory Panel Meeting (9:00 am-11:30 pm):

The Advisory Panel (AP) met to review public comment from the PID for Draft Amendment III, and formulate recommendations for the Management Section to consider in the development of Draft Amendment III for public comment.

Staff presented the public comment summary to the Advisory Panel (enclosed). In general, state-by-state allocations received more positive feedback from public comment than a limited entry program. Additionally, many comments were in support of management measures that maintain biological viability of the fishery by minimizing catch of egg bearing females and small males.

The Technical Committee (TC) presented a report of the 2015 winter sampling (enclosed). In the absence of commercial fishery, samples were collected under a Research Set Aside (RSA) program to continue the TCs biological time series for the annual northern shrimp stock assessment. Results showed an unusually high proportion of small egg-bearing females. Also, egg hatch was later than recent years, and continues to be correlated with temperature.



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In regards to the 2015 winter sampling report, AP members suggested the sampling area should be expanded to include offshore areas and more coastal coverage if a similar sampling study was to occur in 2016. It was identified that the presence of lobster traps may hinder the ability to expand the sampling area. TC members will work to increase cooperation with lobstermen so the proposed sampling areas are free from lobster gear, and shrimp trawlers are able to fish as they normally would during a commercial season.

The AP was in agreement that state-by-state allocations was the best way to manage the northern shrimp fishery because the fishery naturally moves from state-to-state throughout the season (from Southwest to Northeast along coastal Gulf of Maine), and each state should be able to set its own regulations to meet the respective needs of their states fishery. AP members stipulated landings history used to determine state-specific allocation percentages be based on the best available data and reflect the longest timeframe possible. From that point, the bulk of conversation was directed towards state-specific regulations in the event of state-by-state allocations. Since the states would ultimately manage their fishery independently under a state-by-state allocation program, there was not consensus recommendations to the Section.

Management Section Meeting (1:00-4:00 PM):

The Section met to review the public comment summary from the PID, the TCs report of 2015 winter sampling, and the APs recommendations before considering with the development of Draft Amendment III.

Section members asked if there was a relationship between time of egg drop and recruitment success. The TC replied there appears to be a correlation with temperature and algal biomass, which is a major food source for immature shrimp, and could provide insight into the egg drop-recruitment relationship.

The AP reported their recommendations for Draft Amendment III for public comment; mainly consensus that state-by-state allocations (rather than limited entry) is the preferred management measure. Option B2, as proposed previously in Draft Addendum I to Amendment II, was the preferred Total Allowable Catch (TAC) allocation method (i.e., landings data from 2001-2011; 89.8% to ME, 8.8 to NH, and 1.4% to MA).

The Section discussed the PID issue by issue and gave direction to the PDT for various options to include in Draft Amendment III for public comment, starting with the goals and objectives of the current Fishery Management Plan.

Section members identified the need to include an objective that directly addresses the management of participation to promote long term fishery sustainability.

Some Section members expressed considerable concern regarding a limited entry program because of the high number of license holders in the fishery, and state regulatory procedures that would make it difficult to implement a limited entry program. Other Section members expressed a state-legislature should not influence the Sections decision making, and limited entry should still be considered as a viable management option. The Section tasked the PDT to develop limited entry and state-by-state allocation management options in Draft Amendment III for public comment. The Section was explicit about including license capping and fixed percentage share program options and time frames be consistent across all options. The PDT will also develop license transferability options, a license capping

option using attrition as means of reducing licenses, TAC overage options that would not penalize those states that fished within their allocation, and a projecting season closure program.

In regards to specification process related management measures, the PDT in collaboration with the TC, will develop language for how to set the TAC under Draft Amendment III in the absence of biological reference points. Additionally, the PDT will develop and include multi-year specification options that allow the section to set various regulations (e.g., TAC, trip and trap limits, season dates, and RSA) for multiple years as opposed to one year at a time.

Other management options to be included in the draft amendment are defined season options reflecting egg hatch timing, gear-specific seasons, state-specific seasons, and area-divided management units (i.e., dividing the coast into area-specific management units). Also, mandatory use of size sorting grates options will be developed since the AP, TC, Section, and public all tend to agree protecting egg bearing shrimp is vital to the existence of a viable fishery.

Motions:

Move to include a management objective that would state “manage participation in the fishery at levels that would result in an economically viable fishery and long term sustainability for the northern shrimp resource. Motion by Mr. Grout. Second by Mr. Adler. Motion passes 2-1.

Move to task the PDT to develop Draft Amendment III for public comment. Motion by Mr. Stockwell. Second by Mr. Adler. Motion passes without objection.

Move to adjourn. Motion by Mr. Adler. Second by Mr. Stockwell. Meeting adjourned.

Documents enclosed:

Section and Advisory Panel sign in sheets
Public Comment Summary
2015 Winter Sampling Report

Northern Shrimp Advisory Panel Meeting

Atlantic States Marine Fisheries Commission

Westin Portland Harborview (formerly the Eastland Hotel)

Portland, ME

June 12, 2015

-- PLEASE PRINT --

<u>Name</u>	<u>Organization</u>	<u>City / State</u>	<u>E-mail</u>
MARSHALL ALLEN	FLORIDA DEPARTMENT OF NATURAL RESOURCES	DADE COUNTY, FL	
MARK BENNETT	FLORIDA DEPARTMENT OF NATURAL RESOURCES	DADE COUNTY, FL	
Arnold Gault Jr	AP Shrimp Trap	So. Bristol ME	
Andrew Long	AP NH	New Castle, NH	
Reginald Howard	FLORIDA DEPARTMENT OF NATURAL RESOURCES	SOUTH BRISTOL, ME	
John DeLorenzo	AP MAINE	So Bristol / ME	
Steve Feun	ASMC		
Chris Paulsen	DMR	Portland	
Pam Thomas	NORFOLK / NMFS	PORTLAND	Pam.Thomas@noaa.gov
Seamus Eusem	City Harbor	Boothbay Harbor	Seamus.Eusem@maine.gov
Maggie Hunter	ME DMR	Boothbay Harbor	
John Paulsen	Maine State Dept of Inland Fisheries & Aquaculture	Booth Bay	
NEWBOLD VARRIN	FLORIDA DEPARTMENT OF NATURAL RESOURCES	PORTLAND ME	
Manssa Hammond	RENOSSOFT EAST	SPRINGTON ME	
Myke Amersberg	MA Dept of Shrimping	CLAREMONT, MA	
Joseph Susek	AP Section	CLAREMONT MA	Wynflave Lab, fishing@gmail.com
Kelly Whitmore	DMR	CLAREMONT MA	



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MEMORANDUM

May 29, 2015

To: Northern Shrimp Section and Advisory Panel
From: Max Appelman, FMP Coordinator
Subject: Public Comment on Northern Shrimp Public Information Document for Amendment 3

The following pages represent a summary of all public comment received by ASMFC by April 15, 2015 at 5:00 p.m. (closing deadline) on the Public Information Document (PID) for Amendment 3 to the Northern Shrimp Interstate Fishery Management Plan.

A total of 19 written comments were received during the public comment period. Four of those comments were from the following groups and organizations: Associated Fisheries of Maine, Maine Coast Fishermen's Association, Maine Lobstermen's Association, and Penobscot East Resource Center. Written comments were submitted primarily by Maine trap and trawl fishermen. A summary of the written comment (PDF pages 27-29) is provided as well as individual comment letters (PDF pages 40-82).

All states within the management unit held a public hearing; there were two in Maine and one in both New Hampshire and Massachusetts. Approximately 128 individuals attended all the public hearings. A brief summary of comments received at the public hearings is provided, followed by detailed summaries for each hearing (PDF pages 30-39).

Written Comment Summary

Five major themes were identified and supported throughout public comment received:

1. Amending the FMP to promote the long term sustainability of the northern shrimp fishery.
2. Supported limiting effort, although not necessarily by means of limited entry (e.g., gear and vessel restrictions also a means of reducing effort).
3. Maintaining State's access to the resource that is based on historical landings.
4. Allowing new participants to enter the fishery if limited entry is implemented.
5. Management measures that maximize the catch of large females while minimizing catch of egg bearing females and small shrimp

ISSUE 1: LIMITED ENTRY INTO THE FISHERY

Limited Entry	in favor	not in favor	no preference
Individual	4	4	7
Group/Organization	2	2	-
Total	6	6	7

Those in favor of limited entry generally agree:

- That limited entry should be implemented as a measure to moderate the boom and bust cycle of northern shrimp and provide for a more stable harvest from year to year.
- That the current control date of June 7, 2011 is appropriate.
- To freezing the number of licenses at current levels, and assigning
- Landings history assigned to individual vessels in conjunction with the longest timeframe possible.
- That new participants should be encouraged to enter the fishery, at some "Entry Level Quota," via a weighted lottery system as attrition occurs (e.g., as individuals leave the fishery, individuals are allowed in using a weighted lottery system).

Primary reasons identified by those not in favor of limited entry include:

- The shrimp fishery is currently a supplemental fishery
- Limiting effort by other restrictions is more applicable to the long term sustainability of northern shrimp biomass.
- Concern of a barrier to younger fishermen trying to enter the fishery; contrary to simplicity of current/past participation.
- Fear of unfair exclusion of participants that have shown commitment to the fishery; many fishermen have fished extensively in years prior to proposed timeframes
- Feared that a few permits would eventually control most of the total allowable catch (TAC)

ISSUE 2: STATE-BY-STATE ALLOCATION

State-by-State allocation	In favor	Not in favor	No Preference
Individual	1	5	9
Group/Organization	*1	3	-
Total	2	8	9

*support by default; prefer state-by-state rather than limited entry

- Majority of public comment received is opposed to state-by-state allocations.
- Primary concern is that the TAC will be unfairly allocated to Maine.
- Those in favor suggested the states allocate quota to individuals and/or vessels based on landings history during a specified timeframe.
- Little opposition to allowing fishermen in different states to transfer quota between states.
- Vessels could be allowed to land in other states as long as they had state issued permits and/or quota for that state.

ISSUE 3: HOW SHOULD THE SPECIFICATIONS PROCESS OCCUR UNDER AMENDMENT 3?

Key points from public comment received relating to Issue 3 are as follows:

- Five comments suggest that 87/13 gear allocation should be revisited, and closer to 50/50
- A defined season from some date in January through March
- Management measures reflective of minimizing catch of egg-bearing females.
- No trip limits; catch limits had minimal support.
- Research set aside: 3 support, 1 against
- Three comments in favor of multi-year specs. Sixteen no comment.

ISSUE 4: SHOULD THE GOALS AND OBJECTIVES OF THE FISHERY MANAGEMENT PLAN FOR NORTHERN SHRIMP BE REVISITED?

Current goals and objectives are appropriate as identified by the Interstate Fishery Management Plan for northern shrimp, although current management effort should focus on goals and objectives relating to rebuilding stock biomass as opposed to social and cultural goals and objectives.

ISSUE 5: OTHER ISSUES; how would you like to see northern shrimp managed in the future?

Public comment received under issue 5 was primarily for management measures that minimize the catch of egg bearing females and small shrimp including:

- size sorting grates to reduce catch of small shrimp

- no trawling within 3 miles
- minimum count per pound
- different trawl and trap seasons to minimize catch of egg-bearing females
- restrict mesh size, roller size, and sweep length
- restrict number of traps
- some comments in reference to individual quotas and TAC allocations, but were addressed in Issues 1 and 2.

Other notable comments from written comment:

- Should be able to pass landings history to a family member
- Lowest year should be dropped in the final calculation for assigning landings history
- Trap only fishery in 2016; initiate buy-back program for trawlers to switch to traps
- No trawling until biomass recovers
- Daily catch limit will demand higher market prices
- Put a freeze on the current number of licenses
- No fishing until 50% egg drop
- Regulations should focus on small/egg bearing shrimp
- “Use it, or lose it” license requirement if limited entry
- Individuals that have shown commitment should not be excluded
- Research on gear technologies to reduce catch of egg bearing females and small males
- Catch shares, or days allowed to fish, assigned to license based on historic days-at-sea for that license (i.e., higher catch allotted to licenses that depend more on the resource)

Public Hearing Brief Summary

Massachusetts:

No attendance

New Hampshire:

Attendees provided suggestions for a limited entry program including how the number of licenses should be capped and how the quota could be allocated to the qualified licenses.

Attendees also provided suggestions for state-by-state allocations including discussion on quota transfer limitations, and where particular state issued permits could operate under the regulation. Some small discussion occurred on other issues, including how the specification process should occur under Amendment 3.

Maine:

Many commenters were not in favor of limited entry, and there was minimal support for state-by-state allocations. Heavy support was received for allowing young fishermen to enter the fishery. Other discussion included the time frame to be considered when attributing landings history to permit holders, quota transfer limitations, vessel and gear restrictions that protect egg bearing shrimp, and acknowledging goals and objectives when making management decisions.

New Hampshire Public Hearing

Public Information Document for Draft Amendment 3

13 Attendees

Meeting Staff: Mike Waine (ASMFC), Douglas Grout (NH F&G), Cheri Patterson (NH F&G)

Meeting Participants: See enclosed sign in sheet

Issue 1: Limited Entry

-State should hold the licenses and there would always be a set number of licenses so that new participants could enter into the fisheries

-Limited entry program suggestion

- Cap total number of licenses by state from qualification period and assign licenses by state to a vessel
- Qualification period: Two in favor for 2001-2009 would like to see data on landings before making a final decision.
- If a license was fishing during the qualification period and they are still fishing they would automatically get a license
- Use the same qualification period for licenses to decide state by state allocation.
- Therefore, effort would be capped by license number
- Do not re-evaluate the control date
- Vessel participants is 20-25 and percent landings is relatively stable so that is what New Hampshire would be looking at.

Other Limited Entry Comments:

-New Hampshire favors 20-25 licenses and think it is unfair to limit Massachusetts because they did not have processing ability.

- Multiple people spoke in favor of state by state allocation with licenses being distributed by the state to cap effort and stay within the quota.
- A couple people spoke in favor of keeping the control date.

Issue 2: State by State Allocation

- One person is in favor of state by state allocations noting the groundfish fishery. State by state allocation is a more equitable way to manage.
- There was no market in the New Hampshire fishery, but in the state of Maine they have the infrastructure to support a market.
- One person would like flexibility for New Hampshire to have a trap fishery with state by state allocations
- One person in favor of quota transfers because the fishery wants to take advantage of the resource wherever it is.
- One person is in favor of quota rollovers.
- One person wants industry to land within the state that they are permitted.
- Two people would like to limit participants to land in one state even if they hold licenses in all states.
- The Section should consider allowing individuals to fish in Maine state waters, but not land in Maine.
- Individuals would like for the plan to clarify the definition of state waters in terms of enforcement because it is believed that in Maine they can enforce up to 12 miles.
- New Hampshire was concerned that Maine processors may not buy shrimp that was harvested by New Hampshire because they want to control the fishery.

Issue 3: How Should the Specification Process Occur Under Amendment 3?

- One person is against trip limits because they are wasteful. This was also a problem in the groundfish fishery.
- The overage/underage provision should be at the discretion of the Section.
- One person is in favor of using historical performance to establish a TAC
- One person was in favor of 25mt of a research set aside so that it would minimize a directed fishery but still allow for obtaining samples.

Issue 4: Should the Goals and Objectives of the Fishery Management Plan be Revised?

No comments at the hearing.

Issue 5: Other Issues

- Days at sea in the fishery was previously considered, and one participant thinks it's a good idea and should be considered again.

General Comments

- The groundfish fishery is in a poor condition which makes the shrimp fishery more desirable from a participation standpoint.
- Participants in the shrimp fishery are getting old and people should consider reconstituting the fishery for when the next generation takes over.

Public Hearing: Rockland, Maine

Approximate head count 80 people-only 26 signed the sign-in sheet; 12 commenters

March 7, 2015

Issue 1: Limited Entry into the Fishery

The majority of the commenters were not in favor of limited entry. Most felt limited entry would cause disagreement within the Northern shrimp fishery, putting one gear type against another. It would force some fisherman to go out of business. Too many Maine fisherman would be locked out of the fishery under limited entry. It would also make it very difficult for new fisherman to enter into the fishery. It is important to the many commenters that younger guys are able to get into the fishery and there is diversification within the fleet.

Issue 2: State-by-State Allocation

There were some commenters in favor of state-by-state allocation. They felt the state would be able to manage its own quota. The state could zone the fishery to have the fisherman fish when the shrimp came into their areas.

Issue 3: How Should the Specifications Process Occur Under Amendment 3?

No comment

Issue 4: Should the Goals and Objectives of the Fishery Management Plan for N. Shrimp be Revised?

No comment

Issue 5: Other Issues

Some commenters felt it would be good to have daily trip limits. Some noted it was important to not fish on egged shrimp. There were commenters that felt how the section voted was not fair.

Specific Comments:

Garry Libby- Gave an overview of his written comments.

Limited entry is needed to get the shrimp back as soon as possible. Yes effort should be capped. Need to reduce the potential effort. Landings should be assigned using history either by vessel or individual. Could potential set up a cooperative.

In favor of a 5 year time frame instead of a 10 year. If we did a 5 year 2006-2010. Or in 10 year 2001-2010. In favor of keeping the current control date.

There should be new participants in the future somehow. If one was retired then one can come back in. When there is room for growth than this could be rethought.

Should the TAC be allocated to the states? It could be. Should it be an IFQ or coops or sectors? He prefers coops or sectors. Have the structure through groundfish. Take a percent of landings to pay for the sectors that way.

Leave the TAC set just the way it is now. Should the fishery have a defined season? Yes it would help to make business plans.

Depending on the shrimp stock if we took 2% from each state than it would give 6% total and that would be good.

Proposed some new goals and objectives.

It should be mandatory to use the fish excluder. Think about using zones that were far out to protect the juvenile males that live offshore all the time.

Craig S.: Shrimp trapper for year, been watching the shrimp go up or down. When there are a lot they are caught with the eggs it impacts the future of the stocks. We are hearing the best possible science. If you catch them like the trappers catch them then you catch when, how and where you want them. I have a big problem with limited entry. I want to see the young guys get in. Everything that is in the document will put people out of business. You should open to just to traps until the biomass opens up then give it to the draggers, then you might get a good catch rate. Look at what has happened in lobster fisher. They are doing well they give them a chance to grow. You have to take care of the brood stock and the ones that are growing up. Just like our kids.

Walter Kumiega- The commission needs to change the way the section votes. The two states that have 10% of the fishery can out vote Maine. Limited entry: Sustainable fishery is the vision and they can do this with a TAC and then have the state do a limited entry the way we want. State by state is crucial to the fishery otherwise we will have a derby, see price fall with large catches, and the fishery closes early. Then the fisherman all lose out then the fishery closes early.

Sustainable is a max count per pound limit but institute fair voting.

Ring B. Fishing using mobile gear. Modify the gear for the best of the fishery. When you start to drive wedges between the fleet. In years past we had enough go around for everyone. We did that ourselves. If it isn't conducive it is not going to be worth doing it. For us to say someone cannot go fishing. Look at the lobster fishy it is a huge mess. People cannot get in because of the laws in the 1990s and it hurting everyone. You tell me sectors work in the ground fishery you are crazy. DAS was working. Sectors is going the wrong way. Be fair to everyone.

Arnie G. south Bristol trap fisherman. I think this plan might work if we are at the top of our game. We are trying to go through some rebuilding years it is going to be an impossible tasks. I would like to go out fishing as soon as I can. You cannot control how fast the fisherman are going to bring in the fish. You need a daily trip limit to control the amount coming in. Most of the trappers are in mid-coast. State-by-state is good way to go. The DMR proved that they can regulate they fish. We don't know how fast we can rebuild there are guys willing to go back fishing for 3, 4, 500 pounds. We need to get away from fishing on the egged shrimp.

You should use days out daily trip limits and close when they are spawning. People deserve the right to eat shrimp in Maine.

Would need to address the latent effort from the federal fishery licenses.

Pat Kelihier- Need to address the concept of quota monitoring and daily quota monitoring. Maine has swipe cad. All states would need to show the same ability of monitoring the quota on a daily basis like the Maine swipe card.

Tad M. In favor of an open fishery but if we have to go into limited entry. My thoughts against a catch share. Everyone in the room that has gone should go and should stay. State should manage their share. Maine's should manage how they choose, so favor state-by-state. Care for our young fishermen should have diversification in the fleet. People cannot predicted what is coming in the future. But allow people to come into the fishery. Keep the control date. You are injuring people from all around. You should not do that. I am getting older but I am not that old I still have some days fishing. It is an aging fishery like the lobster fishery. Figure out what level you need that build up or down to that level. Let people age out of the fishery. Think about something with participation. Put a participation window in there if you have a window of time that you use.

When you do license issues maybe do a draw. You could get more draws based on different criteria, did you do research? Did you do the draw the year before?

David O. Not in favor of complicated limited entry because only a few end up in the fishery and it gets very complicated. If you have to go down this path then maybe you should do something simple like a tiered license based on your historic landings and everyone gets to go. If you go down this path than you allow for folks on the bottom to get to the top tier. So the young guys can work their way up instead of having to buy your way up. You keep changing the rules and then you have to buy more so why bother.

Don't think that ME should regulate the Maine themselves, the 3 states you get a more diversified government group. There have been years when a lot of shrimp have been caught off of ME and NH.

Jim H. I disagree with all of this there is too much regulations. Pitting fisherman against themselves is bad. Garry has a well-orchestrated plan for himself and that is bad. You cannot let people go hog wild but you still have to let young people into the fishery. It seems foolish to not let people fish on the fishery that dies in 5 years. The guys will not go if they do not make any money. Zone the state since everything is so different in each area in particular when the shrimp come in. It is best to catch shrimp with no eggs on them. Limited entry is foolish. Everyone should have a chance to go fishing. Leave it alone and let it be. Design a small quota based fishery. People are screaming for shrimp all over the state. Do something that can start something. Don't pit the trapper against the trawler.

Jeff H. Portland buyer and processor. I have seen the fishery boom and bust many times. I have a problem with us harvesting shrimp with eggs on them. You take away so much potential. This has contributed to the boom and bust. Eggs survive at a much higher level when the water is cold. We compounded this problem by overfishing, not reporting how much is coming in fast enough, and then the eggs not surviving with current warm water. You are going to make people unhappy by preserving the fishery. You can only take out so many each year to preserve the resource. This fishery developed from small boats that wanted to do something in the winter because the shrimp were close to the shore. They were easiest to catch but that does not translate

to the value of the fishery. You need to know if you are going to have a season to invest into the fishery. You need a management plan that has been very different than now because if not it will take us just back to where we are now.

James W Fishing on and off since the 80s. When the state put us to 51 days we lost all our market and the price went down. If you go with the limited entry and quota system it would hurt guys east of Rockland. They will only have a small piece of the pie. I may or may not get much depending on what years you go. There are guys that saw this coming so they went fishing just to have history down the road. We used to fish on big shrimp with no egg and then the quota get caught up and we were shut down and therefore we do not have any history. I am against limited entry.

Gerry C. MA and NH catch shrimp before we do and they are fully egged. Why don't we leave the ASMFC? The shrimp will be caught up before they get to the east and some guys will not be able to get to any fish.

Northern Shrimp Public Information Document for Amendment 3

Atlantic States Marine Fisheries Commission
 March 7, 2015
 Rockport, Maine

-- PLEASE PRINT CLEARLY --

<u>Name</u>	<u>Company/Organization</u>	<u>City, State</u>
Salomito Avarello	College of the Atlantic	Barr Harbor
Gary Libby	RFB Fisheries	Port Clyde
Charlie Pinn	MRAC Americas	
Leslie White Jr	Maine DMR	Boothbay ME
Arnold Gamage Jr	AP	So. Bristol ME
Seamus Gilford	Maine Fresh lobster	Bremen ME
David J. Osier	Osier Seafood	So. Bristol ME
John Seiders	AP	So. Bristol ME
Walter Kumijs	ME Legislature	Deer Isle, ME
Marilyn Lash	DMR	Friendship ME
Arthur Fobes Jr	Fisherman	So. Bristol, ME
Darral Chadwick	Fisherman	Bristol ME
John R. Williams	KHORITY MICHELLE INC	STONINGTON, ME
James Hanscom	Fisherman	Barr Harbor ME
Robert Cugley	Fisherman	So. Bristol ME
Kyle Mohn	PERC	Stunk ME
Maggie Hunter	ME DMR	Boothbay Harbor ME
Kenneth Clive	College of the Atlantic	Barr Harbor ME
Arnold Nickerson	FV Huxley Arm	Rockport me
Katie O'Brien	College of the Atlantic	Barr Harbor
Robin Old	Penobscot Education Ctr	Stonington ME
Coney Prock	FISHMAN IV	So. Bristol ME
Jack Miller	Fisherman	Tenants Harbor, Me
Mark Cheney	Shrimper	Pemaquid, Me.
JAMES WARD	E.V. First Impression	Sorrent, ME
Rocky Trudis	Fisherman	PERC ISLE ME.

Head count was 80 people

Public Hearing: Portland, Maine
~30-40 Attendees (Only 13 signed in).
March 30, 2015

Meeting Staff: Terry Stockwell (ME DMR) & Chris Vonderweidt (ME DMR)

Meeting Participants: Tray B., Roger Allard (F/V Robyn Elizabeth), Jim Shifelds (F/V Top Notch), Lester Durant (Cundy's Harbor Wharf), Rick Callou (F/V E Cosi II), B. Viducie, Joe Nickerson (F/V Haley Ann), Tom Cassamassa (F/V TheresaIrene III), Marshall Alexander (F/V D.), Jeff Holden (Portland Shellfish), Craig Durant (F/V Marie Ann), Troy Brenner (F/V Ocean Spring), and Martin Leeman (F/V Jennifer).

Following the ASFMC supplied presentation, attendees offered comments on all five management issues in the order of their preference. Comments were rearranged by management issue when possible for the purposes of this report.

Issue 1: Limited Entry into the Fishery:

- If limited entry is implemented, do not allow permit stacking the way groundfish is managed.
- We need to maintain shrimp as a small inshore fishery and a limited entry system will destroy that. Do not let it go the route of groundfish management where 10% of the boats are allocated 90% of the quota.

Issue 2: State-by-state Allocation:

- Should use history of state landings to allocate state by state quotas.
- Leery of a Maine state quota because politics will ruin state by state allocation. Maine state legislators will give shrimp quota to lobstermen.
- Management measures should not allow fishermen to catch shrimp 3-miles out and land in other states without being accountable.
- ITQ's should be non-transferrable. Licenses should expire when they are no longer fished, giving young fishermen a chance to enter the fishery.
- Allowing permits/licenses to be sold will create a barrier to young fishermen entering the fishery.

General Comments About Effort Control

- Effort controls should include restrictions on horsepower
- We will never be able to control this fishery until we have some type of effort control.
- Effort control is inevitable, but the devil is in the details.
- Effort control should go by history.
- Should just cap the number of licenses and allow them to be transferrable so that fishermen can buy into the fishery.
- Need to provide opportunity for new entrants.
- No need for effort control because Mother Nature and markets are sufficient controls. Fishermen will not go fishing for nothing.

- The Amendment should include the number of years that the technical committee recommended no season.
- The allocation years should be 2001-2011 (expand 2001-2009 timeline to include 2010 & 2011) because markets came back a bit in 2010 & 2011.
- Allocation history should go back to the 1980's.
- Even if landings cannot be tied to a specific permit or license, the length that someone held a shrimp license should be factored into the allocation.
- VMS will be necessary to enforce any area management measures.

Issue 3: How Should the Specification Process Occur Under Amendment 3:

- While the idea of multi-year specifications sounds good in theory to promote market stability, they are a bad idea because it could mean multiple closed seasons.
- Should not be liable for overages.

Issue 4: Should the Goals and Objectives of the FMP be Revised:

- Goals and objectives are useless because the Section never references them when making management decisions. Should force Section to consider G&O when making management decisions.

Issue 5: Other Issues:

- The discussion on climate change should be removed from the document because it is unfounded by science.
- Egg bearing shrimp should not be caught to sustain the stock. Management should monitor the stock and shut down when the shrimp are egg bearing. Continue to monitor the stock throughout the year and re-open after egg release.
- When the fishery re-opens, the processing sector is further from being viable than the fishery is because the markets and equipment is highly specialized. Maine's processors cannot compete with less expensive Canadian shrimp. Reestablishment of a volume fishery is necessary in order for Maine processors to be viable again. The Canadian processors can operate 5-6 months out of the year.
- Landings are not a true indicator of the resource. The Section should look at what effected landings and the reasons why people went fishing in some years and not others.
- The shrimp industry is in so much trouble right now that it is the right time to get a fresh start with management measures. Step 1 is to figure out how we establish a sustainable catch level and go from there. Imperative to be clear of all political pressures.



Atlantic States Marine Fisheries Commission

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MEMORANDUM

June 1, 2015

To: Northern Shrimp Section and Advisory Panel
From: Max Appelman, Fishery Management Plan Coordinator
RE: Technical Committee Report on 2015 Winter Sampling under the Research Set Aside Program

At its December 2014 meeting, the Section approved a 25 metric ton research set aside that would collect biological samples similar to those that might have been collected from commercial shrimp catches if there had been a fishery. The purpose of the project is to collect data on egg-hatch timing, and the size, gender, and developmental stage of the shrimp, and to continue the TC's time series of catch data that are vital to the annual stock assessments for the Gulf of Maine northern shrimp fishery. Enclosed is a report of the 2015 winter sampling program that occurred under the research set aside.

Enclosed: 2015 Winter Sampling Report

**2015 WINTER SAMPLING
FOR
GULF OF MAINE NORTHERN SHRIMP**



Photo by Shlomit Auciello



Photo by Elaine Jones

Prepared
May 29, 2015
by the
Atlantic States Marine Fisheries Commission's
Northern Shrimp Technical Committee

Kelly Whitmore, Chair (Massachusetts)
Dr. Anne Richards, (NMFS NEFSC)
Robert Eckert, (New Hampshire)
Margaret Hunter (Maine)

SUMMARY

In the absence of a commercial fishery, four trawlers and five trappers collected northern shrimp samples in the Gulf of Maine during January – March 2015 under the northern shrimp research set-aside (RSA). They caught a total of 6.7 mt, or 27% of the 25 mt RSA. Very few northern shrimp were caught in eastern Maine, where catches were dominated by the small striped shrimp, *P. montagui*. Forty-nine trawl and fifteen trap samples were collected and evaluated for shrimp size and sex-stage, and the timing of egg hatch was estimated. An unusually high proportion of the northern shrimp catches comprised small ovigerous females, probably from the 2013 year class. Egg hatch was later than recent years, and continued to be correlated with temperature.

INTRODUCTION

Fisheries for northern shrimp (*Pandalus borealis*) in the Gulf of Maine (GOM) during the past thirty years have been conducted in the winter when egg-bearing (ovigerous) female shrimp move inshore, and sometimes in the spring while the shrimp return offshore after egg hatch. The highest landings usually occur in the months of January and February (Table 3 in Whitmore et al., 2014). Shrimp are caught by trawlers and trappers, with trawlers averaging about 86% of the Maine catch in 2009–2013 (Table 4 in Whitmore et al., 2014). Shrimp samples from commercial catches have been collected by member states (Maine, Massachusetts, and New Hampshire) each season for over thirty years, and have informed annual stock assessment updates.

The 2014–2015 GOM fishery was closed by the Atlantic States Marine Fisheries Commission (ASMFC) due to low stock abundance. In the absence of a fishery, the ASMFC Northern Shrimp Technical Committee (TC) recommended a limited winter sampling program. The purpose of the project was to collect samples similar to those that might have been collected from commercial shrimp catches if there had been a fishery, in order to:

- Continue the TC's time series of samples from GOM northern shrimp fishery catches, estimating the winter size (carapace length) and sex-stage composition of the shrimp stock in traditionally fished areas, and
- Estimate the timing of egg hatch. Northern shrimp in the GOM extrude eggs onto their abdomens in the late summer to early fall and egg hatch has generally begun in February and ended in early April (Clark et al., 2000), but has started earlier and lasted longer in recent years (Richards 2012). It also tends to begin and end earlier in the western GOM and later in the east (e.g. Whitmore et al., 2013, Figures 3–4), so the location of the sampling may influence the results.

At their November 5, 2014 meeting, the ASMFC Northern Shrimp Section established a 25-mt research set aside quota (RSA) to support data collection during the winter of 2014–2015. The program was further defined during Section and TC meetings with industry on December 16, 2014.

METHODS

Trawl samples: The traditional spatial range of the trawl fishery was divided into four regions: Massachusetts-New Hampshire, Western Maine (Kittery to Phippsburg), Midcoast Maine (Phippsburg to Rockland), and Eastern Maine (Vinalhaven to Lubec). Experienced GOM shrimp trawlers were solicited to participate in the project by e-mail and web announcements. One trawl captain for each of the four sampling regions was picked at random from among the qualified applicants from that region. The selected vessels were from Gloucester (MA-NH region), Portland (Western ME region), South Bristol (Midcoast ME region), and Stonington (Eastern ME region) (Figure 1) and ranged in length from 38–45 feet (11.6–13.7 m). Each trawler was asked to fish about once every two weeks during the period in which northern shrimp migrate into inshore waters to hatch eggs (usually January through March), using their standard shrimp-fishing gear. Each trawler made no more than five trips. Trips were scheduled, weather allowing, on a mutually agreed upon date, after discussion between the captain and the state TC member. Participants were asked to conduct at least three tows per day in areas where they would normally fish for shrimp at that time of year. They provided their TC member with a 2-kg sample from the catch from each of three tows, and other information such as date, tow duration, location, depth, and estimated catch weight. The sample was chosen randomly from each tow's catch, and bagged and kept on ice (MA) or frozen (ME) for later delivery to MA DMF or ME DMR. Similar 1-kg samples were also collected for further analysis by scientists at the University of Maine. U. Maine also provided temperature loggers (Onset Tidbit v2) to affix to each fisherman's net, which recorded temperature every five minutes continuously throughout the survey. Trawlers were paid \$500 per trip and were also allowed to keep or sell up to 1,800 pounds (817 kg) of shrimp per day to defray expenses. The first trawl trip was made on January 21 and the last was on March 25, 2015.

Trap samples: Shrimp trappers were also invited to participate, and the five most experienced applicants were chosen, all from Midcoast and Eastern Maine. The trappers were allowed to fish only ten traps, tended as often as needed, keeping no more than 100 lbs (45 kg) of shrimp per week, for personal use only (no sales). Each trapper was asked to combine the catches of all ten traps and collect one randomly chosen 2-kg sample from his day's combined catch about once every two weeks, also on a mutually agreeable schedule. Trappers also collected samples for U. Maine and were provided with a temperature logger to secure to one of their traps. The trappers used their standard shrimp traps and bait (usually herring) and most traps were fished in pairs (two traps per string). The first traps were set out on January 30 and the last ones were hauled March 21, 2015.

Sample work-up: At the labs, samples were analyzed following the usual procedures for commercial shrimp samples. Frozen Maine samples were thawed, and each trawl or trap sample was weighed, and then separated by shrimp species. *P. borealis* specimens were counted, measured (dorsal carapace length (CL)), sexed (male, transitional, or female), and female stage (I, II, or ovigerous) was determined. Female stage I shrimp have not yet carried eggs; female stage II shrimp are not carrying eggs but have in the past, as determined by the presence/absence of sternal spines (McCrary 1971). All other shrimp species in the samples, usually *Pandalus montagui* or *Dichelopandalus leptocerus*, were counted and measured.

Calculations for trawl data: The numbers of northern shrimp of each sex, stage and size (CL in 0.5 mm categories) in each sampled tow were estimated (“raised” or “expanded”) by multiplying the numbers in the sample by the tow catch weight divided by the sample weight. The proportion of northern shrimp females that had carried and hatched off their eggs was calculated for each day as the total female II shrimp in sampled tows divided by the sum of female II shrimp plus ovigerous females in sampled tows. Relative size-sex-stage frequency distributions for each day were calculated by dividing the number of northern shrimp in each sex-stage-size category by the total number in the sampled catches. Shrimp counts per pound for each sample were calculated by dividing the number of shrimp of all species in the sample by the total sample weight. The counts were then expanded to the tow to estimate the total number of shrimp in the tow. The total number of shrimp in all the sampled tows was then divided by the total catch weights of all the sampled tows to give a weighted mean count per pound for each day. Catch rates were calculated for each trip as the estimated total catch weight of shrimp of all species divided by the total number of hours towing.

Calculations for trap data: The proportion of northern shrimp females that had carried and hatched off their eggs was calculated for each trap catch as the total female II shrimp in the sample divided by the sum of female II shrimp and ovigerous females in the sample. Relative size-sex-stage frequency distributions for each catch were calculated by dividing the number of northern shrimp in each sex-stage-size category by the total number in the sample. Shrimp counts per pound for each catch were calculated by dividing the number of shrimp of all species in the sample by the total sample weight. The numbers of shrimp in each trap sample were also expanded to the trip’s catch by size-sex-stage category, for combining with the trawl samples (Figure 13).

Hatch timing: A time series of hatch timing estimates was developed using data collected by the Maine DMR from the commercial shrimp fishery beginning in 1980 (Richards 2012). Samples were not available from Massachusetts and New Hampshire until later years, so in order to be consistent, the time series only uses data collected from Maine ports. Probit analysis was used to define the timing of hatch initiation (taken as the day of each year on which 10% of females had hatched their brood), hatch midpoint (50% hatched), and hatch completion (90% hatched). Duration of the hatch period is the number of days from initiation to completion (inclusive). In many years, hatch completion can be more difficult to estimate because fewer samples are

available at the end of the season. Samples from 2015 were weighted by the size (pounds) of the catch they were collected from. Samples from both trawl and trap gear were included in all years, except hatch metrics for the 2013–2014 winter, when there also was no fishery, are from limited trawl samples collected off Pemaquid Point in Midcoast Maine (Hunter 2014).

RESULTS

Trawl Catches and Samples

The four trawlers fished from the ports of Gloucester (MA), Portland (Western ME), South Bristol (Midcoast ME), and Stonington (Eastern ME) (Figures 1–2). They all made five fishing trips, except the Stonington boat, which made four trips. A summary of their results is in Table 1. A total of 13,600 pounds (6.2 mt) were caught in trawls, or 25% of the 25 mt RSA. Fourteen samples were delivered to the MA DMF, and 35 to the ME DMR. All four captains mentioned having to relocate or take steps to avoid fixed gear in their traditional tows. Locations fished are charted in Figures 1–2.

Size and sex-stage composition in trawl samples: The mean number of shrimp of all species per pound (Number/Lb, Table 1) was about 45, and varied from 30 (Stonington, Feb. 18) to 60 (Portland, Mar. 21) shrimp per pound. In general, the *P. borealis* size-frequency distributions (Figures 7–11) showed a bimodal distribution with a mode at about 19–21.5 mm CL and another at about 28 mm CL, probably from the 2013 and 2010–2011 year classes respectively. All of the Maine boats caught large proportions of small (19–22 mm CL) ovigerous female northern shrimp (Figures 6 and 8–11). The Massachusetts boat also caught shrimp in this size range, but they were more likely to be males or transitionals (Figure 7). Out of all the seventeen trawl trips sampled, there were only five in which the large shrimp (>22 mm CL) outnumbered the small shrimp (<=22 mm CL) (two MA trips (Figure 7), one Midcoast ME trip (Figure 9), and both Eastern ME trips (Figure 11)). Note that the 50% retention level for standard shrimp trawl gear with grate is at about 22.5 mm CL (Cadrin et al. 1999).

The Massachusetts boat was more likely to catch small shrimp when fishing in Scantum Basin, and avoided small shrimp on the two days when the majority of tows were further inshore, about five miles west of Scantum Basin (Figure 2, top left).

The assumed 2013 year class was first identified in the fall 2013 Maine-New Hampshire inshore trawl survey, and appeared again as a weak (about the ninth smallest in the summer survey time series) and unusually fast growing year class in the 2014 summer shrimp survey (Age 1.5 in Table 10 in Whitmore et al. (2014)). See Figure 14 for its progress throughout recent surveys.

Egg hatch in trawl samples: Most of the female shrimp were still carrying eggs in late January and early February, and most had hatched off their eggs by the middle of March (Figures 7–11). Egg hatch rates in samples are plotted in Figures 15–16. The approximate date of 50% egg hatch was day-of-the-year (DOY) 47 (February 16) in Massachusetts, and much later in Maine, about DOY 71 (March 12) in Western Maine, and about DOY 72 (March 13) in Midcoast Maine. Egg hatch was not evaluated for Eastern Maine, because the boat did not obtain *P. borealis* samples after February 18. The approximate DOY of 50% egg hatch from samples in Midcoast Maine in 2015 (DOY 72) was about 12 days later than the approximate DOY 60 from samples collected in the same area in 2014 (Figure 16 and Hunter 2014).

Trawl catch rates: Daily mean catch rates varied tremendously, from a low of 9 lbs/hr (Eastern Maine, February 18) to a high of 837 lbs/hr (Western Maine, March 10) (Table 1). The Western Maine boat consistently had the highest catch rates throughout the sampling season. The overall catch rate for all regions and dates (total estimated pounds caught divided by total trawl hours) was 149 lbs/hr. The overall catch rate for the Maine trawlers was 200 lbs/hr. The average commercial catch rate for Maine shrimp trawlers during the previous ten fishing seasons (2004–2013) was 356 lbs/hr (Table 8, Whitmore et al. 2014).

Trap Catches and Samples

The selected trappers fished in the South Bristol, Tenants Harbor, Vinalhaven, Stonington, and Winter Harbor areas (Figures 3–4). The first Tenants Harbor fisherman chosen was not able to fish due to illness in the family, and his replacement did not begin trapping until March 17. Although 90% of GOM northern shrimp trap landings are landed on or between the Georgetown and Bristol peninsulas in Midcoast Maine (from 2010 and 2011 harvester logbook data, Maine DMR unpublished), only one of the five participants fished in this area (South Bristol); the rest fished further east. Most of the trap catches east of South Bristol had relatively high proportions of the small striped shrimp, *P. montagui*, and would have been considered unmarketable (as in Figure 5). After working up several samples from these catches, the trappers were instructed not to provide more samples until there were more *P. borealis* (Table 2). A total of 1,108 pounds (0.50 mt) were caught in traps, or 2% of the 25 mt RSA, and 15 samples were collected.

Size and sex-stage composition in trap samples: The mean number of shrimp of all species per pound (Number/Lb, Table 2) was about 58, and varied from 31 (South Bristol, March 2) to 130 (Stonington, March 11). The mean would have been higher if more trap samples had been collected, due to the prevalence of the smaller species, *P. montagui*. Only the South Bristol (Figure 9), Tenants Harbor (Figure 12), and Vinalhaven (Figure 12) catch samples had enough *P. borealis* to develop a complete distribution. In general, the *P. borealis* size-frequency distributions (Figures 9, 11, and 12) showed a bimodal distribution with a mode at about 21 mm CL and another at about 28 mm, probably from the 2013 and 2010–11 year classes respectively.

The trappers were not as likely to catch small northern shrimp (≤ 22 mm CL) as the trawlers — see Figure 9 for a side-by-side comparison at South Bristol. The smaller northern shrimp did not outnumber the large in any trap samples from any of the areas.

Length data from the March 17 Tenants Harbor sample were lost.

Egg hatch in trap samples: Most female shrimp caught in traps were still carrying eggs in late January and early February, and most had hatched off their eggs by the middle of March (Figures 9, 11, and 12). Egg hatch rates from samples are plotted in Figure 17. The approximate date of 50% egg hatch was about DOY 65 (March 6) in the South Bristol trap samples, compared with about DOY 72 (March 13) in the South Bristol trawl samples, probably because trappers are more likely to catch shrimp after egg hatch than trawlers fishing at approximately the same time and place (e.g. Figure 3b in Whitmore et al. 2013).

Size and Sex-Stage Composition for Trawl and Trap Samples Combined

When all samples were weighted by catch and combined, 60% of northern shrimp in the sampled catches were ≤ 22 mm CL. Of the females that were ovigerous or had carried eggs, 55% were ≤ 22 mm CL (Figure 13). Small shrimp have never outnumbered the large shrimp, and small ovigerous females have never outnumbered the large ovigerous females, in any season's catch in the 1985–2013 GOM northern shrimp fishery time series (Figure 13 and Whitmore et al. 2014 Figure 3). This suggests that an unusually high proportion of the 2013 year class was ovigerous (at only two years old) and available inshore, and/or that ovigerous females in the older year classes (2010 and 2011) were less abundant or less available inshore.

Hatch Timing for Trawl and Trap Samples Combined

In 2015 the estimated hatch initiation day was DOY 49 (February 18), the midpoint was DOY 70 (March 11) completion was DOY 92 (April 2), and duration of the hatch period was 44 days (Figure 18). The 2015 hatch occurred relatively late; the hatch midpoint was one of the latest in the time series (Figure 19).

Hatch timing continues to be correlated with temperature (Figures 20 and 21), with the hatch occurring later in cooler years. Sea surface temperature measured at Boothbay Harbor was generally cooler in 2014 and 2015 than in other recent years (Figure 22).

DISCUSSION

The 2015 winter research sampling effort met the goals of providing winter length and sex-stage composition information, and continuing the time series of egg hatch timing for the Gulf of Maine northern shrimp stock. The expansion of geographic and temporal coverage, and the

inclusion of trap samples in 2015 compared to 2014 (Pemaquid Point, ME trawl samples only) were beneficial; however it is important to recognize that the effort was still limited in comparison to the resolution of data collected during a typical commercial fishing season. On average, over 200 samples were taken annually in the fishery over the last ten years (2004–2013) through the shrimp port sampling project.

For winter 2015, 49 research samples were analyzed from 17 trawl trips made in the MA-NH, Western ME, Midcoast ME, and Eastern ME regions, as well as 15 trap samples from Midcoast and Eastern Maine. Differences among tows made on the same day within a few miles of each other suggest that the results could be influenced by moving even very short distances. The presence of fixed gear influenced tow operations in all regions. Trap samples provided limited information on northern shrimp, as other shrimp species dominated most catches.

Nonetheless, the samples were important for continuing the time series of hatch timing estimates and tracking the year classes now in the population. Interesting findings emerged, foremost, that small shrimp (≤ 22 mm CL) outnumbered large shrimp (> 22 mm CL) in 12 out of the 17 trawl trips sampled. The high relative abundance of small shrimp is notable and suggests that an unusually high proportion of the 2013 year class was ovigerous (at only two years old) and available inshore, and/or that ovigerous females in the older year classes (2010 and 2011) were less abundant or less available inshore. The pattern of early maturing shrimp is consistent with the 2014 summer survey results, where the 2013 year class (at age 1.5) appeared to be fast growing with some having transitioned to female (stage I). The high proportion of small shrimp is also likely to be an indication that early life survival (the number of shrimp surviving per spawning female) of the 2013 year class was higher than for the very poor 2010–2012 year classes (see Whitmore et al. 2014). However, the apparently higher survival should not be equated with high recruitment (the number of new shrimp entering the population), as recruit abundance of the 2013 year class was the ninth lowest in the 31-year summer shrimp survey time series (Whitmore et al. 2014).

Egg hatch trends observed in the 2015 winter sampling were consistent with historical regional trends of hatch beginning and ending earlier in the western GOM and later in the eastern GOM. Hatch timing continues to be correlated with temperature, with hatch occurring later in cooler years, including 2015. The 2015 hatch midpoint was on March 11 (DOY 70), one of the latest in the Maine time series. Hatch completion occurred on April 2. This is in contrast to the warm year of 2012, for example, where the midpoint of hatch occurred on February 13 (DOY 44) and hatch completion on March 22 (DOY 82). It appears that hatch metrics in 2014 and 2015 were similar to pre-2000 fisheries, when hatch duration was shorter and initiated later than post-2000 fisheries.

ACKNOWLEDGEMENTS

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Table 1. Summary statistics for the trawl data: estimated total shrimp catch, number of tows, total towing time, average depth, average catch rate, number of samples collected for the TC, shrimp (all species) count per pound, and percent of *P. borealis* females whose eggs had hatched off, by area (west to east) and day.

Area	Date	Est. Total Catch	Tows	Tow Time	Avg Depth	Avg Rate	Samples	Avg Count	Egg Hatch
		Pounds	Count	Total hours	Fathoms	Lbs/Hr	Count	Number/Lb	%
MA-NH	26-Jan-15	190	3	4.9	43	39	3	38	22%
	04-Feb-15	210	2	5.0	31	42	2	34	8%
	18-Feb-15	100	3	4.9	49	20	3	50	58%
	17-Mar-15	390	3	6.7	64	59	3	47	100%
	25-Mar-15	330	3	6.8	69	49	3	50	100%
Western ME	21-Jan-15	440	4	5.4	55	81	3	55	1%
	18-Feb-15	1,850	5	5.2	47	358	3	50	10%
	28-Feb-15	2,000	4	3.9	43	512	3	47	20%
	10-Mar-15	1,950	4	2.3	38	837	3	47	46%
	21-Mar-15	1,725	7	8.6	48	200	3	60	75%
Midcoast ME	07-Feb-15	1,490	6	5.9	37	252	3	43	5%
	17-Feb-15	820	6	4.9	37	167	3	37	11%
	28-Feb-15	1,200	6	7.6	38	159	3	42	11%
	13-Mar-15	465	6	4.9	38	96	3	51	50%
	24-Mar-15	340	3	4.1	58	83	3	51	93%
Eastern ME	04-Feb-15	75	3	3.6	41	21	3	40	1%
	14-Feb-15	*4	3	2.3	39	*		no sample, mostly <i>P. montagui</i>	
	18-Feb-15	16	2	1.8	36	9	2	30	9%
	10-Mar-15	*5	3	2.9	38	*		no samples	
Totals	13,600 Lbs, 6.2 mt	76	91			49			
* estimated <i>P. borealis</i> catch only									

Table 2. Summary statistics for the trap data: estimated total shrimp catch, number of traps, number of set-over days, average depth, shrimp (all species) count per pound, and percent of *P. borealis* females whose eggs had hatched off, by area (west to east) and day.

Area	Date	Est. Total Catch	Traps	Set Time	Avg Depth	Count	Egg Hatch	Comments
		Pounds	Number	Days	Fathoms	Number/Lb	%	
South Bristol	07-Feb-15	35	10	3	43	44	13%	
	12-Feb-15	25	10	5	43			no sample
	18-Feb-15	140	10	6	33	34	33%	
	24-Feb-15	150	10	6	33	33	39%	
	02-Mar-15	170	10	6	33	31	40%	
	09-Mar-15	90	10	7	33	32	40%	
	17-Mar-15	75	10	8	33	37	75%	
Tenants Harbor	17-Mar-15	3	10	3	25	39	38%	length data lost
	21-Mar-15	3	10	4	25	49	47%	14% <i>P. montagui</i>
Vinalhaven	12-Feb-15	5	10	1	31	58	23%	48% <i>P. montagui</i>
	14-Feb-15	8	10	2	31			no sample
	18-Feb-15	40	10	4	33			no sample
	22-Feb-15	16	10	4	34	45	15%	27% <i>P. montagui</i>
	25-Feb-15	23	10	3	34			no sample
	27-Feb-15	10	10	2	33			no sample
	02-Mar-15	20	10	3	36			no sample
	05-Mar-15	0.25	10	3	34			no sample
08-Mar-15	5	10	3	34			no sample	
Stonington	02-Feb-15	9	10	3	35	118	0%	98% <i>P. montagui</i>
	11-Feb-15	20	10	9	31			no sample
	27-Feb-15	10	10	16	30			no sample
	01-Mar-15	1	10	2	35	n/a	6%	sample did not include the <i>P. montagui</i>
	11-Mar-15	20	10	10	35	130	100%	99.5% <i>P. montagui</i>
Winter Harbor	11-Feb-15	35	10	4	32	83	0%	99.5% <i>P. montagui</i>
	17-Feb-15	40	10	6	32	83	0%	99.8% <i>P. montagui</i>
	28-Feb-15	40	10	11	30			no sample
	08-Mar-15	30	10	4	31			no sample
	11-Mar-15	52	10	3	31			no sample
	14-Mar-15	18	10	3	31			no sample
	17-Mar-15	10	10	3	30			no sample
	04-Mar-15	6	10	4	30			no sample

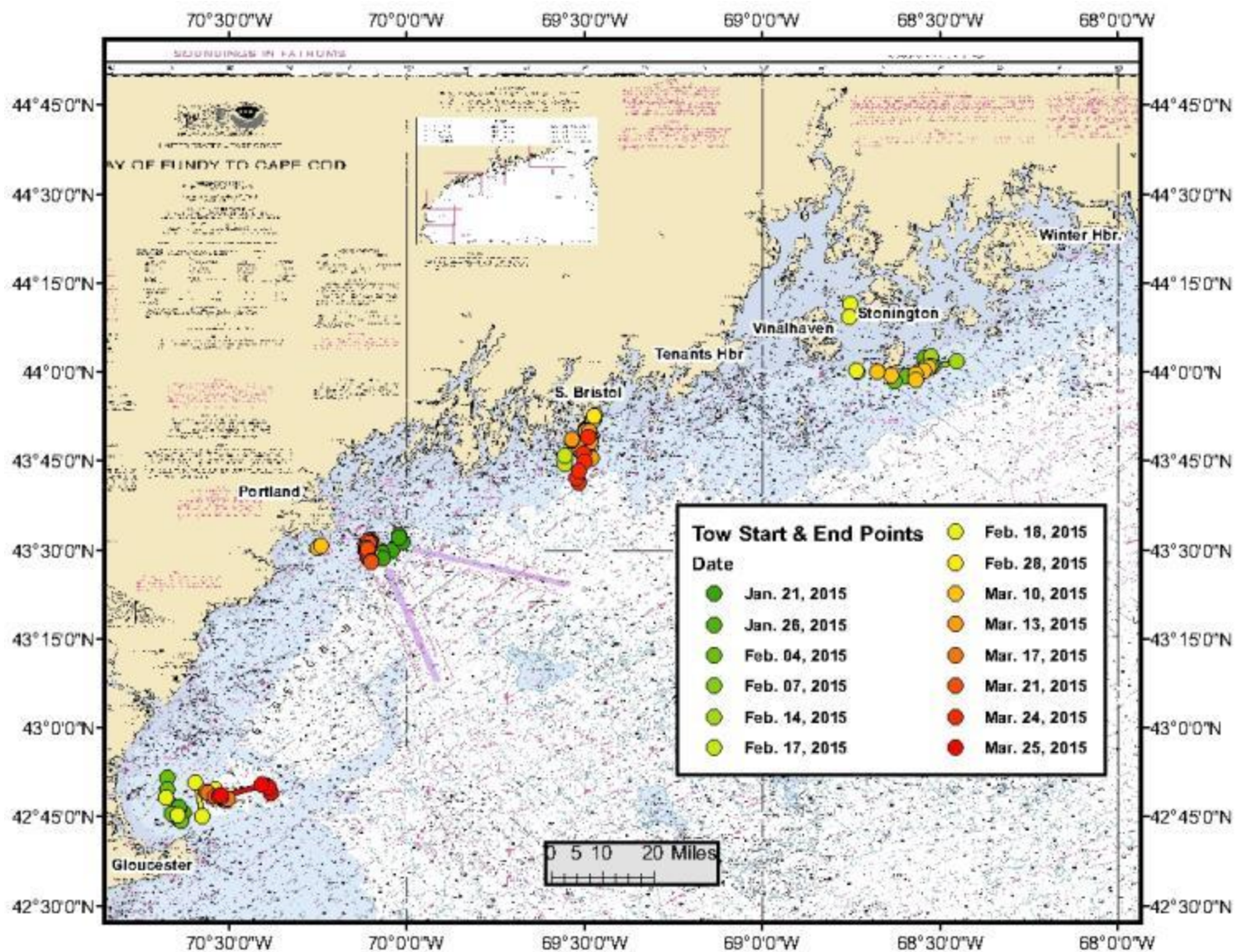


Figure 1. Locations of 2015 Gulf of Maine northern shrimp sampling tows. Color palette (green to red) indicates fishing date.

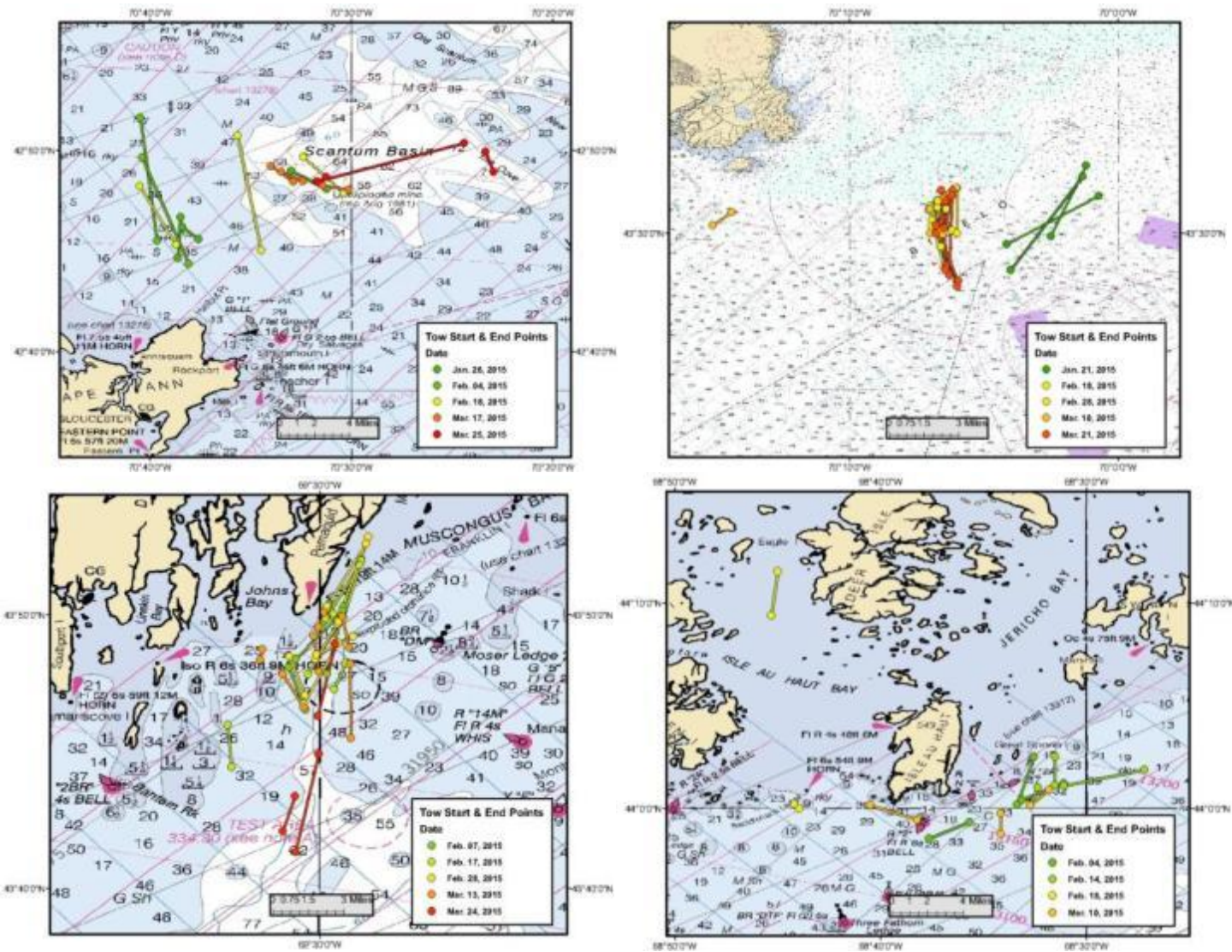


Figure 2. Locations of 2015 Gulf of Maine northern shrimp sampling tows by region: Massachusetts (top left), Western Maine (top right), Midcoast Maine (bottom left), and Eastern Maine (bottom right).

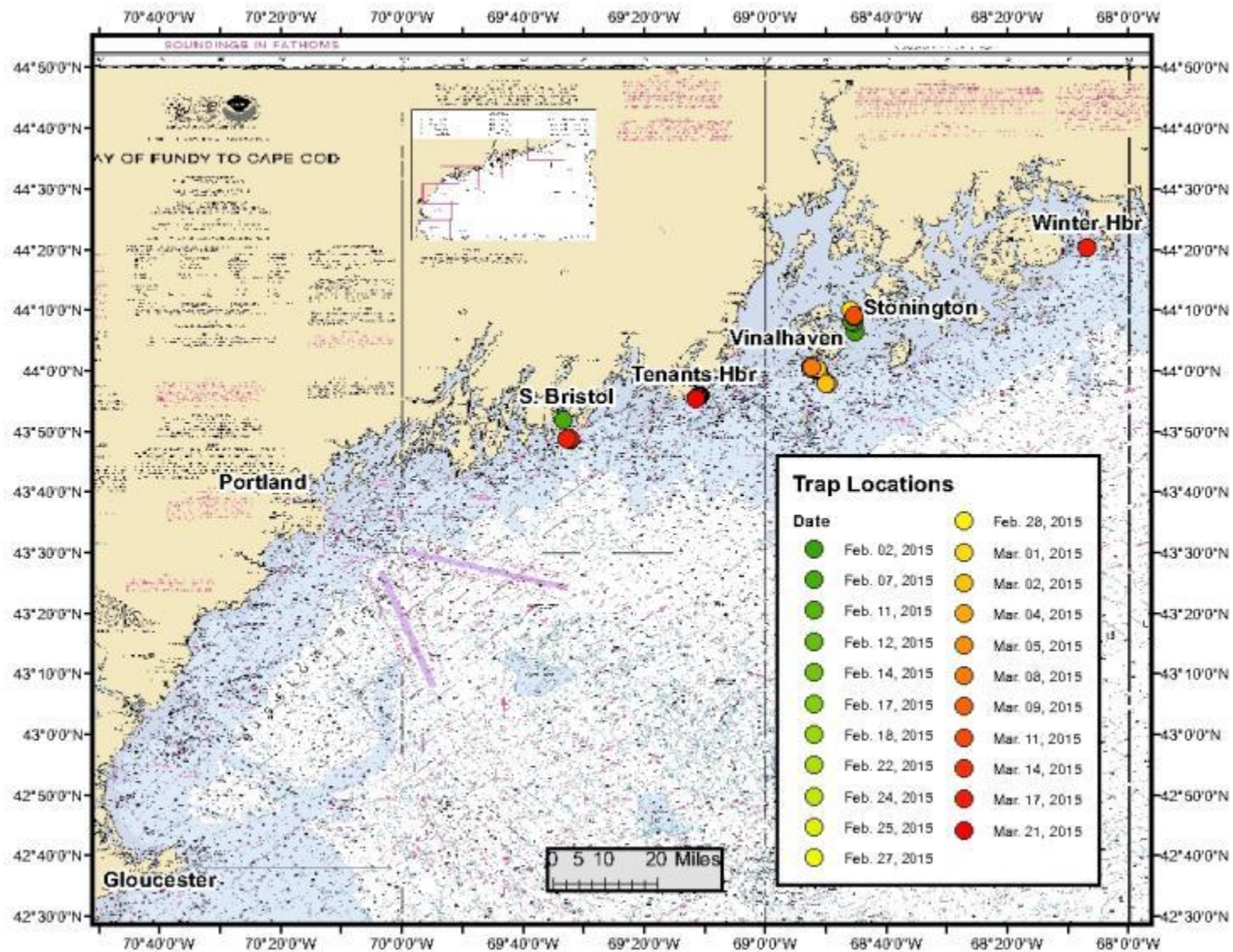


Figure 3. Locations of 2015 Gulf of Maine shrimp sampling traps. Color palette (green to red) indicates fishing date.

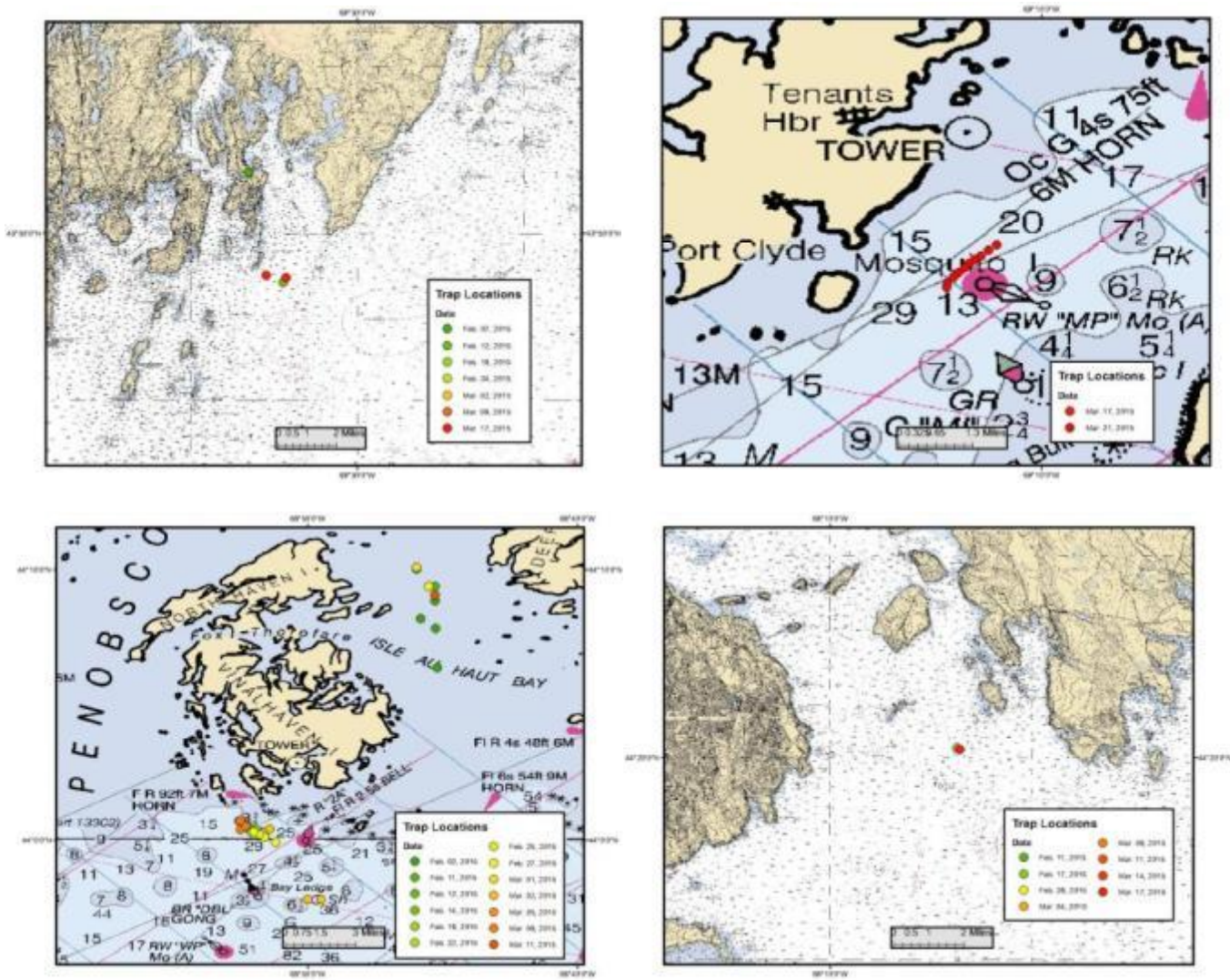


Figure 4. Locations of 2015 Gulf of Maine northern shrimp sampling traps by region: South Bristol (top left), Tenants Harbor (top right), Vinalhaven (bottom left, lower), Stonington (bottom left, upper) and Winter Harbor (bottom right).



Figure 5. Three northern shrimp (*Pandalus borealis*, large and red), and many striped shrimp (*P. montagui* and/or *Dichelopandalus leptocerus*), smaller and pale) from February 14 Stonington trawl catch (Eastern Maine). *Photo by Shlomit Auciello.*



Figure 6. Large and small female ovigerous northern shrimp, from January 26 Massachusetts trawl sample. Calipers are measuring the dorsal carapace length (19.6 mm) of one of the small females. *Photo by MA DMF.*

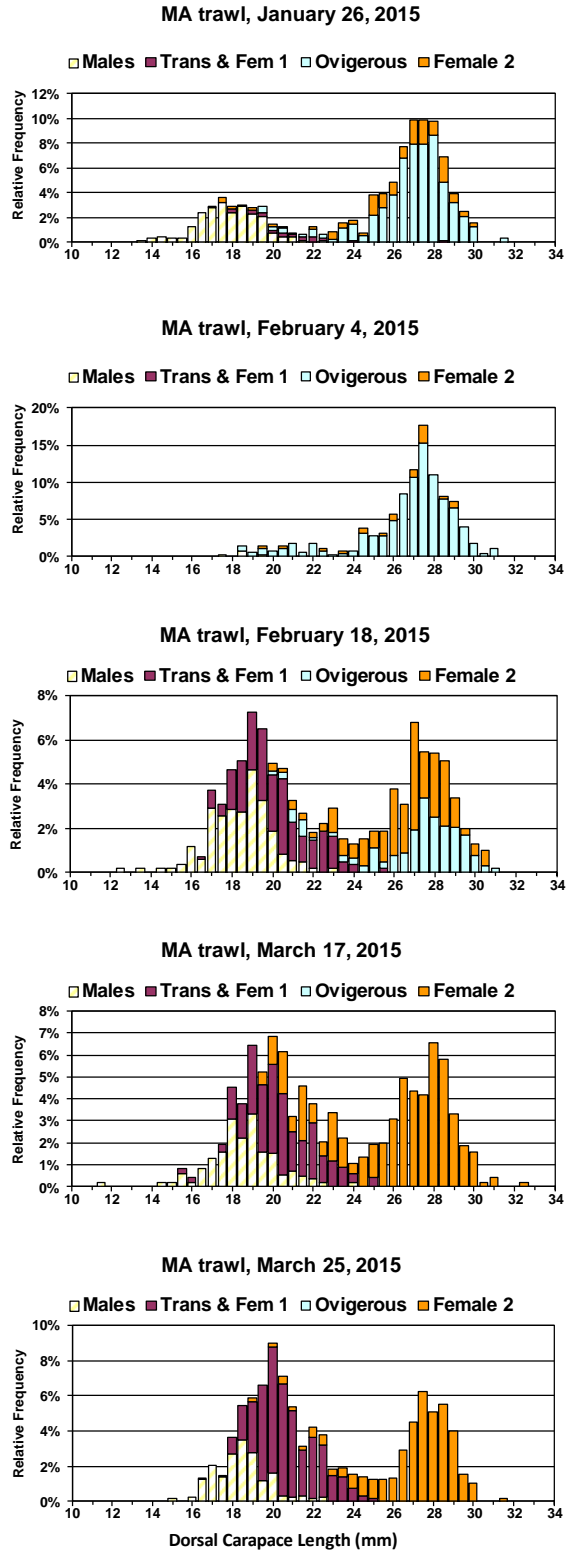


Figure 7. Northern shrimp relative size-sex-stage frequency distributions from Massachusetts trawl samples.

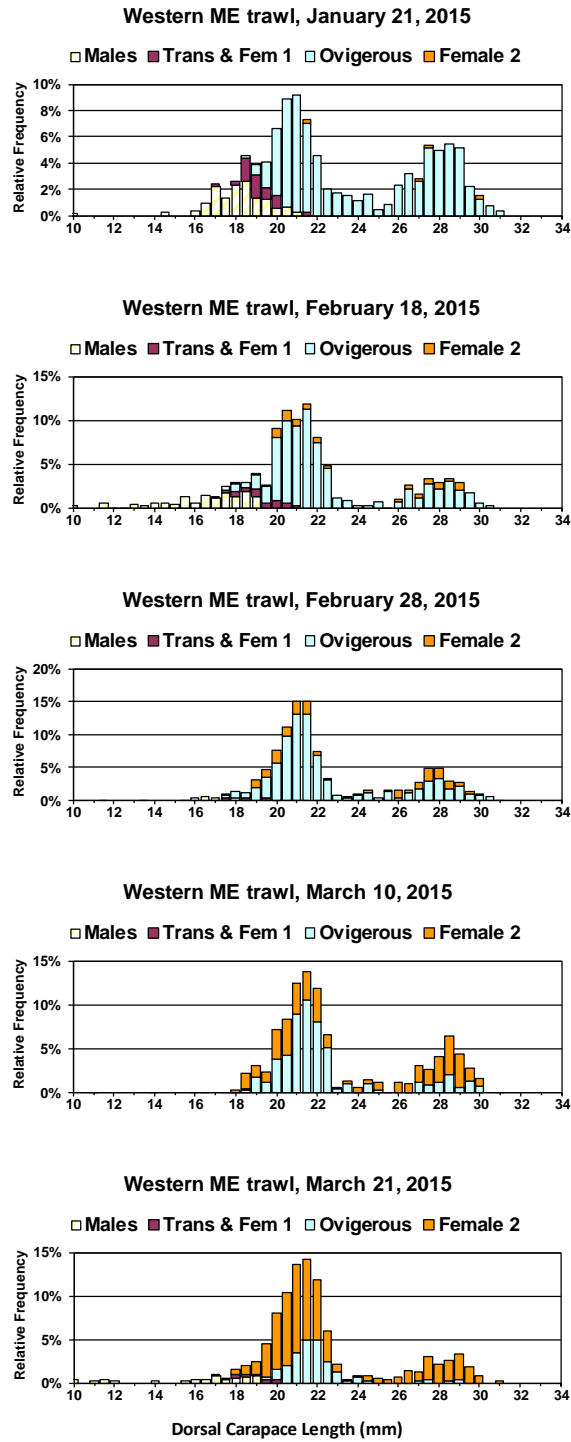


Figure 8. Northern shrimp relative size-sex-stage frequency distributions from Western Maine (Portland) trawl samples.

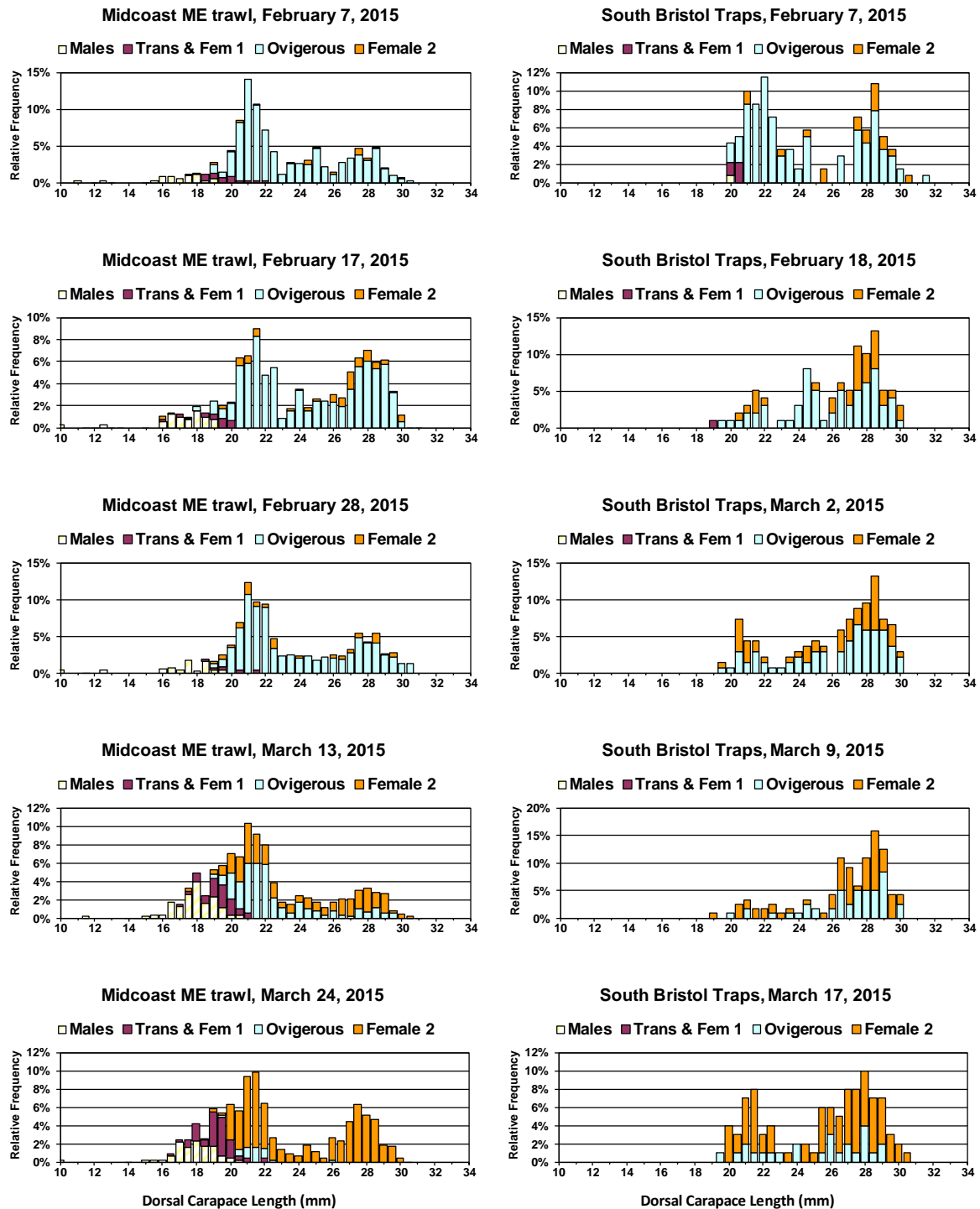


Figure 9. Northern shrimp size-sex-stage frequency distributions from Midcoast Maine (South Bristol) trawl samples (left) and trap samples (right).

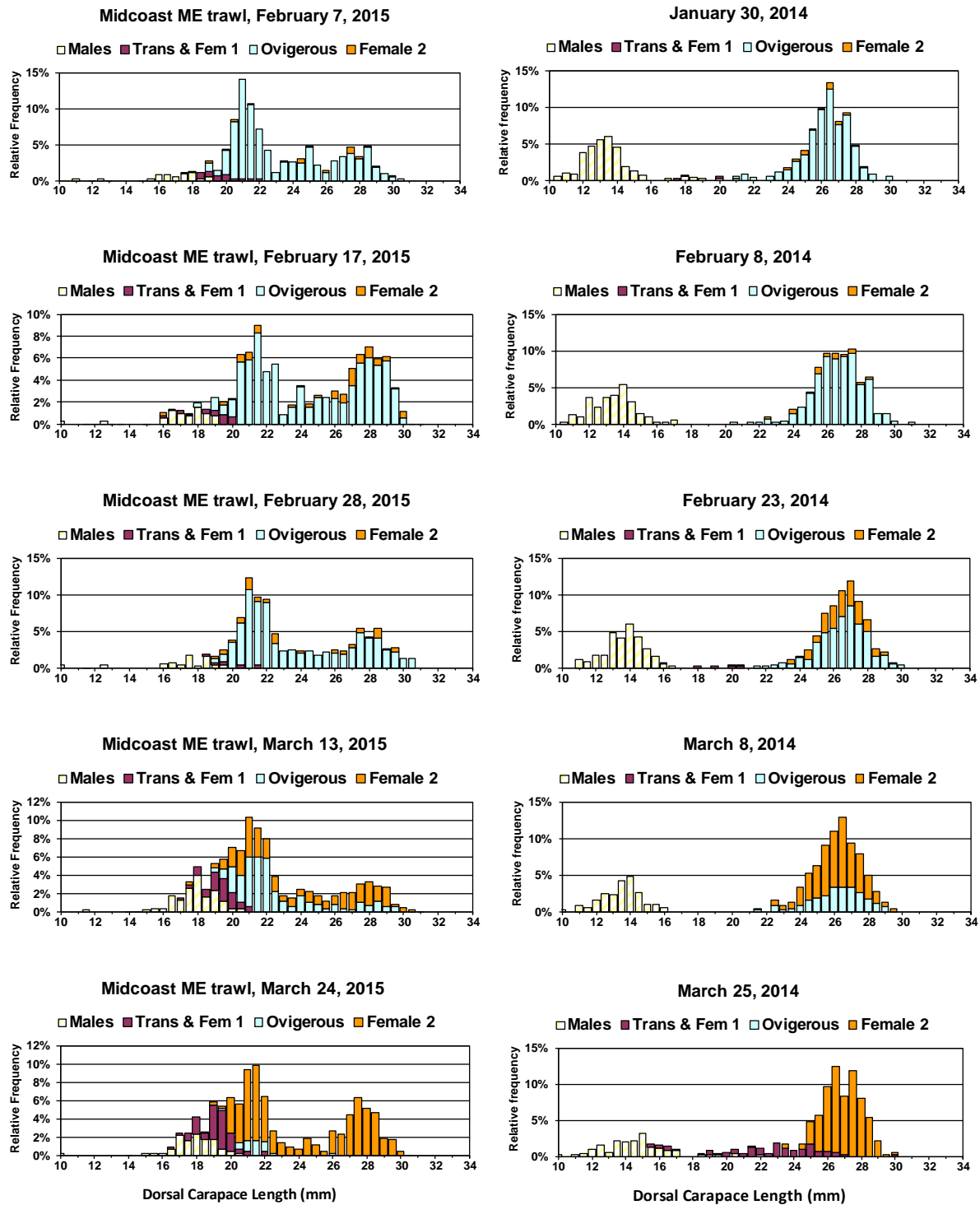


Figure 10. Northern shrimp size-sex-stage frequency distributions from 2015 Midcoast Maine (South Bristol, off Pemaquid Point) trawl samples (left) and 2014 Pemaquid Point trawl samples (right).

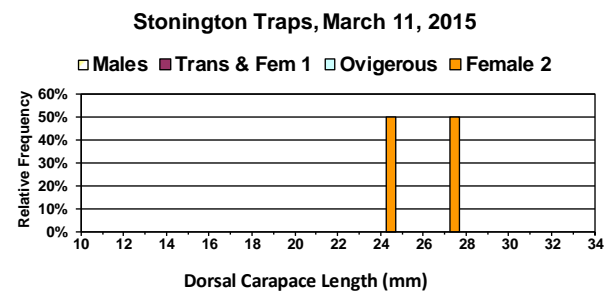
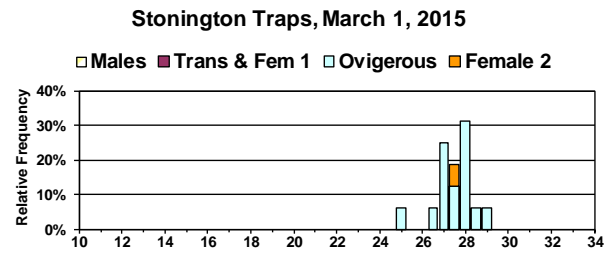
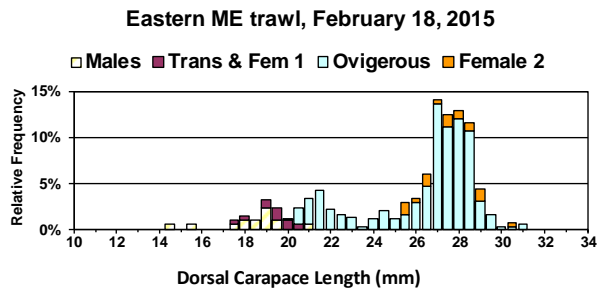
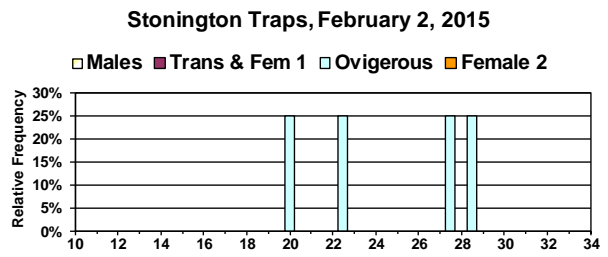
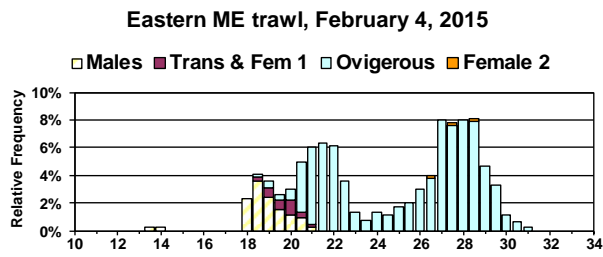


Figure 11. Northern shrimp relative size-sex-stage frequency distributions from Eastern Maine (Stonington) trawl samples (left) and trap samples (right).

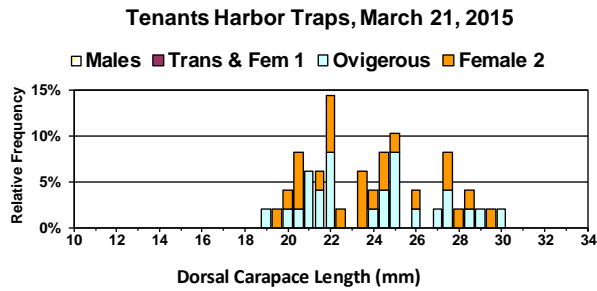
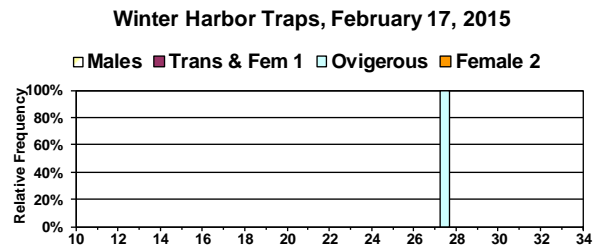
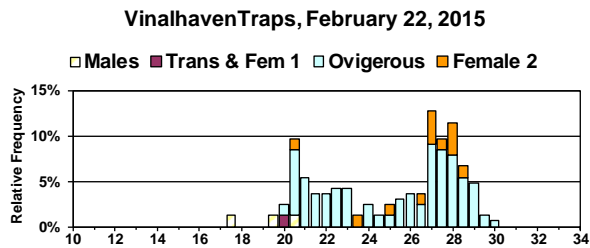
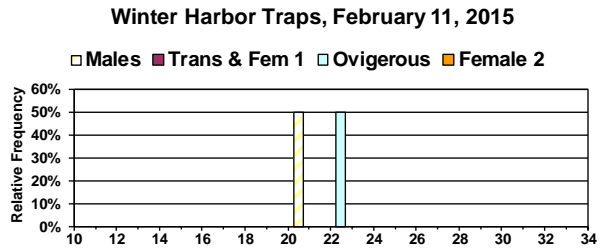
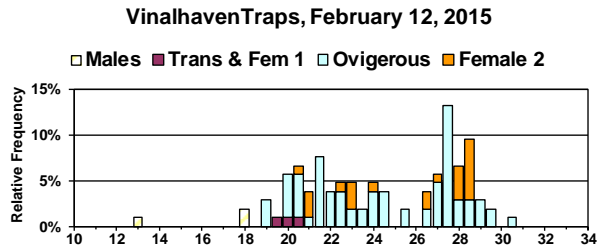


Figure 12. Northern shrimp relative size-sex-stage frequency distributions from other Maine trap samples, Vinalhaven and Tenants Harbor (left) and Winter Harbor (right).

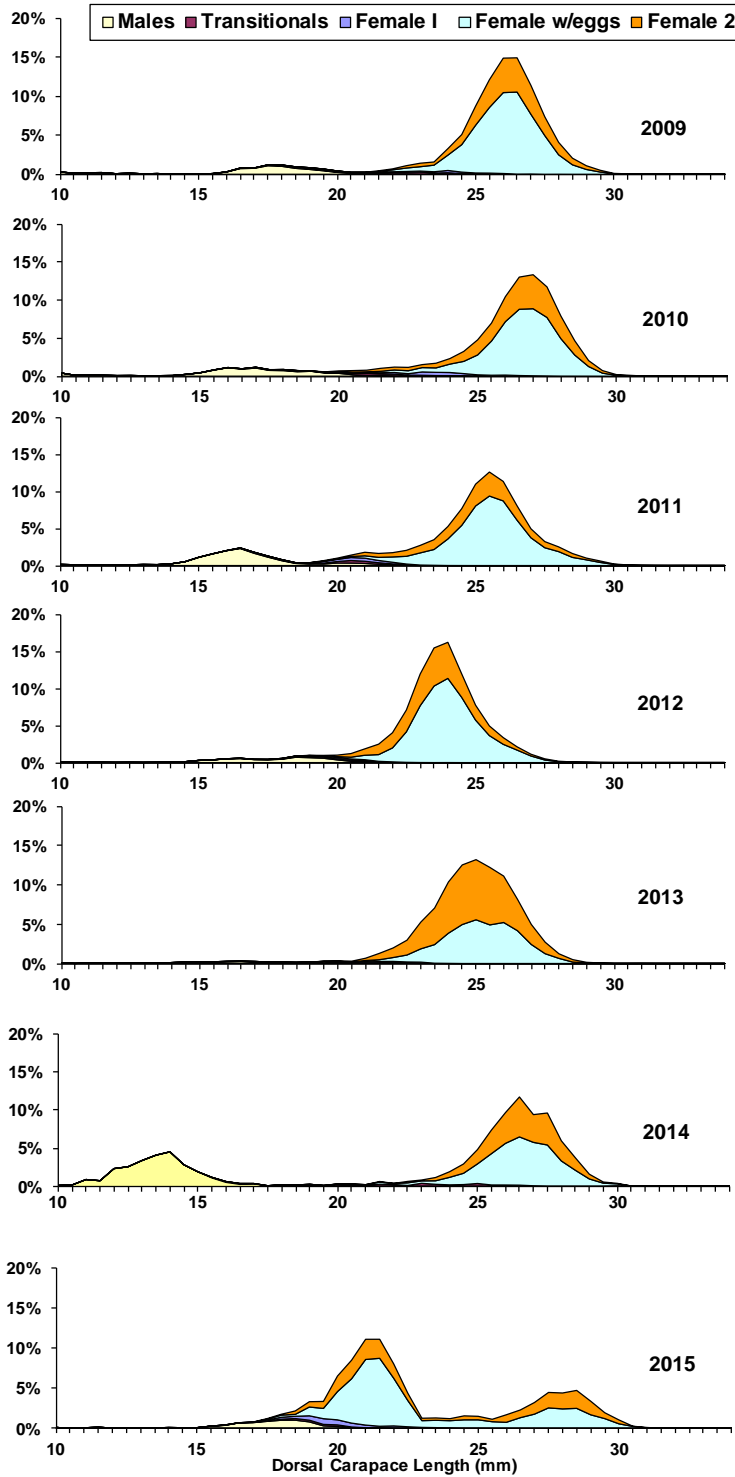


Figure 13. Northern shrimp relative size-sex-stage frequencies from winter sampling with data from 2009–2013 GOM fishery samples expanded to landings, modified from Whitmore et al. (2014); 2014 Pemaquid Point, Maine samples (Hunter 2014); and 2015 GOM winter samples expanded to sampled catches.

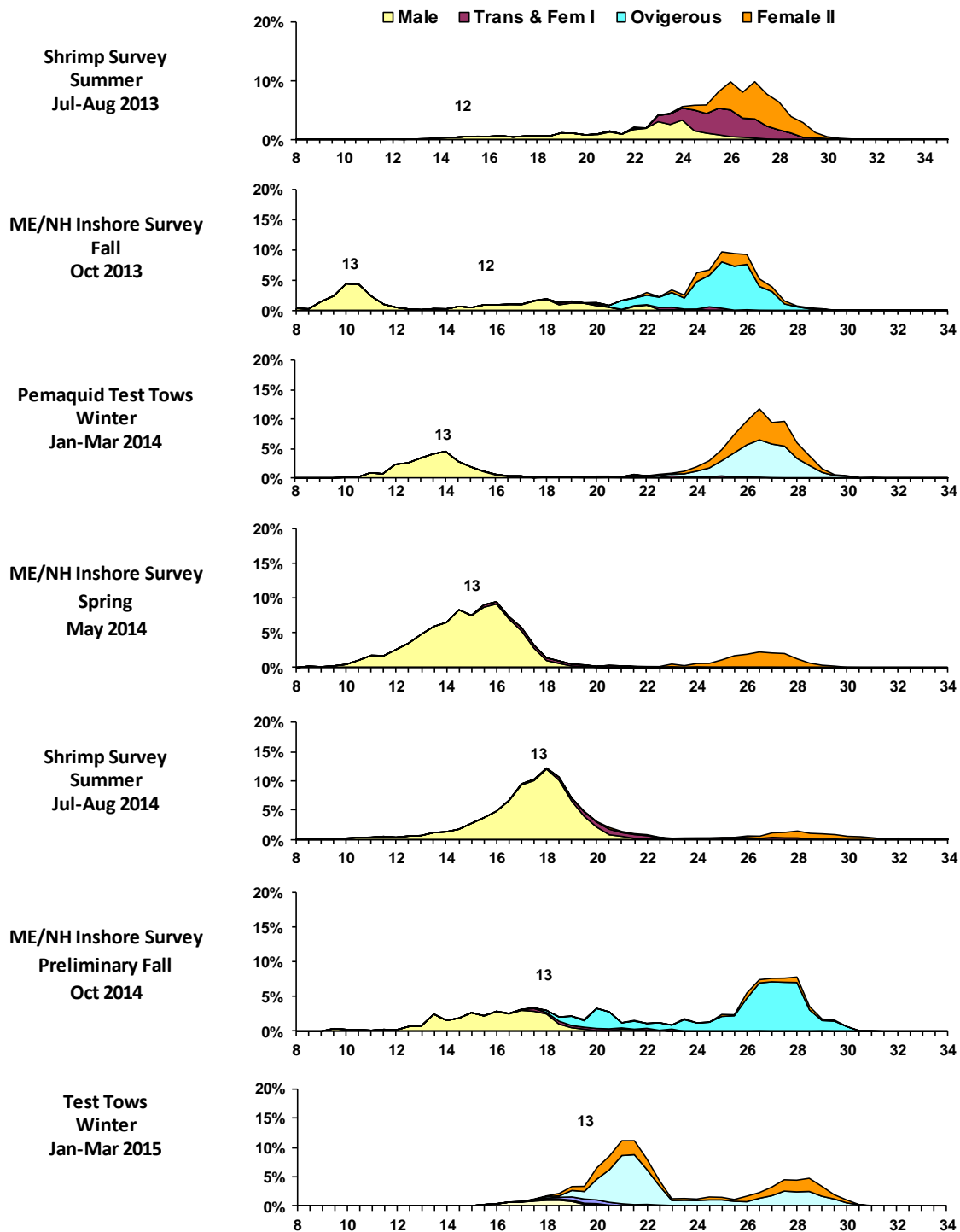


Figure 14. Northern shrimp relative size-sex-stage frequencies from 2013–2015 GOM surveys and sampling programs. Two-digit years denote the mode of assumed 2012 and 2013 year classes.

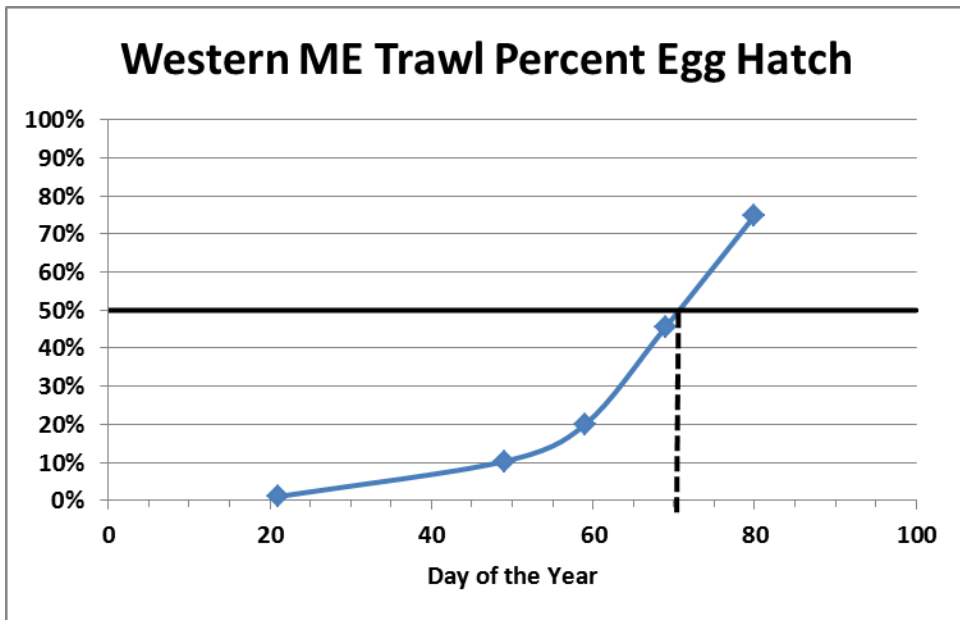
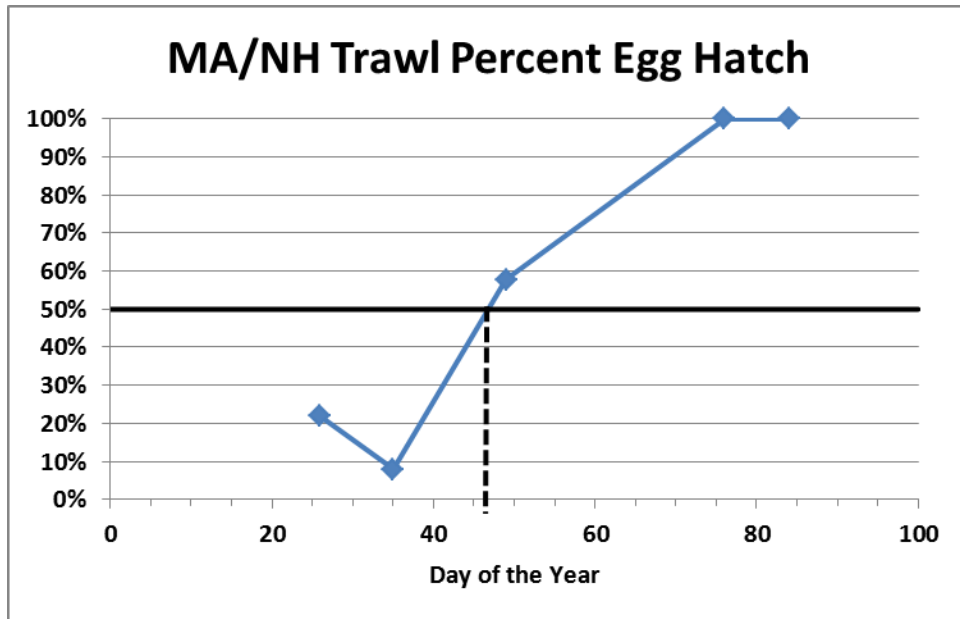


Figure 15. Mean percentage of egg hatch by day of the year (2015) for northern shrimp, for Massachusetts samples (above) and Western Maine samples (below). Dotted line indicates approximate day of 50% hatch.

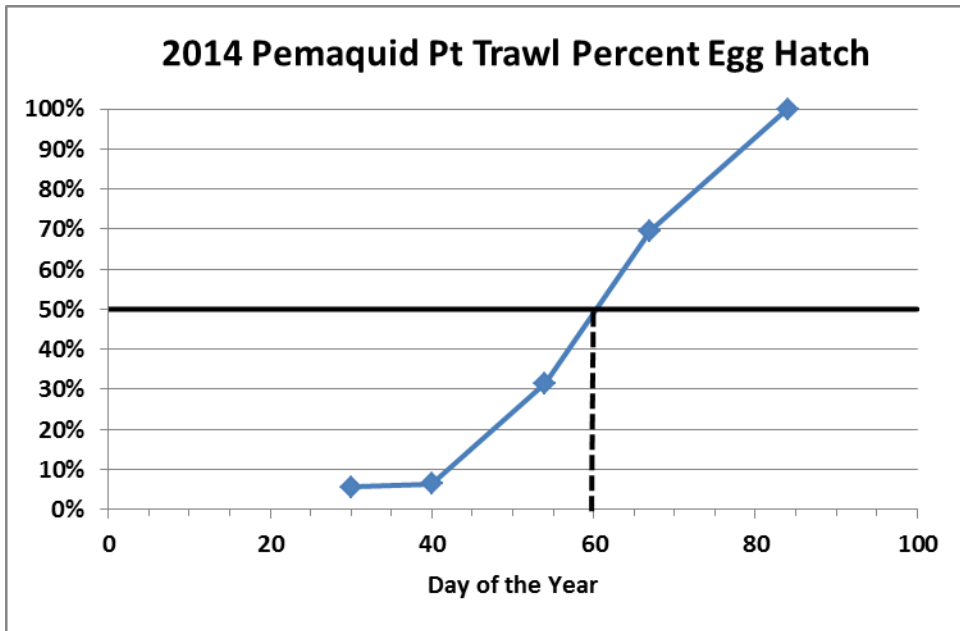
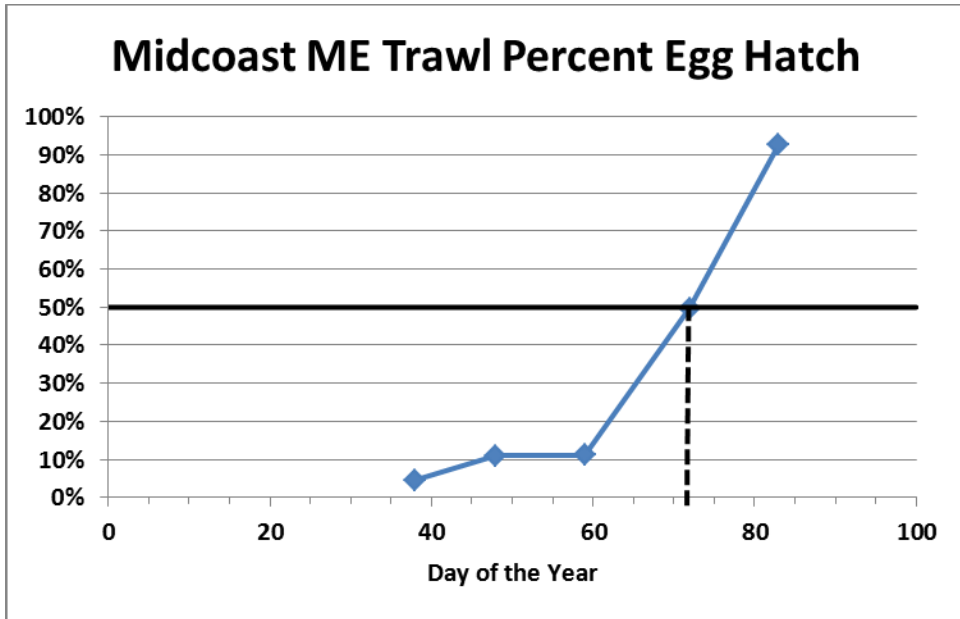


Figure 16. Mean percentage of egg hatch by day of the year for northern shrimp, for 2015 Midcoast Maine (Pemaquid Point, South Bristol) samples (above) and 2014 Pemaquid Point samples (below). Dotted line indicates approximate day of 50% hatch.

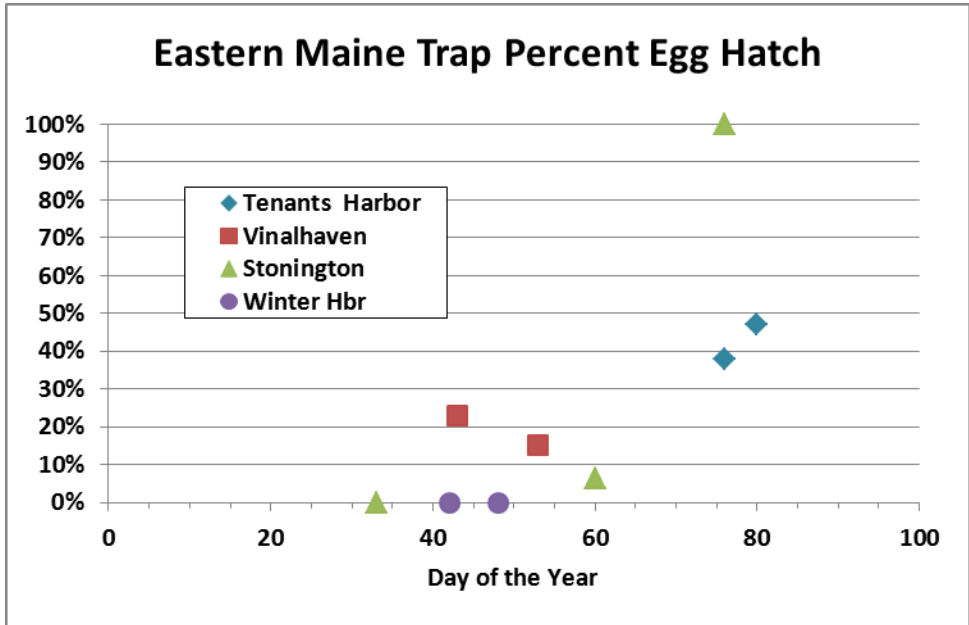
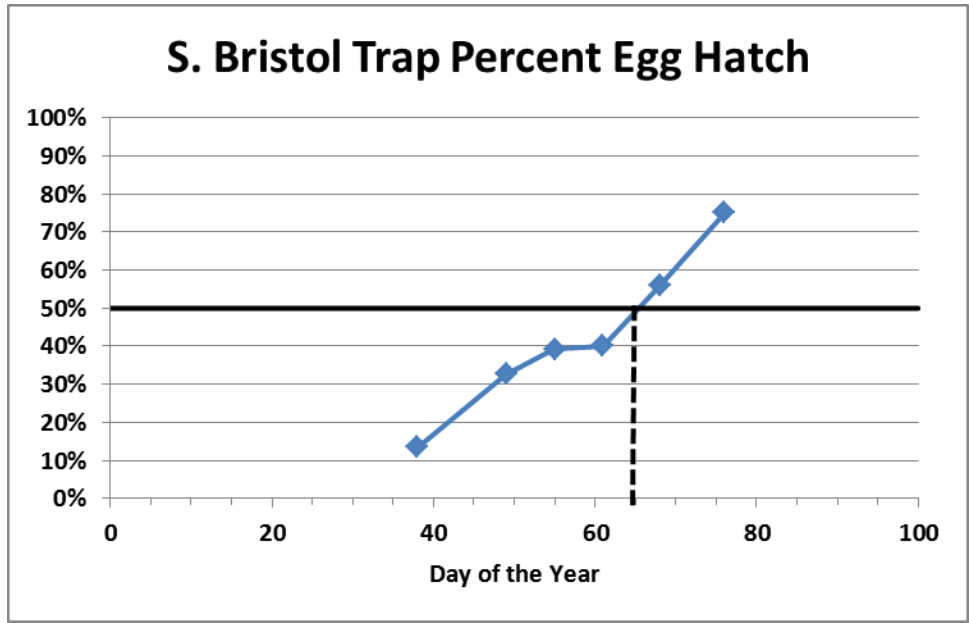


Figure 17. Mean percentage of egg hatch by day of the year (2015) for northern shrimp, for South Bristol trap samples (above) and other Maine trap samples (below, by port). Dotted line indicates approximate day of 50% hatch.

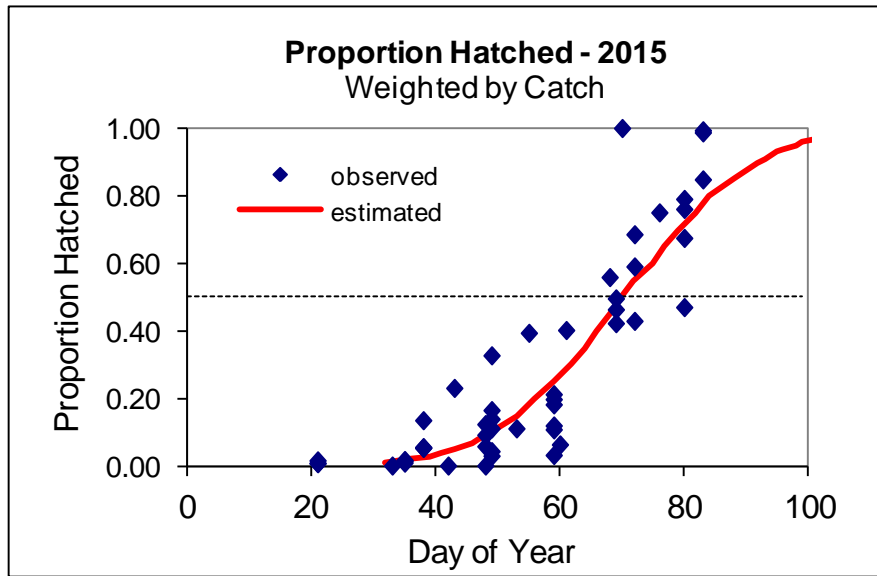


Figure 18. Proportion hatched over time in all Maine samples during 2015. Blue dots are observed proportions in samples; red line is fitted estimate from probit analysis.

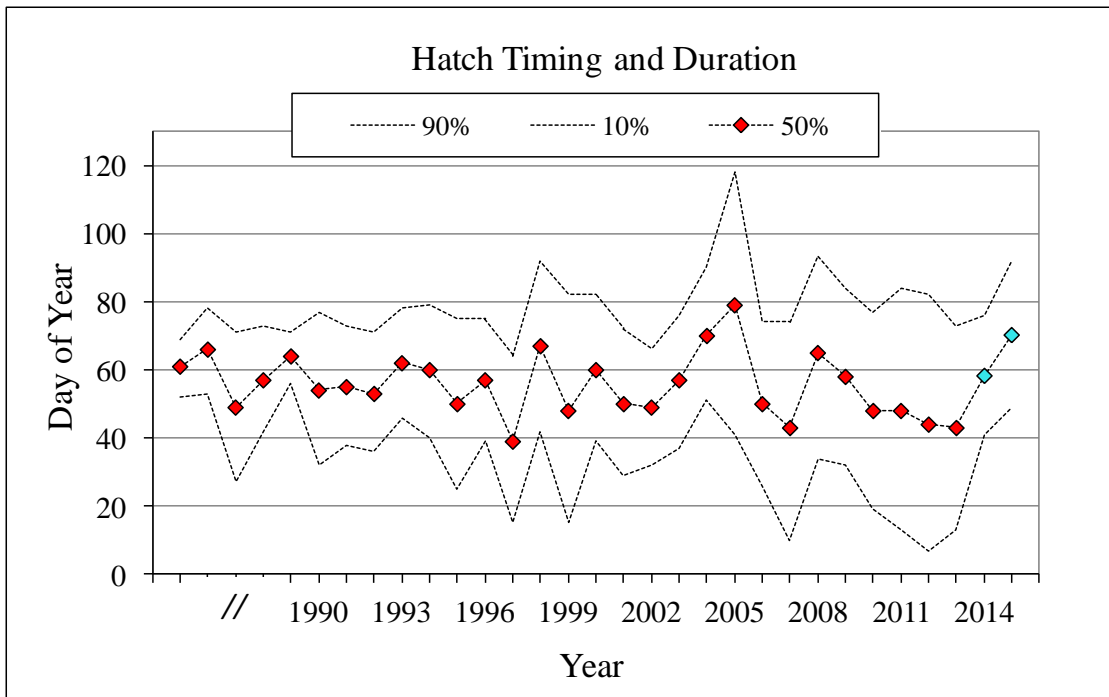


Figure 19. Time series of hatch timing estimates from sampling of the Maine commercial fishery (1980–1984, 1989–2013) and NSTC winter sampling in Maine (2014–2015).

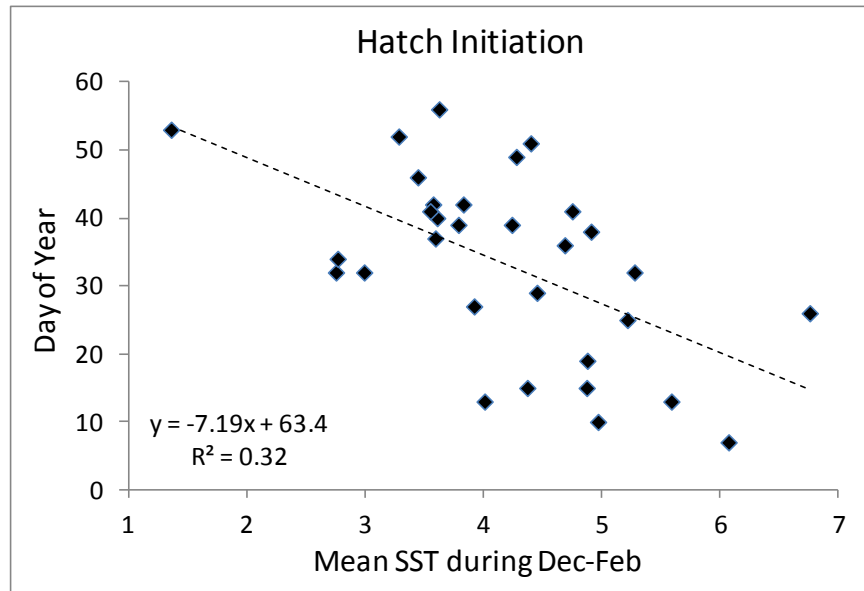


Figure 20. Relationship between average SST (°C measured at Boothbay Harbor) during December through February and initiation of the hatch period.

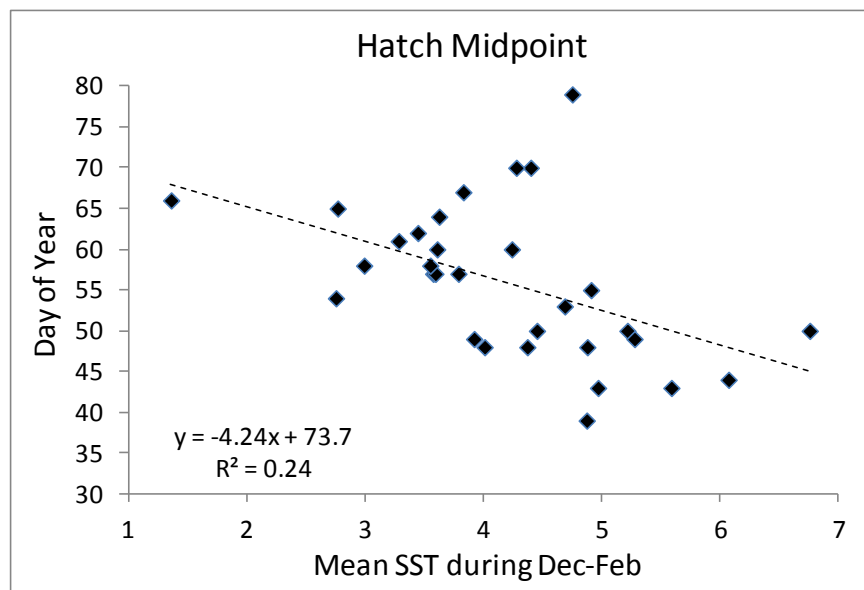


Figure 21. Relationship between average SST (°C measured at Boothbay Harbor) during December through February and timing of the hatch midpoint.

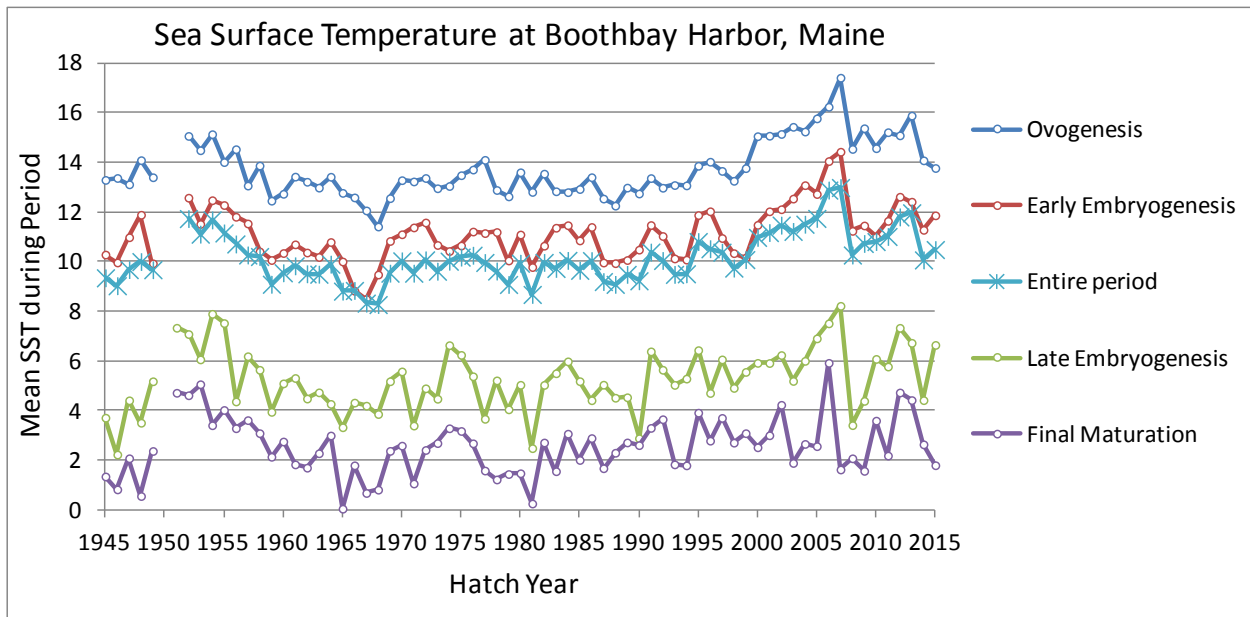


Figure 22. Sea surface temperature (°C) measured at Boothbay Harbor Maine during stages of the shrimp reproductive cycle, 1945–2015.